Greater Cambridge Partnership

CAMBOURNE TO CAMBRIDGE

Technical Report 2 – Air Quality

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1 INTRODUCTION AND SUMMARY

1.1.1. This report presents the findings of an assessment of the potential air quality impacts of the Cambourne to Cambridge (C2C) Scheme during both the construction and operational phases. For both phases, the type, source and significance of potential impacts are identified, along with the measures that should be employed to minimise these described.

1.1.2. The C2C Scheme will include a 13.6km long mainly dedicated busway connecting Cambourne in the west with Cambridge in the east. A service road and maintenance track, to be used as an active travel path, will run alongside the segregated sections of busway. The C2C Scheme will use hybrid vehicles (and in due course, electric vehicles), providing a service of around 10 buses per hour each way. The Scotland Farm travel hub (a park and ride facility) will be situated along the route, just north of the A428, approximately 5km west of Cambridge. Further details about the Scheme proposal are set out in Chapter 3 of the ES[1].

1.1.3. The C2C Scheme redline boundary (hereafter referred to as the 'Site') lies within both South Cambridge District Council (SCDC) and Cambridge City Council's (CCC's) administrative areas. The eastern extent of the Site lies adjacent to CCC's Air Quality Management Area (AQMA).

1.1.4. For assessment purposes, it has been assumed that all buses will be, as a worst case, Euro VI emission standard compliant, although the aspiration is to use ultra-low/zero emissions vehicles.

1.1.5. The assessment of construction phase impacts associated with fugitive dust and fine particulate matter emissions has been undertaken in line with the relevant Institute of Air Quality Management (IAQM) guidance[2].

1.1.6. The assessment of the potential air quality impacts associated with road traffic generated by the operational phase of the C2C Scheme has been completed in line with published methodologies and technical guidance. The pollutants considered in this part of the assessment were nitrogen dioxide (NO_2) and particulate matter (PM_{10} and $PM_{2.5}$). The air quality objectives and policy relevant to this assessment are presented in **Appendix A** and **Appendix B** respectively.

1.1.7. The assessment has concluded that:

- By following good site practice and implementing suitable mitigation measures, the effect of dust and particulate matter releases during the construction phase would be significantly reduced such that any residual effects will be negligible. The residual effects of emissions to air from construction vehicles and plant on local air quality will also be negligible; and
- The C2C Scheme would cause reductions in concentrations of NO_2, PM_{10} and $PM_{2.5}$ at the majority of the existing assessment sensitive receptors; and very small to small increases in pollutant concentrations at the rest of the receptors. There are no exceedances of the relevant air quality objectives and limit values without or with the C2C Scheme. According to the assessment significance criteria, the residual effects of the Scheme are therefore negligible, and no mitigation measures are required.

[1] Environmental Statement (Document reference: C2C-10-00-Environmental Statement (Volume 1))
[2] IAQM. Guidance on the assessment of dust from demolition and construction (v1.1 2016). Available from https://iaqm.co.uk/text/guidance/construction-dust-2014.pdf [Accessed: November 2022]

1.1.8. Based on the assessment results, it is concluded that the C2C Scheme would comply with national, regional and local policy for air quality as summarised in **Appendix B**.

1.1.9. A glossary of terms used in this report is provided in **Appendix C**.

2 BASELINE ENVIRONMENT

2.1.1. To provide an assessment of the significance of any new development proposal on local air quality, it is necessary to identify and understand the baseline air quality conditions in and around the study area (the study area is defined in Section 3, Methodology). This provides a reference against which any potential changes in air quality can be assessed.

2.1.2. To identify existing air quality conditions, a review of publicly available information has been undertaken, including the latest air quality review and assessment reports published by CCC, available monitoring data, and background concentration maps published by Defra[3]. This section presents the results of the review.

2.1.3. Since air quality is forecast to improve in the future (mainly attributable to improvements in vehicle emissions and the increasing proportion of electric vehicles (EVs) within the fleet), a future baseline has also been assessed. This allows changes in air quality due to the C2C Scheme to be isolated from wider changes in pollutant concentrations between the current baseline and opening year (including due to background growth on the local road network and any committed developments in the vicinity). The future baseline has been assessed as the opening year of the C2C Scheme, in the absence of the scheme, and is reported in paragraphs 2.1.26 to 2.1.39.

2.2 EMISSION SOURCES

2.2.1. Air quality within the study area is primarily influenced by emissions from road traffic. The areas located either side of the main road corridors (A428 and A1303) and roads within the Cambridge City AQMA are the worst affected areas with respect to poor air quality.

2.2.2. There is one industrial installation within the CCC's administrative area, Addenbrooke's Clinical Waste Incinerator at Addenbrookes Hospital, approximately 12.5km southeast to the C2C Scheme. This installation is permitted and regulated by the Environment Agency. However, considering its distance from the C2C Scheme, it is considered that the incinerator will not substantially affect air quality within the study area.

2.2.3. There are 19 smaller industrial installations with emissions to air that are permitted and regulated by CCC[4]. As all of the regulated industrial installations are required under permit terms to mitigate pollutant emissions to air, it is unlikely that these sources will significantly affect air quality within the study area.

2.2.4. There is no readily available information regarding industrial installations within SCDC's administrative area. Notwithstanding this, it is assumed that any industrial installations with emissions to air will be regulated, and therefore unlikely to significantly influence air quality within the study area.

[3] DEFRA Background Concentration Mapping: Available at: https://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html [Accessed November 2022]

[4] Cambridge City Council (no date). Currently permitted processes under pollution prevention and control act 1999 as of 31 April 2016. Available at:https://www.cambridge.gov.uk/media/1724/list_of_processes_regulated_by_us_april_2016.pdf [Accessed November 2022].

2.2.5. There are no other local authorities which contain industrial installations that would influence air quality at the Site.

2.3 LOCAL AIR QUALITY MANAGEMENT

2.3.1. The majority of the Scheme lies within SCDC's administrative area. An AQMA had previously been declared along the A14 between Bar Hill and Milton, however this was revoked in 2020.

2.3.2. In 2021, SCDC published an Air Quality Strategy[5] which sets out focused actions to ensure:

1) that air quality is monitored and understood district-wide and that appropriate measures are introduced to ensure compliance with relevant air quality objectives;
2) that policies are in place to minimise impacts from future developments; and
3) public engagement aimed at increasing awareness of air quality issues.

2.3.3. The eastern extent of the Scheme lies within CCC's administrative area, adjacent to the city centre AQMA. The AQMA was declared in 2004, covers an area encompassing the inner ring road and land within it and has been designated due to exceedances of the AQS objective for annual mean NO_2.

2.3.4. Monitoring data presented within both CCC and SCDC's latest Annual Summary Reports[6,7](ASRs) are presented below.

2.4 LOCAL AUTHORITY AIR QUALITY MONITORING DATA

2.4.1. The results of NO_2, PM_{10} and $PM_{2.5}$ monitoring being undertaken by CCC and SCDC within 2km of the Site are provided in **Appendix D** for the period 2017 to 2021 inclusive. Baseline air quality conditions as interpreted from the monitoring data (obtained from either continuous monitoring or passive NO_2 diffusion tubes) are discussed below.

NO_2 Concentrations

Automatic Monitoring

2.4.2. There are four continuous monitoring stations (all roadside) within 2km of the Site (CM1, CM4, CM5 and GIRT). The monitoring results show that the AQS objectives for annual and hourly mean NO_2 concentrations were met at all four continuous monitoring sites for the period 2017 to 2021 inclusive (see **Appendix D Table TR2-D-1** and **Table TR2-D-3** respectively). Furthermore, all four monitoring stations reported an improvement in NO_2 concentrations over this time period.

Diffusion Tubes

2.4.3. In total there are 35 diffusion tube monitoring locations within 2km of the Site (31 of which are operated by CCC, the remainder by SCDC). The monitoring results indicate that the AQS objective for annual mean NO_2 concentrations was met in all years 2017 – 2021, where data was available[8].

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5 South Cambridgeshire District Council Air Quality Strategy 2021 – 2025. Available at: https://www.scambs.gov.uk/media/19544/air-quality-strategy-2021-2025.pdf [Accessed November 2022].
6 Cambridge City Council LAQM Annual Status Report 2022. Available at: https://www.cambridge.gov.uk/media/11277/air-quality-annual-status-report-2022.pdf [Accessed November 2022].
7 South Cambridgeshire District Council (2022). LAQM Annual Status Report 2022.
8 The four sites within SCDC have only recently been installed and so data is only available for 2021.

2.4.4. Annual mean NO_2 concentrations determined for 2020 and 2021 were significantly lower than for previous years, reflecting of the travel restrictions and national lockdowns associated with the COVID-19 pandemic. Notwithstanding the influence of the COVID-19 pandemic, there was an overall downward trend in annual mean NO_2 concentrations measured between 2017 and 2019, where data was available[9].

PM_{10} Concentrations

2.4.5. There are three continuous monitoring stations (all roadside) within 2km of the Site boundary where PM_{10} concentrations are reported (CM1, CM4 and GIRT). The monitoring results show that the AQS objectives for annual and daily mean PM_{10} concentrations were met at all three sites for the period 2017 to 2021 inclusive (see **Appendix D Table TR2-D-4** and **Table TR2-D-5** respectively).

2.4.6. The monitoring also indicates that annual mean PM_{10} concentrations were fairly stable prior to 2020, with a significant decrease in measured levels in 2020 following COVID-19 restrictions, most likely in response to reduced vehicle movements. A small increase from 2020 to 2021 was observed at the GIRT monitor, located at A1307 Huntingdon Road.

$PM_{2.5}$ Concentrations

2.4.7. $PM_{2.5}$ concentrations are only measured at two of the roadside automatic monitoring sites (CM1 and GIRT).

2.4.8. The monitoring results show that the AQS objective for annual mean $PM_{2.5}$ concentrations was met at both sites for the period 2017 to 2021 inclusive (see **Appendix D Table TR2-D-6**).

2.4.9. Whilst there was a small decrease in $PM_{2.5}$ levels between 2017 and 2020 and an increase from 2020 to 2021, overall the monitoring trend remains fairly stable.

2.5 BACKGROUND CONCENTRATIONS

2.5.1. Estimated background concentrations obtained from Defra[3] for annual mean NO_2, PM_{10} and $PM_{2.5}$ concentrations (**Appendix E**) meet the AQS objectives (**Appendix A**) for both 2019 baseline case and the future baseline year (2041).

2.6 SCHEME SPECIFIC AIR QUALTY MONITORING

2.6.1. Scheme specific diffusion tube monitoring was undertaken by Mott MacDonald in 2019. The six-month survey was carried out to determine existing baseline NO_2 concentrations along the route and surrounding areas of the C2C Scheme.

2.6.2. Monitoring was undertaken using diffusion tubes at 22 locations and co-located with the 'Girton' roadside continuous air quality monitoring station.

2.6.3. The six months of monitoring data were annualised and bias adjusted by Mott MacDonald. The 2019 equivalent annual mean NO_2 concentrations are presented in **Appendix D Table TR2-D-13**. The results indicate the following:

- Location 13 has the highest concentration, with an annualised concentration of 30µg/m³. This site is located along the A1303 after Junction 13 of the M11 and experiences relatively high traffic flows heading in and out of Cambridge. The nearest receptor to this monitoring site is a

[9] Again noting that the four SCDC sites have only have data available for 2021.

residential receptor located on the A1303, which is 10m back from the road. This is further away from the road than the monitoring site and therefore concentrations at the receptor will be lower. This site is still below the annual mean AQS objective for NO_2;

- Location 7 has the lowest concentration (12.5µg/m^3) and is located in a residential area of Upper Cambourne. The monitoring location is it is set back approximately 10m from the main road which is representative of the distance receptors are located from the road. This monitoring site is located approximately 150m south of the C2C Scheme; and
- Sites 1-7 are located within Upper Cambourne and all show concentrations of less than 50% of the annual mean AQS objective for NO_2.

2.6.4. Monitoring results shown that the annualised 2019 NO_2 concentrations are well within the annual mean NO_2 air quality objective. The air quality in and around the study area is considered to be good, and not at risk of exceeding the AQS objective for NO_2.

2.7 MODELLED BASELINE CONCENTRATIONS

2.7.1. The assessment methodology is described in Section 3. Notwithstanding this, the results of detailed dispersion modelling undertaken as part of the assessment for the C2C scheme is presented below for both the 2019 baseline and 2041 future baseline cases. The full modelling results presented in **Appendix K**.

Annual Mean NO_2 Concentrations

2.7.2. In 2019, annual mean NO_2 concentrations are predicted to meet the AQS objective (40µg/m^3) at all of the assessment receptors. The highest concentration of 38.4µg/m^3 is predicted at Castle Street (102 Allways House) and is likely attributable to queuing traffic at the signalised junction present at this location.

2.7.3. In the 2041 future baseline case, concentrations are reduced from the 2019 baseline scenario due to the forecast improvement in vehicle emissions and background concentrations up to 2041, which more than offsets the predicted traffic growth. The highest concentration of 19.6µg/m^3 is again predicted at Castle Street (102 Allways House).

1-hour Mean NO_2 Concentrations

2.7.4. In both the 2019 baseline and 2041 future baseline cases, annual mean NO_2 concentrations predicted by the model were below 60µg/m^3 at all locations. Therefore, the 1-hour mean objective for NO_2 (200µg/m^3 not to be exceeded more than 18 times a year) is predicted to be met at all of assessment receptors in both the current and future baseline.

Annual Mean PM_{10} Concentrations

2.7.5. In 2019, annual mean PM_{10} concentrations are predicted to meet the AQS objective (40µg/m^3) at all of the assessment receptors. The highest concentration is 22.0µg/m^3, predicted on the at Junction 14 of the M11 (on the on slip to the A14).

2.7.6. In the 2041 future baseline case, concentrations are reduced from the 2019 baseline scenario due to the forecast improvement in vehicle emissions and background concentrations up to 2041, which more than offsets the predicted traffic growth. The highest concentration of 20.6µg/m^3 is again predicted at Junction 14 of the M11 (on the on slip to the A14).

2.7.7. The highest concentration is 20.6µg/m^3 without the C2C Scheme, predicted on the slip road at M11 (on slip to A14).

24-hour Mean PM_{10} Concentrations

2.7.8. The AQS objective for 24-hour mean PM_{10} concentrations (50µg/m^3 not to be exceeded more than 35 times a year) is predicted to be met at all modelled receptors in both the 2019 baseline and 2041 future baseline cases.

Annual Mean $PM_{2.5}$ Concentrations

2.7.9. In 2019, annual mean $PM_{2.5}$ concentrations are predicted to meet the limit value (20µg/m^3) at all of the assessment receptors. The highest concentration is 19.2µg/m^3, predicted on the at Junction 14 of the M11 (on the on slip to the A14).

2.7.10. In the 2041 future baseline case, concentrations are reduced from the 2019 baseline scenario due to the forecast improvement in vehicle emissions and background concentrations up to 2041, which more than offsets the predicted traffic growth. The highest concentration of 12.1µg/m^3 is again predicted at Junction 14 of the M11 (on the on slip to the A14).

2.8 WORLD HEALTH ORGANISATION GUIDELINES

2.8.1. The WHO updated its air quality guidelines (AQG)[10] in 2021 in response to the real and continued threat of air pollution to public health. The AQG for annual mean NO_2, PM_{10} and $PM_{2.5}$ concentrations are 10, 15 and 5µg/m^3 respectively.

2.8.2. In the 2019 baseline case, concentrations at majority of the modelled receptors (101 receptors, 84%), are not predicted to meet the WHO AQG for annual mean NO_2 (10µg/m^3). By the 2041 future baseline case, the WHO AQG is predicted to be met at 61, out of 121, of the modelled human receptors without the C2C Scheme.

2.8.3. In the 2019 baseline case, at majority of the modelled receptors (118 out of 121 receptors) concentrations are not predicted to meet the WHO AQG for annual mean PM_{10} (15µg/m^3). In the 2041 baseline, without the C2C Scheme, the WHO AQG is predicted to be met at 43, out of 121, of the modelled human receptors.

2.8.4. The WHO AQG for 24-hour PM_{10} concentration (45µg/m^3) not to be exceeded more than 4 times a year) is predicted to be met at all modelled receptors in both the 2019 baseline and 2041 future baseline cases.

2.8.5. The WHO AQG for annual mean $PM_{2.5}$ (5µg/m^3) is not predicted to be met at any of the modelled receptors in either of the 2019 baseline and 2041 future baseline cases.

2.9 SUMMARY

2.9.1. The baseline review has been undertaken with reference to publicly available information. In-addition dispersion modelling has been undertaken to predict current and future baseline pollutant concentrations.

2.9.2. Air quality monitoring data shows that concentrations of all measured pollutants meet AQS objectives. The data shows evidence of improving long term trends in air quality.

[10] WHO Global Air Quality Guideline 2021. Available at: https://apps.who.int/iris/handle/10665/345329

2.9.3. It is unlikely that emissions to air from exiting permitted industrial installations would substantially contribute to pollutant concentrations at Site.

2.9.4. Overall, the baseline air quality in the study area is good. The likelihood of exceeding the AQS objectives in the current baseline and future baseline is low.

3 METHODOLOGY SUMMARY

3.1 CONSTRUCTION PHASE

3.1.1. Dust comprises particles typically in the size range 1-75 micrometres (µm) in aerodynamic diameter and is created through the action of crushing and abrasive forces on materials. The larger dust particles fall out of the atmosphere quickly after initial release and therefore tend to be deposited in close proximity to the source of emission. Dust therefore, is not likely to cause long-term or widespread changes to local air quality; however, its deposition on property and cars can cause 'soiling' and discolouration. This may result in complaints of nuisance through amenity loss or perceived damage caused, which is usually temporary.

3.1.2. The smaller particles of dust (less than 10µm in aerodynamic diameter) are known as particulate matter (PM_{10}) and represent only a small proportion of total dust released. This includes a finer fraction, known as $PM_{2.5}$ (with an aerodynamic diameter less than 2.5µm). As these particles are at the smaller end of the size range of dust particles, they remain suspended in the atmosphere for a longer period of time than the larger dust particles and can therefore be transported by wind over a wider area. PM_{10} and $PM_{2.5}$ are small enough to be drawn into the lungs during breathing, which in sensitive members of the public could have a potential impact on health.

3.1.3. An assessment of the likely significant impacts on local air quality due to the generation and dispersion of dust and PM_{10} during the construction phase has been undertaken with reference to:

- The IAQM guidance on the assessment of dust from demolition and construction[2];
- The available information for this phase of the C2C Scheme provided by the Client and Project Team; and
- Professional judgement.

3.1.4. The risk of potential dust and PM_{10} impacts from demolition; earthworks; general construction activities and track-out were assessed in line with the IAQM Construction Dust Guidance[2]. It takes into account the nature and scale of the activities undertaken for each source and the sensitivity of the area to an increase in dust and PM_{10} levels to assign a level of risk. Risks are described in terms of there being a low, medium or high risk of dust impacts. Once the level of risk has been ascertained, then site specific mitigation proportionate to the level of risk is identified, and the significance of residual effects determined. A summary of the IAQM Construction Dust Guidance[2] assessment methodology is provided in **Appendix F**.

3.1.5. In addition to impacts on local air quality due to on-site construction activities, exhaust emissions from construction NRMM may have an impact on local air quality adjacent to the routes used by these vehicles to access the Site and in the vicinity of the Site itself.

SENSITIVE RECEPTORS

3.1.6. A construction dust risk assessment is undertaken where there are: 'human receptors' within 350m of the site boundary, or within 50m of the route(s) used by construction vehicles on the public highway, up to 500m from the site entrance(s); and/or 'ecological receptors' within 50m of the site boundary, or within 50m of the route(s) used by construction vehicles on the public highway, up to 500m from the site entrance(s). It is within these distances that the impacts of dust soiling and increased particulate matter in the ambient air will have the greatest impact on local air quality at sensitive receptors. The construction dust assessment study areas are illustrated in **Figure 1** in **Appendix L**.

3.1.7. For construction traffic emissions, consideration has been given to sensitive receptors (human and ecological) which fall within proximity (200m) of the routes most likely to be used by construction traffic.

SIGNIFICANCE CRITERIA

3.1.8. The IAQM Construction Dust Guidance assessment methodology recommends that significance criteria are only assigned to the identified risk of dust impacts occurring from a construction activity with appropriate mitigation measures in place. For almost all construction activities, the application of effective mitigation should prevent any significant effects occurring to sensitive receptors and therefore the residual effect will normally be not significant.

3.1.9. For the assessment of the impact of exhaust emissions from plant used on-site and construction vehicles accessing and leaving the Site on local concentrations of NO_2 and particulate matter, the significance of residual effects has been determined using professional judgement and the principles outlined in the Environmental Protection UK (EPUK)/IAQM Land-Use Planning guidance[11], which are described below.

3.2 OPERATIONAL PHASE

3.2.1. The detailed dispersion model ADMS-Roads (version 5.0.0.1) has been used to predict changes in NO_2, PM_{10} and $PM_{2.5}$ concentrations for human receptors as a result of the implementation of the C2C Scheme. ADMS-Roads uses detailed information regarding traffic flows on the local road network, surface roughness, and local meteorological conditions to predict pollutant concentrations at specific receptor locations, as determined by the user.

3.2.2. Meteorological data, such as wind speed and direction, is used by the model to determine pollutant transportation and levels of dilution by the wind. Meteorological data used in the model was obtained from the Met Office observing station at Bedford Station for 2019. Given the location of the observing station in relation to the Site and its data capture, Bedford Station is considered to provide representative data for the assessment.

3.2.3. The traffic data have been derived from the CCC's regional transport model (Series F CSRM Traffic model). It includes details of the annual average daily traffic (AADT) flows, vehicle speeds (km/h) and the percentage of heavy duty vehicles (HDVs) for the local road network in all assessment years considered. The details of transport model methodology and limitations are detailed in the Transport Assessment Report[12].

3.2.4. The study area (see **Figure 2** in **Appendix L)** comprises all roads within 200m of the roads that meet the IAQM screening criteria and all roads within the AQMA. It is considered that the IAQM screening criteria are more precautionary compared to the screening criteria set in the Design Manual for Roads and Bridges (DMRB) LA 105 Air Quality[13], which are typically applied to the motorway and all-purpose trunk road projects.

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[11] Environmental Protection UK and Institute of Air Quality Management (Version 1.2 Updated January 2017). Land Use Planning & Development Control: Planning for Air Quality.

[12] Transport Assessment Report (Document reference: C2C-25-00-Transport assessment).

[13] Highways England. Design Manual for Roads and Bridges LA 105 Air Quality 2019.

3.2.5. For the assessment, three scenarios were modelled, as follows:

- 2019 baseline case which has also been applied for model verification;
- The 2041 Do Minimum (DM) - is the scenario with the currently proposed Local Plans for the four Local Authority Districts (Cambridge City, South Cambridgeshire, Huntingdonshire and East Cambridgeshire) represented in Cambridge Sub Regional Model (CSRM2 Series F). This includes local assumptions on housing, employment and other developments, along with transport schemes which are either committed or expected to be required to support development; and
- The 2041 Do Something (DS) – the highway demand in the DM scenario with the full C2C Scheme build out.

3.2.6. 2019 is the most recent year for which suitable monitoring data[14] and meteorological data are available to enable verification of the model results, and so this year has been used as the baseline year for this assessment.

3.2.7. 2041 represents the opening year of the C2C Scheme. The DM and DS scenarios included the 'Making Connections' schemes which comprise a package of measures to improve the way that people and vehicles move around in Greater Cambridge and the wider area, whilst reducing congestion and improving air quality[15]. Whilst yet to be adopted, the proposals include transforming the bus network, investing in other sustainable travel schemes, and creating a Sustainable Travel Zone proposal. Further detail regarding Making Connections is presented in the Transport Assessment Report[12].

STUDY AREA

3.2.8. Study area is shown in **Figure 2** in **Appendix L**. The study area for the operational phase assessment of local air quality has been defined in accordance with the threshold criteria contained within EPUK/IAQM Land Use Planning Guidance.

3.2.9. The EPUK/IAQM guidance advises that developments may result in a potentially significant impact on air quality where trip generation exceeds the following traffic scoping criteria for developments within or adjacent to an AQMA:

- A change of Light Duty Vehicles (LDV) flows of more than 100 Annual Average Daily Traffic movements (AADT); and/or
- A change in Heavy Duty Vehicles (HDVs) of more than 25 AADT.

3.2.10. The operational phase study area covers all road links where the EPUK/IAQM criterion (as outlined above) are exceeded. In addition, road links within the CCC's AQMA are also included. This approach to defining the study area was agreed with the Environmental Health Officers at both SCDC and CCC.

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[14] Data from 2020 and 2021 is not considered suitable due to the effect of the COVID-19 pandemic (and associated lockdowns) on traffic flows.

[15] Making Connections – it is part of the GCP's City Access programme to improve the way that people and vehicles move around city, whilst reducing congestion and improving air quality. Details are available here: https://www.greatercambridge.org.uk/sustainable-transport-programme/city-access-programme/making-connections

VEHICLE EMISSION FACTORS

NO_X, PM_{10} and $PM_{2.5}$ Vehicle Emission Rates

3.2.11. Vehicle emission factors for use in the assessment have been obtained using Defra's Emissions Factors Toolkit (EFT) version 11.0 (November 2022)[16]. The EFT allows for the calculation of emission factors arising from road traffic for years including and after 2018. For predictions of future year emissions, the EFT takes into account factors such as anticipated advances in vehicle technology and changes in vehicle fleet composition, such that vehicle emissions are assumed to reduce over time.

3.2.12. For the purpose of the assessment presented herein, 2019 emissions have been applied to the 2019 baseline scenario whilst 2030 emissions have been applied to the 2041 scenarios (both without and with the C2C Scheme).

Bus Emission Rates

3.2.13. During consultation, the Greater Cambridge Partnership (GCP) requested that the assessment of the C2C Scheme apply the same assumptions/proportions as the Making Connections work with respect to the bus fleets. The assumptions applied are shown in **Table TR2.3.1** below.

Table TR2.3.1 – Bus Proportion applied for assessment

Scenario	Euro VI	Euro V	Euro IV	Electric
2019 Base	0.36	0.48	0.15	0.01
2041 DM	0.81	-	-	0.19
2041 DS	-	-	-	1.00

SELECTION OF BACKGROUND CONCENTRATIONS

3.2.14. Background concentrations for the study area have been taken from the national maps provided by Defra[3]. These maps provide estimated annual mean background concentrations for the whole of the UK at a grid resolution of 1 x 1 km, for all years between 2018 and 2030.

3.2.15. A key assumption is that background concentrations will reduce over time. Many local authorities are finding that the results of their local monitoring do not always support this assumption, with many areas showing that pollutant concentrations have remained fairly stable over recent years. In Cambridge, however, there has been a reduction in monitored NO_2, PM_{10} and $PM_{2.5}$ concentrations in recent years and, consequently, it is reasonable to apply Defra's estimates for 2030 in the future scenarios.

[16] Defra Emissions Factors Toolkit, version 11.0. Available at: https://laqm.defra.gov.uk/review-and-assessment/tools/emissions-factors-toolkit.html [Accessed November 2022]

3.2.16. It should be noted that the background maps present both the total estimated background concentrations and the individual contributions from a range of emission sources (for example, motorways, aircraft, domestic heating etc). When detailed modelling of an individual sector is required as part of an air quality assessment (such as motorways, trunk roads etc), the respective contribution(s) can be subtracted from the overall background estimate to avoid the potential for double-counting.

3.2.17. For this assessment, emissions from motorways, trunk roads and A-roads within the background grid map square have been included in the modelling. Background concentration contributions from these sectors have, therefore, been removed from the background concentrations utilised within the assessment. The background concentrations used in the assessment are presented in **Appendix E**.

MODEL VERIFICATION

3.2.18. The ADMS-Roads dispersion model has been widely validated for this type of assessment and is considered to be fit for purpose. Model validation undertaken by the software developer will not have included validation in the vicinity of the study area.

3.2.19. To determine the performance of the model at a local level, a comparison of modelled results with the results of monitoring carried out within the study area was undertaken. This process of verification aims to minimise modelling uncertainty and systematic error by correcting modelled results by an adjustment factor/adjustment factors to gain greater confidence in the final results Model verification has been carried out following the methodology specified in Chapter 7 Section 4 of LAQM.TG(22).

3.2.20. Details of the verification factor calculations are presented in **Appendix G**.

3.2.21. In the absence of suitable monitoring data, the NO_x verification factors have been applied to the modelled outputs for both PM_{10} and $PM_{2.5}$.

SELECTION OF SENSITIVE RECEPTORS

3.2.22. In terms of locations that are sensitive to pollutants emitted from engine exhausts, these include places where members of the public are likely to be regularly present over the period of time prescribed in the AQS. For instance, on a footpath where exposure will be transient (for the duration of passage along that path) comparison with the AQS objective for 1-hour mean NO_2 concentrations may be relevant. At a school or residential property, where exposure is likely to occur over longer periods, comparison with AQS objectives for 24-hour and annual mean concentrations is more appropriate. Box 1.1 of LAQM.TG(22) provides examples of the locations where the air quality objectives should/should not apply.

3.2.23. To complete the assessment, a number of ‘human receptors’ representative of locations of relevant public exposure were identified at which pollution concentrations were predicted. These receptors are located adjacent to the roads that are likely to experience the greatest changes in traffic flows as a result of the implementation of the C2C Scheme.

3.2.24. All modelled receptors included in the assessment are shown in **Figure 3** in **Appendix L** and details of the modelled receptors are provided in **Appendix H**.

RESULTS PROCESSING

Determination of Total Annual Mean NO2, PM10 and PM2.5 Concentrations

3.2.25. To enable the determination of air quality impacts it was first necessary to multiply each of the ADMS-Roads model outputs by the appropriate adjustment factor from model verification and then combine with the appropriate background concentration. The basic formula for this is:

Total annual mean concentration (µg/m^3) = verification factor x model output annual mean road contribution (µg/m^3) + annual mean background concentration (µg/m^3).

3.2.26. For PM_{10} and $PM_{2.5}$ this is a simple process, applying the basic formula above. However, for total annual mean NO_2 concentrations it is necessary to account for atmospheric chemistry in converting model output NO_x to NO_2; the Defra NO_x to NO_2 calculator was therefore used to do this.

3.2.27. The resultant total annual mean pollutant concentrations are comparable with the relevant AQS objectives (**Appendix A**).

Determination of 1-hour Mean NO2 and 24-hour Mean PM10 Statistics

3.2.28. Defra's LAQM.TG(22) advises that exceedances of the 1-hour mean NO_2 AQS objective (i.e. no more than 18 exceedances of 200µg/m^3 allowed in a year) are unlikely to occur where annual mean concentrations are below 60µg/m^3. This rule of thumb has therefore been applied in this assessment.

3.2.29. For determining compliance with the 24-hour mean PM_{10} AQS objective (i.e. no more than 35 exceedances of 50µg/m^3 allowed in a year), LAQM.TG(22) supports the use of the following empirical relationship:

The number of 24-hour mean PM_{10} exceedances of 50µg/m^3 = -18.5 + 0.00145 x annual mean^3 + (206 ÷ annual mean)

Note that this relationship is not valid for annual mean concentrations less than 14.8µg/m^3 and concentrations less than 17µg/m^3 should be considered to be indicative of zero exceedances.

SIGNIFICANCE CRITERIA

3.2.30. The approach provided in the EPUK/IAQM guidance has been used within this assessment to assist in describing the air quality effects associated with the implementation of the C2C Scheme.

3.2.31. The EPUK/IAQM guidance recommends that the degree of an impact is described by expressing the magnitude of incremental change in pollution concentration as a proportion of the relevant assessment level and examining this change in the context of the new total concentration and its relationship with the assessment criterion, as summarised in **Table TR2.3.2.**

Table TR2.3.2 – Impact Descriptors for Individual Human Receptors

Long term average concentration at receptors in assessment year	% Change in concentration relative to the AQS objective/limit value			
	1	2-5	6-10	>10
75% or less of AQS objective	Negligible	Negligible	Slight	Moderate
76-94% of AQS objective	Negligible	Slight	Moderate	Moderate
95-102% of AQS objective	Slight	Moderate	Moderate	Substantial
103-109% of AQS objective	Moderate	Moderate	Substantial	Substantial
110% or more of AQS objective	Moderate	Substantial	Substantial	Substantial

Notes

AQS objectives for the relevant pollutants are provided in **Appendix A**.

Where the %change in concentrations is <0.5%, the change is described as 'Negligible' regardless of the concentration.

When defining the concentration as a percentage of the AQO, 'without scheme' concentration should be used where there is a decrease in pollutant concentration and the 'with scheme;' concentration where there is an increase.

Where concentrations increase, the impact is described as adverse, and where it decreases as beneficial.

3.2.32. The EPUK/IAQM guidance notes that the criteria in **Table TR2.3.2** should be used to describe impacts at individual receptors and should be considered as a starting point to make a judgement on significance of effects, as other influences may need to be accounted for. The EPUK/IAQM guidance states that the assessment of overall significance should be based on professional judgement, taking into account several factors, including:

- The existing and future air quality in the absence of development;
- The extent of current and future population exposure to the impacts; and
- The influence and validity of any assumptions adopted when undertaking the prediction of impacts.

3.2.33. The EPUK/IAQM guidance states that for most road transport related emissions, long-term average concentrations are the most useful for evaluating the impacts. The guidance does not include criteria for determining the significance of the effect on 1-hour mean NO_2 concentrations or 24-hour mean PM_{10} concentrations. The significance of effects of 1-hour mean NO_2 and 24-hour mean PM_{10}

concentrations arising from the operational phase has therefore been determined qualitatively using professional judgement and the principles described above.

4 ASSUMPTIONS AND EMBEDDED MITIGATION

4.1 ASSUMPTIONS

4.1.1. At the time of assessment, a Principal Contractor was still to be appointed, and therefore a method statement for the construction phase was not available to inform the construction phase assessment. In the absence of this information, professional judgement and reasonable worst-case assumptions have been used in the completion of this part of the assessment where necessary. Where information used in the assessment has been based on an estimate this is clearly stated.

4.1.2. In relation to the operational phase assessment, there are uncertainties associated with both measured and predicted concentrations. The model (ADMS Roads) used in this assessment relies on input data (including predicted traffic flows), which also have uncertainties associated with them. The model itself simplifies complex physical systems into a range of algorithms. In addition, local micro-climatic conditions may affect the concentrations of pollutants that the ADMS Roads model will not take into account. In order to reduce the uncertainty associated with predicted concentrations, model verification has been carried out following guidance set out in LAQM.TG(22). As the model has been verified against local monitoring data and adjusted accordingly, there can be reasonable confidence in the predicted concentrations. This is supported by the statistical analysis undertaken for the verification process.

4.1.3. The traffic data used in the dispersion modelling of occupational phase effects was produced by the WSP Transport Team who factored data from the weekday peak-hour CCC strategic transport models to 24hr AADT flows. As advised by CCC, factors for this purpose have been based on locally available count data relevant to the study.

4.1.4. The bus fleet and electric bus proportion used in the assessment are based on the Making Connections' assumptions and proportions.

4.2 EMBEDDED MITIGATION

CONSTRUCTION MITIGATION

4.2.1. The best practice and identified mitigation measures for the construction phase are included within the Code of Construction Practice (CoCP)[17] for the C2C Scheme. The contractor will be responsible for implementing the CoCP[17].

4.2.2. The mitigation measures included within the CoCP[17] are based on the risk category identified in accordance with the IAQM guidance[2]. The IAQM construction phase risk assessment is detailed in Section 5 and the IAQM recommended mitigation measures for high risk are presented in **Appendix J**. It is anticipated that with the implementation of effective site-specific mitigation measures the environment effect during construction phase will not be significant.

OPERATIONAL MITIGATION

4.2.3. A C2C Scheme itself aims to provide reliable and sustainable services bypassing general traffic congestion. The C2C Scheme route offers a public transport alternative for those travelling to and

[17] Code Of Construction Practice (Document reference: C2C-26-00-Code of Construction Practice

from the city centre and surrounding major employment sites, reducing dependence on cars by encouraging public transport use and so reducing congestion.

4.2.4. The following embedded mitigation measures in the design will help to minimise any adverse air quality effects associated with the C2C Scheme:

- All buses using the route will be required to be operate to the highest emission standards (currently Euro VI). The provision of an electric bus fleet to serve the C2C Scheme will be implemented as soon as is reasonably practicable once the technology is available for such buses to run over required distances and periods.

5 ASSESSMENT OF IMPACTS AND EVALUATION OF EFFECTS

5.1 CONSTRUCTION PHASE

DUST AND PM10 POTENTIALLY ARISING FROM ON-SITE ACTIVITIES

5.1.1. Construction activities that have the potential to generate and/or re-suspend dust and PM_{10} include:

- Preparation of temporary access/egress to the construction site and haulage routes;
- Earthworks including those associated with the extension of the existing culvert;
- Materials handling, storage, stockpiling, spillage and disposal;
- Movement of vehicles and construction traffic within the construction area (including excavators and dumper trucks);
- Exhaust emissions from site plant, especially when used at the extremes of their capacity and during mechanical breakdown;
- Construction of the C2C busway, the travel hub, M11 overbridge, Bin Brook crossing, associated service road and active travel path; and
- Site landscaping after completion.

5.1.2. The majority of the releases are likely to occur during the 'working week'. However, for some potential release sources (e.g. exposed soil produced from significant earthwork activities) in the absence of dust control mitigation measures, dust generation has the potential to occur 24 hours per day over the period during which such activities are to take place.

5.1.3. Construction is anticipated to commence in 2025 and continue over approximately 24 months. The proposed days and times that construction activities are planned are as follows:

- 0800 to 1800 Monday to Friday; and
- 0800 to 1300 Saturday.

5.1.4. No working is proposed on Sundays or bank holidays. Occasional out of hours working may take place, where required, however this will be agreed in advance with the local authority, and notify any people affected by it.

5.1.5. Typically, site deliveries via HGV will be also limited to normal working hours. Large and exceptional operations such as pre-construed bridge components may require to be delivered outside of normal hours; these will tend to occur over specific short durations within the construction programme.

ASSESSMENT OF POTENTIAL DUST EMISSION MAGNITUDE

5.1.6. The IAQM assessment methodology has been used to determine the potential dust emission magnitude for the following four different dust and PM_{10} sources: demolition; earthworks; construction; and trackout. The findings of the assessment are presented below.

Demolition

5.1.7. Altas Building will be demolished with the C2C Scheme. The total volume of buildings to be demolished within the Site is less than 20,000m^3, with potentially dusty construction material (e.g. concrete), and with demolition activities occurring below 10m above ground level. Therefore, the potential dust emission magnitude is considered to be **small** for demolition activities.

Earthworks

5.1.8. The total area of the Site is greater than 980,000m^2. The soil type comprises lime-rich loamy and clayey soils[18] which are therefore potentially dusty in certain weather conditions. It is estimated that the total volume of excavation approximately 119,000 tonnes. It is also assumed that more than 10 heavy earth moving vehicles will be active at any one time. Therefore, the potential dust emission magnitude is considered to be **large** for earthworks.

Construction

5.1.9. Given the size of the C2C Scheme, it is assumed that the total volume of road/pathway to be constructed will be greater than 100,000m^3 with both potentially dusty materials (e.g. granite material and concrete) and materials with low dust potential (e.g. bituminous material) being used. In addition, on-site concrete batching is not anticipated to occur, rather ready-mix concrete will be delivered as required. Therefore, the potential dust emission magnitude is considered to be **large** for construction activities.

Trackout

5.1.10. At this stage, it is assumed that there will be 10-50 HDV (>3.5t) outward movements in any one day, travelling on potentially dusty surface materials. Exact details will be confirmed at a later stage following the appointment of a principal contractor (who will work up a detailed design and construction strategy and programme). Due to the size of the construction area and site compound, it is also assumed that the length of unpaved roads within the C2C Scheme site will be greater than 100m. Therefore, the potential dust emission magnitude is considered to be **large** for trackout.

5.1.11. **Table TR2.5.1** provides a summary of the potential dust emission magnitude determined for each construction activity considered.

Table TR2.5.1 – Potential Dust Emission Magnitude

Activity	Dust Emission Magnitude

[18] Cranfield Soil and Agrifood Institute Soilscape Map - https://www.landis.org.uk/soilscapes/ [Accessed December 2022]

Demolition	Small
Earthworks	Large
Construction Activities	Large
Trackout	Large

ASSESSMENT OF SENSITIVITY OF THE STUDY AREA

5.1.12. A windrose generated using the 2019 meteorological data used for the dispersion modelling of operational phase impacts is provided in **Appendix I**. This shows that the prevailing wind direction is from the southwest. Therefore, receptors located to the north east of the construction area are more likely to be affected by dust and particulate matter emitted and re-suspended during the construction phase.

5.1.13. Under low wind speed conditions, it is likely that the majority of dust would be deposited in the area immediately surrounding the source. Due to the linear nature of the C2C Scheme it is envisaged that the works will be phased and so the areas likely to be affected by dust and particulate matter will change throughout the course of the construction period. There are a number of sensitive human receptors within 350m of the construction area including within the following residential areas: West Cambridge, Upper Cambourne, Hardwick and along St Neots Road. The sensitivity of the study area to dust soiling during demolition, earthworks and construction is therefore high.

5.1.14. There are no sensitive ecological receptors within the distances specified within the IAQM guidance (see paragraph 3.1.6). Therefore, the potential effects of the construction phase on ecological receptors have not been considered further.

5.1.15. There are two principal points of access to the Busway and Travel Hub sites from the adjacent highway network. These are from the A428/ Scotland Road grade-separated dumbbell junction and from the Madingley Mulch Roundabout.

5.1.16. From the west, construction traffic will travel on the A428 and access the C2C works via either the A428/ Scotland Road junction or the Madingley Mulch roundabout.

5.1.17. From the east, construction traffic will travel via the M11 and Madingley Road to the Madingley Mulch roundabout, and from there access the C2C works via St Neots Road.

5.1.18. Some construction traffic will utilise Madingley Road and the University of Cambridge’s West Cambridge campus’ on-site roads to provide access for the M11 bridge and the section of Busway running between the M11 and Grange Road. Limited amounts of construction traffic will be permitted to travel on Madingley Road and Grange Road in order to construct the tie-in between the Busway and Grange Road.

5.1.19. According to the IAQM criteria, it is those receptors that fall within 50m of the road edge up to 500m from the two site access points that will be the most sensitive to the effects of trackout. A review of aerial mapping indicates that over 100 highly sensitive receptors are located in this identified area, including a high number of residential dwellings. The sensitivity of the study area due to track out is therefore high.

5.1.20. The nearest PM_{10} monitor is GIRT at A1307 Huntington Road. The 2020 measured annual mean concentration at this monitoring station was 20µg/m^3 (see **Appendix E**). The sensitivity of the study area to human health effects due changes in particulate concentrations is therefore low.

5.1.21. Taking the above into account, and following the IAQM Construction Dust Guidance assessment methodology, the sensitivity of the area to changes in dust and PM_{10} has been derived for each of the construction activities considered. The results are presented in **Table TR2.5.2**.

Table TR2.5.2 - Sensitivity of the Study Area

Potential Impact	Sensitivity of the Surrounding Area			
	Demolition	**Earthworks**	**Construction**	**Trackout**
Dust Soiling	High	High	High	High
Human Health	Low	Low	Low	Low

RISK OF IMPACTS

5.1.22. The predicted dust emission magnitude has been combined with the defined sensitivity of the area to determine the risk of impacts during the construction phase, prior to mitigation. **Table TR2.5.3** below provides a summary of the risk of dust and PM_{10} impacts for the C2C Scheme. The risk category identified for each construction activity has been used to determine the level of mitigation required.

Table TR2.5.3 – Summary Dust Risk Table to Define Site Specific Mitigation

Potential Impact	Risk			
	Demolition	**Earthworks**	**Construction**	**Trackout**
Dust Soiling	Medium	High Risk	High Risk	High Risk
Human Health	Negligible	Low Risk	Low Risk	Low Risk

CONSTRUCTION VEHICLES & PLANT

5.1.23. The greatest risk of impact from changes in air quality due to emissions from vehicles and plant associated with the construction phase will be in the areas immediately adjacent to the site access. It is anticipated that construction vehicles will access and egress the Site via the A428 or M11 (detailed in Section 5.1.15). Due to the size of the Site, it is considered likely that the construction traffic will be low in comparison to the existing traffic flows on these roads.

5.1.24. The C2C Scheme will minimise the need to import or export materials, and to balance cut and fill as far as possible. This will help to reduce potential effects arising due to construction traffic emissions.

5.1.25. Final details of the exact plant and equipment likely to be used during construction will be determined by the appointed contractor with reference to the CoCP17. Assessment for this report has been based on professional judgment[19]. Construction plant required for the development of the C2C Scheme will typically include excavators, dumpers, mobile cranes, bulldozers, compactors, bowsers and graders. The number of plant and their location within the Site are likely to be variable over the construction period.

5.1.26. Based on the current local air quality in the area, the proximity of sensitive receptors to the roads likely to be used by construction vehicles, and the likely numbers of construction vehicles and plant that will be used[12], the effects are considered to be negligible and not significant.

5.2 OPERATIONAL PHASE

5.2.1. The results of the detailed dispersion modelling are presented within **Appendix K** and a summary is provided below.

2041 Future Year

Annual Mean NO_2 Concentrations

5.2.2. In 2041, the AQS objective for annual mean NO_2 concentrations (40µg/m^3) is predicted to be met at all modelled receptors with the C2C Scheme operational. The highest concentration of 18.2µg/m^3 is predicted on Castle Street (102 Allways House).

5.2.3. 85 of the 121 modelled receptors (70%) are predicted to experience improvements in concentrations with the C2C Scheme. Only 2 of the 121 modelled receptors (2%) are predicted to experience an increase in NO_2 concentrations. Where increases are predicted to occur, these range between 0.0µg/m^3 to 0.1µg/m^3. The greatest increases of 0.1µg/m^3 is predicted at Receptor 14 (a dwelling on No. 2 Cambridge Road, Coton Village) and Receptor 66 (No. 1 Scotland Road). None of the assessment receptors are the predicted change in concentrations >1% of the relevant objective level and all the modelled receptors predicted total concentrations are <75% of the objective. Therefore, in accordance with the EPUK/IAQM guidance, the impact of the C2C Scheme on annual mean NO_2 concentrations is considered to be negligible.

1-hour Mean NO_2 Concentrations

5.2.4. As all predicted annual mean NO_2 concentrations are all well below 60µg/m^3, it can be assumed that there will be compliance with the 1-hour mean AQS objective. Therefore, any impacts on 1-hour mean NO_2 concentrations as a result of the C2C Scheme can be described as negligible.

Annual Mean PM_{10} Concentrations

5.2.5. The AQS objective for annual mean PM_{10} concentrations is predicted to be met at all assessment receptors with the C2C Scheme. The highest concentration is 20.7µg/m^3, predicted on the slip road at Junction 14 of M11 (on slip to A14).

5.2.6. 17 out 121 modelled receptors (14%) are predicted to experience an improvement in PM_{10} concentrations with the C2C Scheme. At 6 out of 121 modelled receptors (5%), an increase in PM_{10} concentrations is predicted. However, at all of these locations, the predicted increase is equal to

[19] Appendix ES2: Statement of Competence (Document reference: C2C-10-00-Environmental Statement (Volume 1)

0.1µg/m^3 (<1% of the limit value) and total concentrations are predicted to be less than 20µg/m^3 (50% of the AQS objective). With reference to **Table TR2.5.4**, these impacts can, therefore, be described as negligible.

24-hour Mean PM_{10} Concentrations

5.2.7. In 2041, the AQS objective for 24-hour mean PM_{10} concentrations (50µg/m^3 not to be exceeded more than 35 times a year) is predicted to be met at all modelled receptors with the C2C Scheme. Therefore, all impacts on 24-hour mean PM_{10} concentrations can be described as negligible.

Annual Mean $PM_{2.5}$ Concentrations

5.2.8. In 2041, annual mean $PM_{2.5}$ concentrations are predicted to easily meet the limit value of 20µg/m^3 with the C2C Scheme. The highest concentration is 12.1µg/m^3, predicted at Junction 14 of the M11 (on the on slip to the A14).

5.2.9. 13 out 121 modelled receptors (11%) are predicted experience an improvement in $PM_{2.5}$ concentrations as a result of the C2C Scheme. At 1 out of 121 modelled receptors (<1%), an increase in $PM_{2.5}$ concentrations is predicted. However, at this location, the predicted increase is equal to 0.1µg/m^3 (<1% of the limit value). With reference to **Table TR2.5.5.**

WHO Guideline

5.2.10. The WHO AQG is more stringent than the current AQS objectives. The WHO AQG for annual mean NO_2 (10µg/m^3) is predicted to be met at 63 of the modelled human receptors with the C2C Scheme (33%). Two more receptors will meet the WHO AQG for annual mean NO_2 with the C2C Scheme.

5.2.11. The WHO AQG for annual mean PM_{10} (15µg/m^3) is predicted to be met at 43, out of 121, of the modelled human receptors with and without the C2C Scheme.

5.2.12. The WHO AQG for annual mean $PM_{2.5}$ (5µg/m^3) is not met at any of the modelled human receptors without nor with the C2C Scheme.

SIGNIFICANCE OF EFFECT

5.2.13. Overall, in relation to AQS objectives and the $PM_{2.5}$ limit value, the implementation of the C2C Scheme is not expected to significantly effect local air quality.

5.3 CUMULATIVE

CONSTRUCTION PHASE

5.3.1. The IAQM guidance for the assessment of dust from construction defines the study area as within 350m of the Site boundary and within 50m of likely routes of construction vehicles up to 500m from the Site entrance. Therefore, there is the potential for cumulative effects where other activities with the potential for dust and PM_{10} emissions will be undertaken within 700m of the Site boundary, and along similarly affected road links.

5.3.2. There are seven developments within 700m of the Site boundary:

- Bourn Airfield New Village;
- Land at Highfields;
- West Cambridge Development Site;
- Clerk Maxwell Road Scheme;

- North West Cambridge Development (Eddington);
- New Development at St Chad's; and
- Grange Lane College Accommodation.

5.3.3. Further details regarding the likely cumulative effects of these developments alongside the construction of the C2C Scheme are provided below.

5.3.4. The following schemes are currently under construction and will likely to complete (or near to) in advance of the commencement of works on the C2C Scheme: Grange Lane College Accommodation (41 units) and Clerk Maxwell Road Scheme (35 dwellings). Significant cumulative effects are therefore considered unlikely.

5.3.5. A planning application for St Chads (reference 19/1212/FUL) was granted in 2020. This cumulative scheme is small in size (23 units) and, therefore, providing that best practice measures are implemented to minimise construction emissions, significant cumulative effects are considered unlikely.

5.3.6. There is potential for the construction of the C2C Scheme to overlap with the construction phases of the following schemes which are committed development (all have been granted planning permission):

- West Cambridge Development Site (37,160 sq.m of academic floorspace);
- Land at Highfields (up to 140 units); and
- North West Cambridge Development (3000 units, 100000 sq.m of employment floorspace, 40000 sq.m of commercial floorspace, 60000 sq.m of academic floorspace, 5300 sq.m of gross retail floorspace, 6500 sq.m of senior living).

5.3.7. All these cumulative schemes sit within 700m of the C2C Scheme and are of a scale where cumulative effects could occur during the construction phase as a result of increased dust deposition or emissions to air from construction plant and/or traffic.

5.3.8. In terms of dust and particulate matter generation, the greatest cumulative effects are likely to occur at existing properties within close proximity to the C2C Scheme, in particular properties situated along the A1303 Madingley Road, Highfields Road and Saint Neots Road. In terms of emissions to air from plant and/or construction traffic, the greatest cumulative effects are likely to occur within close proximity to the Site boundary and along the routes being used by construction traffic (A1303 Madingley Road and M11).

5.3.9. There is also the potential for cumulative effects to occur as a result of the construction of Bourn Airfield New Village (a new mixed use village comprising residential development of approximately 3,500 dwellings mixed uses comprising employment, retail, hotel, leisure, residential institutions education, community facilities and open space). However, the planning application (reference S/3440/18/OL) is still awaiting a decision[20]. Furthermore, as Bourn Airfield is located on the western edge of the C2C Scheme, cumulative effects with respect to dust and particulate generation and emissions to air from on-site plant will only occur if the construction phase of Bourn Airfield New

[20] Greater Cambridge Shared Planning: a strategic partnership between Cambridge City and South Cambridgeshire District Councils - https://applications.greatercambridgeplanning.org/online-applications/simpleSearchResults.do?action=firstPage [Accessed 27/04/2023]

Village coincide with the construction of the western end of the C2C Scheme. Existing properties on Broadway and Saint Neots Road are the most at risk from cumulative effects due to the construction of the C2C Scheme and Bourn Airfield. There is also the potential for cumulative effects due to emissions to air from traffic associated with the construction of these two schemes.

5.3.10. The mitigation measures proposed for the C2C Scheme (see the CoCP[17] and **Appendix J**) are targeted at reducing dust and PM_{10} emissions associated with the construction phase, thereby reducing potential cumulative effects. Some of these measures listed are specifically targeted at working with the contractors of nearby developments to minimise cumulative effects. Notably that:

- Regular liaison meetings should be held between appointed contractors for each of the developments as appropriate to ensure plans are co-ordinated and dust and particulate matter emissions are minimised;
- Method statements will define any specific environmental control measures, including environmental and cultural heritage protection works, to be implemented to meet the requirements of this draft CoCP[17] and the Local Environment Management Plan (LEMP), and will set out the measures required to reduce cumulative effects of concurrent construction activities; and,
- The Principal Contractor will produce a Local Traffic Management Plan (LTMP) in consultation with the highway and traffic authorities, the emergency services and other relevant key stakeholders.

5.3.11. Overall, the cumulative effects of the construction of the C2C Scheme are considered to be negligible, short-medium term, temporary in nature, and not significant following the implementation of the recommended mitigation measures.

OPERATIONAL PHASE

5.3.12. As noted in paragraph 3.1.14, the traffic data provided for use in the air quality assessment includes traffic contributions from dependent developments. The traffic data also considered all local plan growth from CCC and SCDC, including Cambourne West, Bourn Airfield and West Cambridge. Local Plan growth is treated as committed development and included in the traffic future baseline model. The model results (i.e. the total predicted concentrations) for the future year scenarios therefore takes into account the contributions to local pollutant concentrations associated with dependent developments which have been assessed as negligible in terms of their impacts on local air quality at the modelled receptors (i.e. cumulative effects are accounted for within total predicted concentrations whereas the reported change is as a result of the C2C Scheme only).

6 SUMMARY OF LIKELY SIGNIFICANT EFFECTS

6.1.1. The assessment has investigated locations where dust generating construction activities would be most likely to result in higher levels of dust deposition. Mitigation measures have been identified and included in the environmental commitments for the C2C Scheme which would be a mandatory requirement under the contracts for implementation of the works. These include measures focused on the control of dust and channels for registering concern should there be periods when dust is perceived as a nuisance by receptors in the vicinity of the working area.

6.1.2. It has been concluded that construction-related dust and emissions from the construction traffic would not constitute a significant environmental effect.

6.1.3. The assessments for the operational scheme have demonstrated there would be no exceedances of the relevant air quality objectives/limit values for NO_2, PM_{10} and $PM_{2.5}$ either without or with the C2C Scheme.

6.1.4. The C2C Scheme will encourage modal shift and improve air quality. This has been demonstrated by the assessment. The model results show that three times as many receptors would experience an improvement in concentrations of NO_2, PM_{10} and $PM_{2.5}$ respectively when compared to the assessment without the C2C Scheme.

6.1.5. The impacts of the C2C Scheme would be generally beneficial. Where increases in pollutant concentrations have been identified due to the C2C Scheme, these increases are small and would not constitute a significant environmental effect.

Appendix A

RELEVANT UK AIR QUALITY STRATEGY OBJECTIVES

Table TR2-A-1 - Relevant Air Quality Strategy Objectives and Standards

Pollutant	Concentration (µg/m³)	Measured As	Objective
Nitrogen dioxide (NO_2)	40	Annual mean	Not to be exceeded
	10	Annual mean	World Health Organisation (WHO) guideline level.
	200	1-hour (hourly) mean	Not to be exceeded more than 18 times a year
Particulate matter less than 10 micrometres in diameter (PM_{10})	40	Annual mean	Not to be exceeded
	15	Annual mean	World Health Organisation (WHO) guideline level.
	50	Daily mean	Not to be exceeded more than 35 times a year
Particulate matter less than 2.5 micrometres in diameter ($PM_{2.5}$)	20	Annual mean	Not to be exceeded
	10	Annual mean	Environment Act 2021 concentration target (to be met by 2040, with a new interim target of 12 µg/m³ by the end of January 2028).
	5	Annual mean	World Health Organisation (WHO) guideline level.

Table TR2-A-2 - Environmental Improvement Plan 2023 Targets and Commitments[21]

Target	Details
Long Term Targets:	By the end of 2040, we will achieve a maximum Annual Mean concentration Target (AMCT) of 10 micrograms of $PM_{2.5}$ or below per cubic meter (µg/m³)

21 Environmental Improvement Plan 2023. Available here: Environmental Improvement Plan (publishing.service.gov.uk)

Target	Details
	By the end of 2040, we will reduce population exposure to $PM_{2.5}$ by 35% compared to 2018 levels.
Interim Targets:	By the end of January 2028, the highest annual mean concentration in the most recent full calendar year must not exceed 12 µg/m^3 of $PM_{2.5}$.
	Compared to 2018, the reduction in population exposure to $PM_{2.5}$ in the most recent full calendar year must be 22% or greater by the end of January 2028.

Appendix B

RELEVANT AIR QUALITY LEGISLATION AND POLICY

RELEVANT AIR QUALITY LEGISLATION AND POLICY

ENVIRONMENT ACT 1995

Under Part IV of the Environment Act 1995, local authorities must review and document local air quality within their area by way of staged appraisals and respond accordingly, with the aim of meeting the air quality objectives defined in the Regulations. Where the objectives are not likely to be achieved, an authority is required to designate an AQMA. For each AQMA the local authority is required to draw up an Air Quality Action Plan (AQAP) to secure improvements in air quality and show how it intends to work towards achieving the air quality objectives in the future.

UK AIR QUALITY STRATEGY

The Government's policy on air quality within the UK is set out in the Air Quality Strategy for England, Scotland, Wales and Northern Ireland (AQS)[22]. The AQS provides a framework for reducing air pollution in the UK with the aim of meeting the requirements of European Union legislation[23.]

The AQS also sets out standards and objectives for nine key air pollutants to protect health, vegetation and ecosystems. These are benzene (C_6H_6), 1,3 butadiene (C_4H_6), carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO_2), particulate matter (PM_{10} and $PM_{2.5}$), sulphur dioxide (SO_2), ozone (O_3), and polycyclic aromatic hydrocarbons (PAHs). The standards and objectives for the pollutants considered in this assessment are given in **Appendix A.**

The air quality standards are levels recommended by the Expert Panel on Air Quality Standards (EPAQS) and the World Health Organisation (WHO) with regards to current scientific knowledge about the effects of each pollutant on health and the environment.

The air quality objectives are policy based targets set by the Government, which take into account economic efficiency, practicability, technical feasibility and timescale. Some objectives are equal to the EPAQS recommended standards or WHO guideline limits, whereas others involve a margin of tolerance, i.e. a limited number of permitted exceedances of the standard over a given period.

For the pollutants considered in this assessment, there are both long-term (annual mean) and short-term standards. In the case of NO_2, the short-term standard is for a 1-hour averaging period, whereas for PM_{10} it is for a 24-hour averaging period. These periods reflect the varying impacts on health of differing exposures to pollutants, for example temporary exposure on the pavement adjacent to a busy road, compared with the exposure of residential properties adjacent to a road.

The AQS contains a framework for considering the effects of a finer group of particles known as $PM_{2.5}$ (fine particulate matter less than 2.5 micrometres in diameter) as there is increasing evidence that such particles are more closely associated with observed adverse health effects than PM_{10} (coarse particulate matter less than 10 micrometres in diameter).

[22] Department for Environment, Food and Rural Affairs (Defra) and the Devolved Administrations (2007). The Air Quality Strategy for England, Scotland, Wales and Northern Ireland (Volumes 1 and 2)

[23] The UK formally left the EU on 31st January 2020 and new air quality legislation for the UK will be brought forward in due course. The Air Quality (Miscellaneous Amendment and Revocation of Retained Direct EU Legislation) (EU Exit) Regulations 2018 (SI 2018/1407) (see Regulation 5) makes changes to retained direct EU legislation relating to air quality, to ensure that it continues to operate effectively.

AIR QUALITY REGULATIONS

Many of the objectives in the AQS have been made statutory in England with the Air Quality (England) Regulations 2000[24] and the Air Quality (England) (Amendment) Regulations 2002[25] for the purpose of Local Air Quality Management (LAQM).

These Regulations require that likely exceedances of the AQS objectives are assessed in relation to:

"…the quality of air at locations which are situated outside of buildings or other natural or man-made structures, above or below ground, and where members of the public are regularly present…"

The Air Quality Standards Regulations 2010[26] transposed the European Union Ambient Air Quality Directive (2008/50/EC) into law in England. This Directive set legally binding limit values for concentrations in outdoor air of major air pollutants that impact public health such as PM_{10}, $PM_{2.5}$ and NO_2. The limit values for NO_2 and PM_{10} are the same concentration levels as the relevant AQS objectives.

Regulation 2 of the Environment (Miscellaneous Amendments) (EU Exit) Regulations 2020[27] lowered the limit value for $PM_{2.5}$ from 25µg/m^3 to 20µg/m^3.

CLEAN AIR STRATEGY

Defra published the Government's Clean Air Strategy in 2019[28]. This sets out measures to reduce emissions from all sources of air pollution, making air healthier to breathe, protecting nature and boosting the economy. The Clean Air Strategy also proposes new goals to cut public exposure to airborne particulate matter.

Furthermore, it is stated that: *"New legislation will create a stronger and a more coherent framework for action to tackle air pollution. This will be underpinned by new England-wide powers to control major sources of air pollution, in line with the risk they pose to public health and the environment, plus new local powers to take action in areas with an air pollution problem."*

The Pre-Submission Local Plan has been drafted to support the aims and objectives of the Clean Air Strategy.

ENVIRONMENT ACT 2021

The Environment Act 2021[29], published in November 2021, provides a new framework for environmental protection within the UK. It aims to ensure that environmental standards are maintained and that improvements are achieved (specifically in relation to air quality, water, waste and resources, nature and biodiversity) and bridges the gaps in legislation resulting from the UK's departure from the EU. The Environment Act 2021 does not replace the Environment Act 1995, but it does make amendments to strengthen environmental protections. In relation to air quality, the Environment Act 2021 includes a legally binding duty on Government to bring forward at least two new air quality targets for $PM_{2.5}$ into secondary legislation.

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24 The Air Quality (England) Regulations 2000 - Statutory Instrument 2000 No.928
25 The Air Quality (England) (Amendment) Regulations 2002- Statutory Instrument 2002 No.3043
26 The Air Quality Standards Regulations 2010 - Statutory Instrument 2010 No. 1001
27 The Environmental (Miscellaneous Amendments) (EU Exit) Regulations 2020 - Statutory Instrument 2020 No.000
28 Defra (January, 2019). Clean Air Strategy 2019.
29 UK Government (1995) Environment Act 1995. https://www.legislation.gov.uk/ukpga/1995/25/contents

Target objectives under consideration for air quality include:

- Reducing the annual mean concentrations of $PM_{2.5}$ in ambient air; and
- Reducing population exposure to $PM_{2.5}$.

RELEVANT PLANNING POLICY

NATIONAL PLANNING POLICY FRAMEWORK

The Government's overall planning policies for England are described in the National Planning Policy Framework[30]. The core underpinning principle of the Framework is the presumption in favour of sustainable development, defined as:

"… meeting the needs of the present without compromising the ability of future generations to meet their own needs"

One of the three overarching objectives of the NPPF is that the planning system should seek *"to protect and enhance our natural, built and historic environment; including making effective use of land, improving biodiversity, using natural resources prudently, minimising waste and pollution, and mitigating and adapting to climate change, including moving to a low carbon economy."*

In relation to air quality, the following paragraphs in the document are relevant:

- Paragraph 55: *"Local planning authorities should consider whether otherwise unacceptable development could be made acceptable through the use of conditions or planning obligations. Planning obligations should only be used where it is not possible to address unacceptable impacts through a planning condition."*
- Paragraph 104, which relates to the need to consider transport related issues at the earliest stages of plan making and development proposals, so that *"…c) opportunities to promote walking, cycling and public transport use are identified and pursued; d) the environmental impacts of traffic and transport infrastructure can be identified, assessed and taken into account – including appropriate opportunities for avoiding and mitigating any adverse effects, and for net environmental gains...."*
- Paragraph 105: *"Significant development should be focused on locations which are or can be made sustainable, through limiting the need to travel and offering a genuine choice of transport modes. This can help to reduce congestion and emissions, and improve air quality and public health…."*
- Paragraph 174: *"Planning policies and decisions should contribute to and enhance the natural and local environment by:* […] *e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans...."*
- Paragraph 185: *"Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of*

30 Ministry of Housing, Communities and Local Government (July 2021) National Planning Policy Framework.

pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development…."

- Paragraph 186: *"Planning policies and decisions should sustain and contribute towards compliance with relevant limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and Clean Air Zones, and the cumulative impacts from individual sites in local areas. Opportunities to improve air quality or mitigate impacts should be identified, such as through traffic and travel management, and green infrastructure provision and enhancement. So far as possible these opportunities should be considered at the plan-making stage, to ensure a strategic approach and limit the need for issues to be reconsidered when determining individual applications. Planning decisions should ensure that any new development in Air Quality Management Areas and Clean Air Zones is consistent with the local air quality action plan."*
- Paragraph 188: *"The focus of planning policies and decisions should be on whether proposed development is an acceptable use of land, rather than the control of processes or emissions (where these are subject to separate pollution control regimes). Planning decisions should assume that these regimes will operate effectively. Equally, where a planning decision has been made on a particular development, the planning issues should not be revisited through the permitting regimes operated by pollution control authorities."*

CAMBRIDGE CITY COUNCIL LOCAL PLAN 2018

The Cambridge Local Plan[31] forms part of the development plan for Cambridge. It sets out the vision, policies and proposals for the future development and land use in Cambridge to 2031. It is the main consideration in the determination of planning applications.

In relation to local air quality, **Policy 36: Air Quality, Odour and Dust** requires that:

- Development will be permitted where it can be demonstrated:
  - a. that it does not lead to significant adverse effects on health, the environment or amenity from polluting or malodorous emissions, or dust or smoke emissions to air; or
  - b. where a development is a sensitive end-use, that there will not be any significant adverse effects on health, the environment or amenity arising from existing poor air quality, sources of odour or other emissions to air.
- According to the end-use and nature of the area and application, applicants must demonstrate that:
  - a. there is no adverse effect on air quality in an air quality management area (AQMA);
  - b. pollution levels within the AQMA will not have a significant adverse effect on the proposed use/users;
  - c. the development will not lead to the declaration of a new AQMA;
  - d. the development will not interfere with the implementation of the current Air Quality Action Plan (AQAP);

31 Cambridge City Council – Cambridge Local Plan 2018. Available here: https://www.cambridge.gov.uk/media/6890/local-plan-2018.pdf

- e. any sources of emissions to air, odours and fugitive dusts generated by the development are adequately mitigated so as not to lead to loss of amenity for existing and future occupants and land uses; and
- f. any impacts on the proposed use from existing poor air quality, odour and emissions are appropriately monitored and mitigated by the developer.

SOUTH CAMBRIDGESHIRE LOCAL PLAN 2018

The South Cambridgeshire Local Plan sets out the planning policies and land allocations to guide the future development of the district up to 2031. It includes policies on a wide range of topics such as housing, employment, services and facilities, and the natural environment.

The Local Plan was adopted on 27 September 2018, and the policies relevant to air quality are:

- **Policy TI/2: Planning for Sustainable Travel** requires that:

"*Developers will be required to demonstrate they will make adequate provision to mitigate the likely impacts (including cumulative impacts) of their proposal including environmental impacts (such as noise and pollution) and impact on amenity and health. This will be achieved through direct improvements and Section 106 contributions and/or the Community Infrastructure Levy (CIL), to address transport infrastructure in the wider area including across the district boundary."*

- **Policy SC/12: Air Quality** requires that:
  - 1. Where development proposals would be subject to unacceptable air quality standards or would have an unacceptable impact on air quality standards they will be refused.
  - 2. Where emissions from the proposed development are prescribed by EU limit values or national objectives, the applicant will need to assess the impact on local air quality by undertaking an appropriate air quality assessment and detailed modelling exercise having regard to guidance current at the time of the application to show that the national objectives will still be achieved.
  - 3. Development will not be permitted where it would adversely affect air quality in an Air Quality Management Area (AQMA); or lead to the declaration of a new AQMA through causing a significant deterioration in local air quality by increasing pollutant levels either directly or indirectly; or if it would expose future occupiers to unacceptable pollutant levels.
  - 4. Larger development proposals that require a Transport Assessment and a Travel Plan as set out in Policy TI/2 will be required to produce a site based Low Emission Strategy. This will be a condition of any planning permission given for any proposed development which may result in the deterioration of local air quality and will be required to ensure the implementation of suitable mitigation measures.
  - 5. Development will be permitted where:
    - a. It can be demonstrated that it does not lead to significant adverse effects on health, the environment or amenity from emissions to air; or
    - b. Where a development is a sensitive end use, that there will not be any significant adverse effects on health, the environment or amenity arising from existing poor air quality.
  - 6. Specifically applicants must demonstrate that:

- c. There is no adverse effect on air quality in an Air Quality Management Area (AQMA) from the development;
- d. Pollution levels within the AQMA will not have a significant adverse effect on the proposed use / users;
- e. The development will not lead to the declaration of a new AQMA;
- f. The development will not interfere with the implementation of and should be consistent with the current Air Quality Action Plan;
- g. The development will not lead to an increase in emissions, degradation of air quality or increase in exposure to pollutants at or above the health based air quality objective;
- h. Any impacts on the proposed use from existing poor air quality, are appropriately mitigated;
- i. The development promotes sustainable transport measures and use of low emission vehicles in order to reduce the air quality impacts of vehicles.

- 7. Applicants shall, where appropriate, prepare and submit with their application, a relevant assessment, taking into account guidance current at the time of the application.

GREATER CAMBRIDGE SUSTAINABLE DESIGNE AND CONSTRUCTION SUPPLEMENTARTY PLANNING DOCUMENT 2020

The Greater Cambridge Sustainable Design and Construction SPD[32] has been prepared to provided additional technical guidance on the implementation of the local plan policies, setting out the information that should be submitted with planning applications to demonstrate how schemes meet the council's requirements.

RELEVANT GUIDANCE

NATIONAL PLANNING PRACTICE GUIDANCE – AIR QUALITY

This guidance[33] provides a number of guiding principles on how the planning process can take into account the impact of new development on air quality and explains how much detail air quality assessments need to include for proposed developments, and how impacts on air quality can be mitigated. It also provides information on how air quality is taken into account by local authorities in both the wider planning context of Local Plans and neighbourhood planning, and in individual cases where air quality is a consideration in a planning decision.

LOCAL AIR QUALITY MANAGEMENT REVIEW AND ASSESSMENT TECHNICAL GUIDANCE

The Department for Environment, Food and Rural Affairs (Defra) has published technical guidance to be followed by local authorities in undertaking review and assessment work. This guidance,

32 The Greater Cambridge Sustainable Design and Construction SPD (January 2020). Available here: https://www.cambridge.gov.uk/media/8157/greater-cambridge-sustainable-design-and-construction-spd.pdf

33 Ministry of Housing, Communities & Local Government (March 2014). National Planning Practice Guidance

referred to in this document as LAQM.TG(22)[34], has been referenced in undertaking this assessment.

LAND-USE PLANNING AND DEVELOPMENT CONTROL: PLANNING FOR AIR QUALITY

Environmental Protection UK (EPUK) and the Institute of Air Quality Management (IAQM) have published joint guidance[11] that offers comprehensive advice on: when an air quality assessment may be required; what should be included in an assessment; how to determine the significance of any air quality impacts associated with development; and, the possible mitigation measures that may be implemented to minimise these impacts.

[34] Defra (2021) Part IV The Environment Act 1995 and Environment (Northern Ireland) Order 2002 Part III, Local Air Quality Management Technical Guidance LAQM.TG(22)

Appendix C

GLOSSARY

Table TR2-C-1 – Glossary

Term	Definition
AADT	Annual average daily traffic. A daily total traffic flow (24 hrs), expressed as a mean daily flow across all 365 days of the year.
Adjustment	Application of a correction factor to modelled results to account for uncertainties in the model
Accuracy	A measure of how well a set of data fits the true value.
Air quality objective	Policy target generally expressed as a maximum ambient concentration to be achieved, either without exception or with a permitted number of exceedances within a specific timescale (see also air quality standard).
Air quality standard	The concentrations of pollutants in the atmosphere which can broadly be taken to achieve a certain level of environmental quality. The standards are based on the assessment of the effects of each pollutant on human health including the effects on sensitive sub groups (see also air quality objective).
Ambient air	Outdoor air in the troposphere, excluding workplace air.
Annual mean	The average (mean) of the concentrations measured for each pollutant for one year.
AQMA	Air Quality Management Area.
Conservative	Tending to over-predict the impact rather than under-predict.
Data capture	The percentage of all the possible measurements for a given period that were validly measured.
Defra	Department for Environment, Food and Rural Affairs.
Emission rate	The quantity of a pollutant released from a source over a given period of time.
Exceedance	A period of time where the concentrations of a pollutant is greater than the appropriate air quality standard.
Fugitive emissions	Emissions arising from the passage of vehicles that do not arise from the exhaust system.
HDV/HGV	Heavy duty vehicle/heavy goods vehicle.
LAQM	Local Air Quality Management.
Model adjustment	Following model verification, the process by which modelled results are amended. This corrects for systematic error.
NO_2	Nitrogen dioxide.
NO_x	Nitrogen oxides.
PM_{10}	Particulate matter with an aerodynamic diameter of less than 10 micrometres.

Term	Definition
$PM_{2.5}$	Particulate matter with an aerodynamic diameter of less than 2.5 micrometres.
$\mu g/m^3$	Micrograms per cubic metre. A measure of concentration in terms of mass per unit volume. A concentration of $1\mu g/m^3$ means that one cubic metre of air contains one microgram (millionth of a gram) of pollutant.
Uncertainty	A measure, associated with the result of a measurement, which characterizes the range of values within which the true value is expected to lie. Uncertainty is usually expressed as the range within which the true value is expected to lie with a 95% probability, where standard statistical and other procedures have been used to evaluate this figure. Uncertainty is more clearly defined than the closely related parameter 'accuracy', and has replaced it on recent European legislation.
Validation (modelling)	Refers to the general comparison of modelled results against monitoring data carried out by model developers.
Verification (modelling)	Comparison of modelled results versus any local monitoring data at relevant locations.

Appendix D

LOCAL AIR QUALITY MONITORING DATA

Table TR2-D-1 – CCC Automatic Monitoring: Annual Mean NO_2

Site ID	Location	Type	X,Y	Concentration (µg/m³) [AQS objective = 40µg/m³, WHO AQG = 10µg/m³]					
				2016	2017	2018	2019	2020	2021
CM1	Gonville Place	Roadside	545508,257828	36.0	31.0	30.0	28.0	20.0	21.0
CM2	Montague Road	Roadside	546057,259487	27.0	24.0	25.0	22.0	16.0	18.0
CM3	Newmarket Road	Roadside	546317,258900	24.0	26.0	25.0	22.0	18.0	20.0
CM4	Parker Street	Roadside	545366,258391	**41.0**	37.0	32.0	33.0	24.0	23.0
CM5	Regent Street	Roadside	545289,258118	32.0	29.0	26.0	27.0	22.0	23.0

Table TR2-D-2 – CCC NO_2 Diffusion Tube Monitoring: Annual Mean NO_2

Site ID	Location	Type	X,Y	Concentration (µg/m³) [AQS objective = 40µg/m³, WHO AQG = 10µg/m³]					
				2016	2017	2018	2019	2020	2021
1	Emmanuel Street	Roadside	545220,258357	38.0	34.0	36.0	35.0	20.2	22.0
2	Histon Road 2	Roadside	544292,261202	27.0	23.0	24.0	21.0	13.8	12.0
3	Magdalene Street	Roadside	544677,258992	27.0	21.0	22.0	20.0	12.4	13.6
4	Northampton Street	Roadside	544492,259008	37.0	33.0	31.0	31.0	20.1	19.8
5	Silver Street	Roadside	544770,258112	34.0	29.0	26.0	24.0	13.0	13.7
6	Long Road	Kerbside	544867,255709	45.0	40.0	37.0	34.0	24.3	25.6
7	Newmarket Road	Roadside	546181,258886	35.0	32.0	33.0	31.0	26.0	22.7
9	Drummer Street	Roadside	545235,258485	31.0	25.0	28.0	23.0	16.7	17.7
10	Gilbert Road	Roadside	545314,259777	22.0	21.0	20.0	24.0	15.7	13.9
11	Latham Road	Background	544811,256744	13.0	10.0	10.0	11.0	7.4	7.2
12	Newmarket Road	Roadside	547998,259349	29.0	28.0	25.0	23.0	20.4	19.1
13	East Road	Roadside	545904,258431	26.0	24.0	24.0	22.0	15.7	16.2
14	Mill Road	Roadside	546080,257944	25.0	24.0	23.0	21.0	15.8	14.9

Site ID	Location	Type	X,Y	Concentration (µg/m³) [AQS objective = 40µg/m³, WHO AQG = 10µg/m³]					
				2016	2017	2018	2019	2020	2021
16	Regent Street (office)	Roadside	545279,258135	30.0	29.0	27.0	26.0	17.0	18.8
17	Coldhams Lane	Roadside	547216,258286	24.0	22.0	21.0	22.0	15.1	17.6
18	Pembroke Street	Roadside	544884,258098	36.0	34.0	30.0	30.0	17.9	17.9
19	Huntingdon Road 2	Roadside	543100,260344	23.0	21.0	20.0	18.0	11.7	12.1
20	Elizabeth Way	Roadside	546083,259150	31.0	26.0	27.0	26.0	19.3	20.2
21	Victoria Road	Roadside	544425,259560	28.0	25.0	24.0	22.0	15.8	15.5
22	Madingley Road	Kerbside	543784,259093	37.0	33.0	30.0	30.0	18.1	17.5
23	Huntingdon Road	Roadside	543761,259813	23.0	19.0	17.0	17.0	11.7	10.7
24	Histon Road	Kerbside	544308,259664	29.0	29.0	24.0	25.0	19	16.5
25	Barton Road	Roadside	544100,257473	22.0	19.0	19.0	18.0	11.2	11.9
26	Fen Causeway	Roadside	544943,257567	22.0	19.0	19.0	18.0	12.0	12.5
27	Trumpington High St	Roadside	544575,255307	24.0	19.0	20.0	18.0	13.0	12.4
28	Babraham Road	Roadside	546961,255132	0.0	39.0	32.0	33.0	21.5	19.6
29	Cherry Hinton Road	Kerbside	548331,256252	22.0	21.0	19.0	19.0	14.4	14.2
30	Arbury Road	Kerbside	545693,260473	19.0	18.0	17.0	18.0	14.9	14.9
31	Newnham Road	Roadside	544529,257730	33.0	31.0	31.0	29.0	20.3	21.3
32	Hills Road 2	Roadside	545893,257234	29.0	24.0	22.0	22.0	15.3	17.3
33	Victoria Avenue	Roadside	545333,259439	37.0	35.0	35.0	31.0	21.4	23.5
34	Parker Street	Roadside	545390,258390	39.0	32.0	33.0	31.0	19.3	20.9
35	Abbey Road	Roadside	546163,258983	21.0	19.0	17.0	17.0	13.5	13.2

Site ID	Location	Type	X,Y	Concentration (µg/m³) [AQS objective = 40µg/m³, WHO AQG = 10µg/m³]					
				2016	2017	2018	2019	2020	2021
36	Cockburn Street	Urban Background	546596,257594	20.0	17.0	16.0	15.0	11.1	10.9
37	Oaktree Avenue	Urban Background	545885,260088	18.0	16.0	15.0	15.0	11	11.4
38	Chesterton Road	Roadside	545566,259579	26.0	23.0	21.0	23.0	15.9	14.4
39	Maids Causeway	Kerbside	545710,258782	32.0	28.0	30.0	27.0	18.7	18.1
40	Emmanual Road	Roadside	545405,258521	39.0	33.0	34.0	31.0	23.0	25.1
41	Downing Street	Roadside	545162,258240	36.0	28.0	31.0	27.0	16.3	16.9
42	Trumpington Street	Roadside	544981,257890	27.0	24.0	20.0	20.0	13.1	13
43	Lensfield Road	Roadside	545271,257675	36.0	32.0	29.0	27.0	18.6	19.6
44	Park Terrace	Roadside	545430,258271	31.0	23.0	20.0	21.0	13.9	14.6
45	St Andrew's St	Urban Centre	545135,258391	37.0	33.0	33.0	32.0	20.6	17.8
46	Parkside	Kerbside	545549,258283	25.0	23.0	23.0	19.0	13.9	13.7
47,48, 49	Gonville Place	Roadside	545508,257828	35.0	31.0	31.0	29.0	20.1	19.8
50	Hills Road 3	Roadside	545854,257229	32.0	23.0	25.0	23.0	15.9	17.6
51	Shelford Road	Roadside	544960,254220	27.0	24.0	22.0	25.0	14.9	16.5
52	Station Road 2	Kerbside	546019,257300	34.0	22.0	22.0	24.0	15.8	17.6
53	Station Road 1	Kerbside	545897,257325	34.0	30.0	23.0	27.0	19.2	18.8
54	Tenison Road 1	Kerbside	546034,257683	23.0	21.0	23.0	20.0	15.1	13.8
55	Tenison Road 2	Kerbside	546005,257405	25.0	25.0	22.0	22.0	14.4	15.3
56	Silverwood Close	Roadside	546602,258796	27.0	23.0	23.0	20.0	17.3	16.9

Site ID	Location	Type	X,Y	Concentration (µg/m³) [AQS objective = 40µg/m³, WHO AQG = 10µg/m³]					
				2016	2017	2018	2019	2020	2021
57	Great Northern Road	Kerbside	546060,257389	25.0	33.0	30.0	31.0	17.6	18.3
58	Station Place	Kerbside	546080,257092	36.0	32.0	31.0	30.0	23.1	23.6
59	Coldhams Lane 3	Kerbside	548858,257162	0.0	0.0	15.0	16.0	12.1	11.3
60	Barnwell Road	Kerbside	547917,258942	0.0	0.0	23.0	22.0	16.4	17.5
61	Newmarket Road 3	Kerbside	546341,258882	0.0	0.0	33.0	34.0	21.8	26.3
62	Mill Road 2	Kerbside	547181,257566	0.0	0.0	0.0	20.0	14.6	15.1
63	Station Square	Kerbside	546177,257309	0.0	0.0	31.0	33.0	17.9	20.6
64	Park Street	Kerbside	544952,258856	0.0	0.0	24.0	23.0	15.4	15.3
65	Brooklands Avenue	Roadside	545896,257025	27.0	22.0	24.0	22.0	16.1	16.1
66	Shelford/Trumpington	Roadside	544580,254692	36.0	32.0	30.0	28.0	20.9	21.1
67	Shelford 2	Kerbside	544614,254646	25.0	21.0	18.0	19.0	13.8	13.2
68	Addenbrookes Road	Roadside	545211,254217	22.0	18.0	17.0	16.0	12.5	12.2
69	Fendon Road	Kerbside	546854,255405	27.0	24.0	22.0	21.0	15.4	17.2
70	Hills Road 4	Roadside	546693,255379	27.0	22.0	21.0	21.0	16.7	16.2
71	Trumpington Road 2	Kerbside	545245,256860	32.0	25.0	26.0	25.0	14.5	18.7

Table TR2-D-3 – CCC Automatic Monitoring: 1-hour Mean NO_2

Site ID	Location	Type	X,Y	Number of hours greater than 200µg/m^3 [AQS objective allows no more than 18 per year]					
				2016	2017	2018	2019	2020	2021
CM1	Gonville Place	Roadside	545508,257828	0	0	0	0	0	0
CM2	Montague Road	Roadside	546057,259487	0	0	1	0	0	1
CM3	Newmarket Road	Roadside	546317,258900	0	0	0	0	0	0
CM4	Parker Street	Roadside	545366,258391	**0**	0	0	0	0	0
CM5	Regent Street	Roadside	545289,258118	0	0	0	0	0	0

Table TR2-D-4 – CCC Automatic Monitoring: Annual Mean PM_{10}

Site ID	Location	Type	X,Y	Concentration (µg/m^3) [AQS objective = 40µg/m^3, WHO AQG = 15µg/m^3]					
				2016	2017	2018	2019	2020	2021
CM1	Gonville Place	Roadside	545508,257828	-	18.0	19.0	19.0	15.0	14.0
CM2	Montague Road	Roadside	546057,259487	-	20.0	21.0	22.0	19.0	15.0
CM4	Parker Street	Roadside	545366,258391	-	21.0	23.0	21.0	17.0	18.0

Table TR2-D-5 – CCC Automatic Monitoring: 24-hour Mean PM_{10}

Site ID	Location	Type	X,Y	Number of days greater than 50µg/m^3 [AQS objective allows no more than 35 per year]					
				2016	2017	2018	2019	2020	2021
CM1	Gonville Place	Roadside	545508,257828	0	3	1	2	0	0
CM2	Montague Road	Roadside	546057,259487	0	3	1	6	0	0
CM4	Parker Street	Roadside	545366,258391	0	4	1	5	0	2

Table TR2-D-6 – CCC Automatic Monitoring: Annual Mean $PM_{2.5}$

Site ID	Location	Type	X,Y	Concentration (µg/m³) [limit value = 20µg/m³, WHO AQG = 5µg/m³]					
				2016	2017	2018	2019	2020	2021
CM1	Gonville Place	Roadside	545508,257828	-	15.0	15.0	14.0	11.0	12.0
CM3	Newmarket Road	Roadside	546317,258900	-	11.0	10.0	10.0	8.0	8.0

Table TR2-D-7 – South Cambridge Automatic Monitoring: Annual Mean NO_2

Site ID	Location	Type	X,Y	Concentration (µg/m³) [AQS objective = 40µg/m³, WHO AQG = 10µg/m³]					
				2016	2017	2018	2019	2020	2021
IMP	Impington (A14)	Roadside	543739,261625	23.0	23.0	19.0	16.0	13.0	16.0
ORCH	Orchard Park Primary School (A14)	Urban Background	544558,261579	18.0	18.0	14.0	15.0	11.0	11.0
GIRT	Girton	Roadside	542676,260667	23.0	23.0	18.0	17.0	12.0	12.0

Table TR2-D-8 – South Cambridge NO_2 Diffusion Tube Monitoring: Annual Mean NO_2

Site ID	Location	Type	X,Y	Concentration (µg/m³) [AQS objective = 40µg/m³, WHO AQG = 10µg/m³]					
				2016	2017	2018	2019	2020	2021
DT1	The Coppice, Impington	Urban Background	544230,262048	21.3	17.2	14.7	14.7	11.4	10.5
DT2	The Gables, High Street, Histon	Roadside	543770,263678	27.8	27.4	27.1	27.2	19.7	21.1
DT-28N	73 Cambridge Road, Milton	Roadside	547436,262295	-	-	22.8	23.0	18.8	17.3
DT4	96 High Street, Sawston	Urban Background	548600,249136	26.6	26.1	24.7	23.0	16.5	17.0
DT5	Rhadegund Farm Cottage, Bar Hill, A14	Roadside	538744,263640	20.6	16.2	19.4	13.4	10.8	12.2
DT-6N	22 High Street, Linton	Roadside	555942,246680	-	-	20.2	21.0	15.1	16.5
DT7	20 High Street, Tadlow	Roadside	528131,247399	11.8	12.1	8.6	10.2	8.5	7.8
DT-8N	47 High Street, Harston	Roadside	542555,251001	-	-	17.3	15.3	12.3	13.1
DT9	3 Garner Close, Milton	Urban Background	547452,263175	17.8	17.5	14.4	15.5	13.3	12.0

Site ID	Location	Type	X,Y	Concentration (µg/m³) [AQS objective = 40µg/m³, WHO AQG = 10µg/m³]					
				2016	2017	2018	2019	2020	2021
DT10	1A Weavers Field, opp. Co-op, Girton	Urban Background	542537,261467	26.2	26.3	25.8	19.0	15.4	16.5
DT11	Heath House, A505, Thriplow	Urban Background	544034,244585	26.0	24.6	24.9	22.5	15.0	16.9
DT12	Lone Tree Avenue, Impington	Roadside	544119,261862	19.4	18.8	15.1	16.3	12.7	12.2
DT13	1 Brook Close, Histon	Urban Background	543955,263588	19.2	18.5	17.2	16.3	11.5	12.1
DT14	22 Water Lane, Histon	Roadside	544050,263306	27.0	26.4	23.6	22.3	20.2	17.1
DT15	72 Cambridge Road, Impington	Urban Background	544243,261819	20.3	19.4	17.5	18.5	13.4	11.9
DT17	5 Mill Lane, Sawston	Roadside	548545,249366	16.4	14.1	13.1	13.8	10.4	12.2
DT-32N	Banworth Lodge, Ely Road, A10	Roadside	548742,264698	-	-	23.4	21.6	19.0	15.3
DT20	Chieftain Way, Orchard Park	Roadside	544828,261738	23.1	18.2	23.2	14.7	13.9	13.6
DT21	Neal Drive, Orchard Park	Roadside	545056,261784	20.5	18.8	16.7	15.8	12.9	13.1
DT22	Flack End, Orchard Park	Roadside	545435,261906	22.4	21.2	17.5	15.9	13.3	13.5
DT23 a, DT23 b, DT23 c	Orchard Park Primary School	Urban Background	544557,261571	17.7	16.3	16.3	-	10.6	10.5
DT26	Co-op, High Street, Histon	Roadside	543768,263708	19.7	18.9	17.8	17.1	13.2	13.2
DT27	Engledow Drive, Orchard Park	Urban Background	545259,261873	22.1	21.2	17.9	16.8	13.5	13.3
DT28	22 Topper Street, Orchard Park	Roadside	545169,261764	21.0	21.3	16.6	16.7	14.1	13.9
DT29	Church Lane, Little Abington	Urban Background	552961,249251	12.5	11.0	10.0	10.9	8.4	7.8
DT-30N	63 Denny End Road, Waterbeach	Roadside	549154,266006	-	-	16.0	-	12.2	12.1
DT-LN1	Old Railway Tavern, Station Road	Roadside	539847,268169	22.7	18.5	18.6	17.4	13.9	14.5

Site ID	Location	Type	X,Y	Concentration (µg/m^3) [AQS objective = 40µg/m^3, WHO AQG = 10µg/m^3]					
				2016	2017	2018	2019	2020	2021
DT-LN2	75 High Street, Longstanton	Roadside	539570,266842	16.9	16.6	14.5	14.6	11.9	10.7
DT-LN3	1 Rampton Drift, Longstanton	Roadside	540553,266869	13.2	12.7	11.8	11.1	9.0	8.0
DT-LN4	37 Longstanton Road, Oakington	Roadside	540963,264474	15.2	14.6	12.1	-	9.9	9.5
DT-LN5a-5C	Longstanton bypass	Roadside	539614,267484	26.1	26.8	24.3	23.5	16.3	20.4
DT31	Church Road, Teversham	Roadside	549457,258573	-	-	-	-	-	14.0
DT32	Gazelle Way, Cherry Hinton	Roadside	549406,257551	-	-	-	-	-	14.6
DT33	Hudson Road, Upper Cambourne	Urban Background	533359,259765	-	-	-	-	-	10.7
DT34	Jeavons Lane, Great Cambourne	Roadside	532092,259086	-	-	-	-	-	12.3
DT35	Swansley Lane, Lower Cambourne	Roadside	531247,259475	-	-	-	-	-	11.5
DT36	55 St Neots Road	Roadside	538122,259523	-	-	-	-	-	12.3

Table TR2-D-9 – South Cambridge Automatic Monitoring: 1-hour Mean NO_2

Site ID	Location	Type	X,Y	Number of hours greater than 200µg/m^3 [AQS objective allows no more than 18 per year]					
				2016	2017	2018	2019	2020	2021
IMP	Impington (A14)	Roadside	543739,261625	0	0	0	0	0	0
ORCH	Orchard Park Primary School (A14)	Urban Background	544558,261579	0	0	0	0	0	0
GIRT	Girton	Roadside	542676,260667	0	0	0	0	0	0

Table TR2-D-10 – South Cambridge Automatic Monitoring: Annual Mean PM_{10}

Site ID	Location	Type	X,Y	Concentration (µg/m³) [AQS objective = 40µg/m³, WHO AQG = 15µg/m³]					
				2016	2017	2018	2019	2020	2021
IMP	Impington (A14)	Roadside	543739,261625	17.0	16.0	17.0	16.0	15.0	15.0
ORCH	Orchard Park Primary School (A14)	Urban Background	544558,261579	16.0	14.0	14.0	14.0	12.0	12.0
GIRT	Girton	Roadside	542676,260667	17.0	17.0	17.0	17.0	14.0	15.0

Table TR2-D-11 – South Cambridge Automatic Monitoring: 24-hour Mean PM_{10}

Site ID	Location	Type	X,Y	Number of days greater than 50µg/m³ [AQS objective allows no more than 35 per year]					
				2016	2017	2018	2019	2020	2021
IMP	Impington (A14)	Roadside	543739,261625	1	2	1	2	0(22)	0
ORCH	Orchard Park Primary School (A14)	Urban Background	544558,261579	1	1	1	1	0	0
GIRT	Girton	Roadside	542676,260667	1	1	1	3	0	0(22)

Table TR2-D-12 – South Cambridge Automatic Monitoring: Annual Mean $PM_{2.5}$

Site ID	Location	Type	X,Y	Concentration (µg/m³) [limit value = 20µg/m³, WHO AQG = 5µg/m³]					
				2016	2017	2018	2019	2020	2021
ORCH	Orchard Park Primary School (A14)	Urban Background	544558,261579	-	-	-	-	13.0	12.0
GIRT	Girton	Roadside	542676,260667	13.0	11.0	11.0	11.0	10.0	13.0

Table TR2-D-13 – C2C Scheme monitoring NO_2 Diffusion Tube Monitoring: Annual Mean NO_2

Site ID	Location	X,Y	2019 concentration (µg/m³) [AQS objective = 40µg/m³, WHO AQG = 10µg/m³]
Co-location	Girton Road	542673,260666	19.1
Location 1	Damson Way	531426,259502	12.4
Location 2	Broad Street	531875,259703	15.5
Location 3	Monkfield Lane	532065,259495	18.5

Site ID	Location	X,Y	2019 concentration (μg/m^3) [AQS objective = 40μg/m^3, WHO AQG = 10μg/m^3]
Location 4	Sackville Way	532238,259615	15.7
Location 5	Jeavons Lane	532396,259611	14.9
Location 6	Lancaster Gate	532830,259573	14.5
Location 7	Lysander Close	533040,259466	12.5
Location 8	St Neots Road 1	535555,259535	12.9
Location 9	Highfields Road	539446,259444	25.8
Location 10	St Neots Road 2	536373,259737	13.9
Location 11	Meridian Close	536649,259718	14.0
Location 12	St Neots Road 3	537410,259639	15.5
Location 13	Madingley Road	541473,259446	30.0
Location 14	Lansdowne Road	542693,259345	15.4
Location 15	Madingley Road 2	543255,259194	24.3
Location 16	Madingley road 3	544285,259028	25.2
Location 17	High Street	539541,260351	14.4
Location 18	Herschel Road	543976,258301	16.2
Location 19	Cambridge Road	541154,259032	15.4
Location 20	Scotland Road	537043,260374	17.9
Location 21	St Neots Road	534334,259868	21.1
Adams Road	Adams Road	543915,258510	14.3

Appendix E

DEFRA BACKGROUND CONCENTRATIONS

Table TR2-E-1 – CCC & SCDC Background Annual Mean Pollutant Concentrations for 2019 (µg/m³)

Grid Square X,Y	NO_2	PM_{10}	$PM_{2.5}$
544500,260500	15.7	15.7	10.3
542500,259500	17.6	17.1	10.6
544500,259500	20.1	15.8	10.3
545500,259500	19.0	15.6	10.4
543500,258500	13.9	15.2	9.6
544500,258500	20.3	14.9	9.7
545500,258500	21.6	15.3	10.1
546500,258500	19.5	16.2	10.8
543500,257500	13.5	15.3	9.6
544500,257500	16.3	15.0	9.7
545500,257500	20.7	15.4	10.1
545500,255500	13.4	16.1	9.9
532500,266500	10.4	15.8	9.5
532500,265500	9.6	16.0	9.5
535500,265500	15.1	17.7	10.6
532500,264500	9.4	15.8	9.4
537500,264500	18.0	18.9	11.1
531500,263500	9.6	14.6	9.2
538500,263500	18.7	18.0	11.1
533500,262500	9.5	15.8	9.4
538500,262500	10.9	15.9	9.6
539500,262500	14.0	17.8	10.5
540500,262500	18.8	18.9	11.0
544500,262500	14.2	15.7	9.9
530500,261500	9.6	16.9	9.7
537500,261500	9.7	16.5	9.7
538500,261500	10.1	15.7	9.5
540500,261500	12.9	17.3	10.2
541500,261500	22.3	17.7	10.8
542500,261500	18.5	17.3	10.8
543500,261500	18.2	18.7	11.1
544500,261500	19.9	17.8	11.1
529500,260500	11.2	17.0	9.9
531500,260500	11.8	17.4	10.1
533500,260500	10.0	16.8	9.7
539500,260500	10.9	14.9	9.4
540500,260500	12.7	17.1	10.0

Grid Square X,Y	NO_2	PM_{10}	$PM_{2.5}$
530500,259500	9.9	16.5	9.7
531500,259500	10.6	16.0	9.7
532500,259500	10.7	16.0	9.7
533500,259500	11.3	16.8	9.9
535500,259500	11.1	16.1	9.8
537500,259500	11.8	15.8	9.8
538500,259500	11.6	16.6	9.9
539500,259500	12.5	16.1	9.8
540500,259500	11.8	15.5	9.6
541500,259500	12.8	15.6	9.7
530500,258500	9.7	15.4	9.4
530500,257500	9.4	16.0	9.5
531500,257500	9.1	15.0	9.2
541500,257500	16.3	18.6	10.9
542500,257500	13.1	16.8	10.0
532500,256500	9.4	14.2	9.1
536500,256500	9.3	15.7	9.4
538500,256500	10.3	15.2	9.6
542500,256500	13.7	17.8	10.3
543500,256500	12.5	16.5	9.9

Table TR2-E-2 – CCC & SDBC Background Annual Mean Pollutant Concentrations for 2041 (µg/m^3)

Grid Square X,Y	NO_2	PM_{10}	$PM_{2.5}$
544500,260500	8.5	14.5	9.4
542500,259500	6.6	15.9	9.6
544500,259500	10.6	14.5	9.4
545500,259500	9.9	14.3	9.4
543500,258500	7.8	14.0	8.7
544500,258500	11.6	13.7	8.8
545500,258500	12.3	14.1	9.1
546500,258500	10.4	14.9	9.8
543500,257500	7.3	14.1	8.7
544500,257500	8.9	13.8	8.8
545500,257500	11.2	14.2	9.1
545500,255500	7.0	14.9	8.9
532500,266500	5.8	14.7	8.6
532500,265500	5.5	14.8	8.6
535500,265500	5.9	16.5	9.6

Grid Square X,Y	NO_2	PM_{10}	$PM_{2.5}$
532500,264500	5.5	14.6	8.5
537500,264500	6.9	17.8	10.1
531500,263500	5.6	13.5	8.3
538500,263500	6.3	16.8	10.1
533500,262500	5.5	14.6	8.5
538500,262500	6.0	14.8	8.7
539500,262500	6.2	16.6	9.6
540500,262500	6.0	17.7	10.0
544500,262500	7.6	14.5	8.9
530500,261500	5.5	15.8	8.8
537500,261500	5.6	15.4	8.8
538500,261500	5.7	14.5	8.6
540500,261500	6.2	16.1	9.3
541500,261500	6.3	16.5	9.8
542500,261500	7.2	16.1	9.8
543500,261500	7.4	17.5	10.1
544500,261500	7.6	16.6	10.1
529500,260500	5.4	15.8	8.9
531500,260500	5.6	16.3	9.1
533500,260500	5.7	15.7	8.8
539500,260500	5.9	13.8	8.4
540500,260500	6.1	15.9	9.1
530500,259500	5.5	15.4	8.8
531500,259500	6.1	14.9	8.8
532500,259500	6.2	14.8	8.7
533500,259500	5.7	15.7	9.0
535500,259500	5.5	14.9	8.8
537500,259500	5.8	14.6	8.9
538500,259500	5.7	15.4	8.9
539500,259500	5.8	14.9	8.8
540500,259500	6.1	14.3	8.6
541500,259500	6.5	14.4	8.7
530500,258500	5.5	14.3	8.5
530500,257500	5.3	14.9	8.6
531500,257500	5.3	13.9	8.3
541500,257500	6.2	17.5	9.9
542500,257500	6.8	15.6	9.0
532500,256500	5.4	13.1	8.2
536500,256500	5.4	14.5	8.5

Grid Square X,Y	NO_2	PM_{10}	$PM_{2.5}$
538500,256500	5.9	14.0	8.6
542500,256500	6.6	16.6	9.4
543500,256500	6.9	15.3	8.9

Appendix F

IAQM CONSTRUCTION ASSESSMENT METHODOLOGY

IAQM CONSTRUCTION ASSESSMENT METHODOLOGY

STEP 1 – SCREENING THE NEED FOR A DETAILED ASSESSMENT

An assessment will normally be required where there are:

- 'Human receptors' within 350m of the site boundary; or within 50m of the route(s) used by construction vehicles on the public highway, up to 500m from the site entrance(s); and/or
- 'Ecological receptors' within 50m of the site boundary; or within 50m of the route(s) used by construction vehicles on the public highway, up to 500m from the site entrance(s).

Where the need for a more detailed assessment is screened out, it can be concluded that the level of risk is "negligible".

STEP 2A – DEFINE THE POTENTIAL DUST EMISSION MAGNITUDE

The following are examples of how the potential dust emission magnitude for different activities can be defined. (Note that not all the criteria need to be met for a particular class). Other criteria may be used if justified in the assessment.

Table TR2-F-2A - Examples of Human Receptor Sensitivity to Construction Phase Impacts

Dust Emission Magnitude	Activity
Large	Demolition >50,000m^3 building demolished, dusty material (e.g. concrete), on-site crushing/screening, demolition >20m above ground level
	Earthworks >10,000m^2 site area, dusty soil type (e.g. clay), >10 earth moving vehicles active simultaneously, >8m high bunds formed, >100,000 tonnes material moved
	Construction >100,000m^3 building volume, on-site concrete batching, sandblasting
	Trackout >50 HDVs out / day, dusty surface material (e.g. clay), >100m unpaved roads
Medium	Demolition 20,000 - 50,000m^3 building demolished, dusty material (e.g. concrete) 10-20m above ground level
	Earthworks 2,500 - 10,000m^2 site area, moderately dusty soil (e.g. silt), 5-10 earth moving vehicles active simultaneously, 4m - 8m high bunds, 20,000 -100,000 tonnes material moved
	Construction

Dust Emission Magnitude	Activity
	25,000 - 100,000m^3 building volume, dusty material e.g. concrete, on-site concrete batching
	Trackout 10 - 50 HDVs out / day, moderately dusty surface material (e.g. clay), 50 -100m unpaved roads
Small	Demolition <20,000m^3 building demolished, non-dusty material (e.g metal cladding), <10m above ground level, work during wetter months
	Earthworks <2,500m^2 site area, soil with large grain size (e.g. sand), <5 earth moving vehicles active simultaneously, <4m high bunds, <20,000 tonnes material moved, earthworks during wetter months
	Construction <25,000m^3, non-dusty material (e.g. metal cladding or timber)
	Trackout <10 HDVs out / day, non-dusty soil, < 50m unpaved roads

STEP 2B – DEFINE THE SENSITIVITY OF THE AREA

The tables below present the IAQM assessment methodology to determine the sensitivity of the area to dust soiling, human health and ecological impacts respectively. The IAQM guidance provides guidance to allow the sensitivity of individual receptors to dust soiling and health effects to assist in the assessment of the overall sensitivity of the study area.

Table TR2-F-2Ba – Sensitivity of the Area to Dust Soiling Effects

Receptor Sensitivity	Number of Receptors	Distance from the Source (m)			
		<20	<50	<100	<350
High	>100	High	High	Medium	Low
	10-100	High	Medium	Low	Low
	1-10	Medium	Low	Low	Low
Medium	>1	Medium	Low	Low	Low
Low	>1	Low	Low	Low	Low

Table TR2.6-2Bb – Sensitivity of the Area to Human Health Impacts

Receptor Sensitivity	Annual Mean PM_{10} Concentration ($\mu g/m^3$)	Number of Receptors	Distance from the Source (m)				
			<20	<50	<100	<200	<350
High	>32	>100	High	High	High	Medium	Low
		10-100	High	High	Medium	Low	Low
		1-10	High	Medium	Low	Low	Low
	28-32	>100	High	High	Medium	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	High	Medium	Low	Low	Low
	24-28	>100	High	Medium	Low	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	<24	>100	Medium	Low	Low	Low	Low
		10-100	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Medium	>32	>10	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	28-32	>10	Medium	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
	24-28	>10	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
	<24	>10	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Low	-	>1	Low	Low	Low	Low	Low

Table TR2-F-2Bc – Sensitivity of the Area to Ecological Impacts

Receptor Sensitivity	Distance from the Sources (m)	
	<20	<50
High	High	Medium
Medium	Medium	Low
Low	Low	Low

STEP 2C – DEFINE THE RISK OF IMPACTS

The dust emissions magnitude determined at Step 2A should be combined with the sensitivity of the area determined at Step 2B to determine the risk of impacts without mitigation applied. For those cases where the risk category is 'negligible' no mitigation measures beyond those required by legislation will be required.

Table TR2-F-2C – Risk of Dust Impacts

Sensitivity of surrounding area	Dust Emission Magnitude		
	Large	Medium	Small
Demolition			
High	High Risk	Medium Risk	Medium Risk
Medium	High Risk	Medium Risk	Low Risk
Low	Medium Risk	Low Risk	Negligible
Earthworks and Construction			
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible
Trackout			
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Low Risk	Negligible
Low	Low Risk	Low Risk	Negligible

STEP 3 –SITE SPECIFIC MITIGATION

Having determined the risk categories for each of the four activities it is possible to determine the site-specific measures to be adopted. These measures will be related to whether the site is considered to be a low, medium or high risk site. The IAQM guidance details the mitigation measures required for high, medium and low risk sites as determined in Step 2C.

STEP 4 – DETERMINE SIGNIFICANT EFFECTS

Once the risk of dust impacts has been determined in Step 2C and the appropriate dust mitigation measures identified in Step 3, the final step is to determine whether there are significant effects arising from the construction phase. For almost all construction activities, the application of effective mitigation should prevent any significant effects occurring to sensitive receptors and therefore the residual effect will normally be negligible.

Appendix G

MODEL VERIFICATION

The ADMS-Roads dispersion model has been validated for road traffic assessments and is considered to be fit for purpose. Model validation undertaken by the software developer Cambridge Environmental Research Consultants (CERC) is unlikely to have included validation in the vicinity of the C2C Scheme considered in this assessment. It is therefore necessary to perform a comparison of model results with local monitoring data at relevant locations.

What is model verification and when is it required?

The comparison of modelled concentrations with local monitored concentrations is a process termed 'verification'. Model verification investigates the discrepancies between modelled and measured concentrations, which can arise due to the presence of inaccuracies and/or uncertainties in model input data, modelling and monitoring data assumptions.

The following are examples of potential causes of such discrepancy:

- Estimates of background pollutant concentrations;
- Meteorological data uncertainties;
- Traffic data uncertainties;
- Model input parameters, such as 'roughness length'; and
- Overall limitations of the dispersion model.

Where all input data, such as traffic data, emissions rates, and background concentrations have been checked and considered as reasonable, then the modelled results require adjustment to best align with the monitoring data. This may either be a single verification adjustment factor to be applied to the modelled concentrations across the study area, or a range of adjustment factors to account for differences in the nature of specific areas/zones within the study area (e.g. street canyons, motorways, local roads), all which may perform slightly differently and which may preclude the application of a single verification factor.

Approach to model verification within the assessment of the C2C Scheme

Both local authority (CCC and SCDC) and scheme specific monitoring data have been utilised within the verification process. The geographical extent of the proposed scheme, scale of monitoring undertaken by CCC and SCDC, and localised differences (further details are presented below) has resulted in the application of a range of adjustment factors for NO_X.

- For PM_{10} and $PM_{2.5}$, monitoring was limited to three roadside continuous monitoring stations for PM_{10} and two roadside continuous monitoring stations for $PM_{2.5}$. However, upon review, none of these were considered suitable for the purpose of model verification for the following reasons: The annual mean $PM_{2.5}$ concentration measured at CM3 in Newmark Road (10µg/m^3) is lower than the estimated background concentration (10.4µg/m^3) for the grid square containing this monitoring site;
- For PM_{10}, the CM1 and CM2 monitors are located at close proximity of A603 and CM4 is located in a street canyon. These monitoring sites represent very localised conditions. According to the LAQM.TG22, care needs to be taken when applying model adjustment based on one monitoring site only (CM4) as the adjustment may not be representative of other canyon locations. The modelled network has more than 570 links and there are only 14 modelled links (2%) within 200m of the CM1 and CM2 monitoring site. It is considered that there are insufficient PM_{10} monitoring data to sufficiently represent the performance of the model over the wider study area.

Therefore, taken a consistent approach, the modelled road-PM_{10} and road-$PM_{2.5}$ components have been adjusted using the verification factors obtained for NOx before adding to the appropriate background concentrations. This approach is supported by LAQM.TG(22). Notably, Paragraph 7.572 states:

“In the absence of any PM_{10} data for verification, it may be appropriate to apply the road-NOx adjustment to the modelled road-PM_{10}. If this identifies exceedances of the objective, then it would be appropriate to monitor PM_{10} and confirm the findings.”

Data Used in Model Verification

As mentioned above, in certain instances, it may be appropriate to apply a range of adjustment factors. This is because it is important that the location of the monitoring sites used within model verification are representative of the locations to which the verification factors are being applied. For example, if sensitive receptors are roadside, then a verification factor calculated using roadside diffusion tubes must be applied. In some instances, it may be appropriate to calculate more than one verification factor depending on the nature of the receptors (e.g. if some are kerbside and some roadside, then two factors are recommended calculated from kerbside and roadside monitoring data, respectively).

For the assessment presented herein, the assessment/modelling was divided into five verification adjustment zone based on both the geography of the monitoring site.receptors and any likely localised conditions such as the presence of a street canyon, location inside an AQMA etc. The five groupings applied within the verification process were as follows:

- Within the City Centre AQMA;
- Street Canyon;
- A14 corridor;
- A603 corridor;
- A1303 corridor; and
- All other urban roads.

Table TR2-G-1 below present the data used within model verification. The final column (verification zone) indicates which of the five groupings the diffusion tubes have been applied to as part of the verification process.

Table TR2-G-1 – Data used in model verification

Monitoring Site	Verification Zone	Local Authority	X	Y	Background NO_2 (µg/m³)	Monitored NO_2 (µg/m³)	Measured road-NOx (µg/m³) (from NOx to NO_2 calculator)	Modelled road-NOx (µg/m³)	Modelled NO_2 Total before adjustment (µg/m³)	Adjusted Modelled NO_x (Road) (µg/m³)	Adjusted Total NO_2 (µg/m³)	Ratio (measured NO_2/ modelled NO_2)
Location 13	A1303	CCC	541473	259446	9.3	30.0	40.6	10.9	15.2	40.3	29.9	0.00
Location 14	A1303	CCC	542693	259345	9.3	15.4	11.3	3.2	11.0	11.9	15.7	0.02
Location 15	A1303	CCC	543263	259195	10.9	24.3	25.5	9.4	16.0	34.7	28.8	0.18
22	A1303	CCC	543784	259093	10.9	30.0	37.2	7.3	14.9	27.0	25.1	-0.16
Location 9	A1303	SCDC	539449	259445	8.0	25.8	34.0	6.9	11.9	25.6	21.6	-0.16
Location 12	A1303	SCDC	537409	259646	8.0	15.5	13.8	6.2	11.4	23.0	20.3	0.31
Location 21	A1303	SCDC	534451	259825	7.5	21.1	25.5	6.5	11.1	23.9	20.3	-0.04
IMP	A14	SCDC	543739	261625	10.7	16.0	9.8	19.5	21.1	16.0	19.3	0.20
DT10	A14	SCDC	542537	261467	10.4	19.0	15.9	17.8	20.0	14.6	18.3	-0.04
DT15	A14	SCDC	544243	261819	10.9	18.5	14.2	9.1	15.8	7.5	14.9	-0.19
DT20	A14	SCDC	544828	261738	10.9	14.7	7.0	4.9	13.5	4.0	13.0	-0.11
DT21	A14	SCDC	545056	261784	12.2	15.8	6.6	4.8	14.9	3.9	14.4	-0.09
DT22	A14	SCDC	545435	261906	12.2	15.9	6.8	8.9	17.0	7.2	16.2	0.02
DT27	A14	SCDC	545259	261873	12.2	16.8	8.4	8.6	16.9	7.0	16.1	-0.04
20	A603	CCC	546070	259163	13.6	26.0	23.7	8.3	18.1	14.8	21.5	-0.17
25	A603	CCC	544100	257470	11.4	18.0	12.3	5.7	14.5	10.1	16.9	-0.06
26	A603	CCC	544943	257567	11.4	18.0	12.3	12.2	17.9	21.5	22.8	0.26
35	A603	CCC	546163	258983	13.6	17.0	6.4	7.7	17.7	13.7	20.9	0.23
43	A603	CCC	545271	257675	13.9	27.0	25.2	12.5	20.6	22.1	25.5	-0.06

Monitoring Site	Verification Zone	Local Authority	X	Y	Background NO_2 (µg/m³)	Monitored NO_2 (µg/m³)	Measured road-NOx (µg/m³) (from NOx to NO_2 calculator)	Modelled road-NOx (µg/m³)	Modelled NO_2 Total before adjustment (µg/m³)	Adjusted Modelled NO_x (Road) (µg/m³)	Adjusted Total NO_2 (µg/m³)	Ratio (measured NO_2/ modelled NO_2)
47	A603	CCC	545508	257828	13.9	29.0	29.3	14.8	21.8	26.2	27.5	-0.05
61	A603	CCC	546341	258882	13.6	34.0	40.7	14.0	21.0	24.7	26.4	-0.22
CM1 Gonville Place	A603	CCC	545508	257828	13.9	28.0	27.2	14.8	21.8	26.2	27.5	-0.02
CM2 Montague Road	A603	CCC	546057	259487	13.6	22.0	15.8	10.7	19.4	18.9	23.6	0.07
CM3 Newmarket Road	A603	CCC	546317	258900	13.6	22.0	15.9	16.2	22.2	28.7	28.4	0.29
23	All other urban roads	CCC	543761	259813	10.9	17.0	11.2	5.7	14.0	11.0	16.9	-0.01
Co-location	All other urban roads	SCDC	542676	260667	9.9	19.1	17.1	7.1	13.8	13.8	17.4	-0.09
Location 2	All other urban roads	SCDC	531877	259713	8.2	15.5	13.3	4.4	10.7	8.6	13.0	-0.16
Location 10	All other urban roads	SCDC	536373	259737	7.6	13.9	11.5	2.5	9.0	4.8	10.3	-0.26
Location 11	All other urban roads	SCDC	536651	259723	7.6	14.0	11.7	2.0	8.7	3.9	9.8	-0.30
Location 17	All other urban roads	SCDC	539544	260353	8.3	14.4	11.2	2.1	9.5	4.0	10.5	-0.27
Location 19	All other urban roads	SCDC	541157	259031	9.3	15.4	11.3	4.0	11.5	7.8	13.6	-0.12
Location 20	All other urban roads	SCDC	537043	260374	7.8	17.9	18.7	3.7	9.9	7.2	11.8	-0.34
2	All other urban roads	SCDC	544292	261202	10.9	21.0	19.0	5.9	14.1	11.4	17.1	-0.19
19	All other urban roads	SCDC	543101	260345	10.6	18.0	13.7	10.2	16.1	19.7	21.1	0.17
GIRT	All other urban roads	SCDC	542676	260667	9.9	17.0	13.0	7.1	13.8	13.8	17.4	0.02
DT5	All other urban roads	SCDC	538744	263640	8.8	13.4	8.4	10.6	14.6	20.5	19.8	0.47
4	AQMA	CCC	544492	259008	13.6	31.0	34.2	11.0	19.5	30.2	29.1	-0.06

Monitoring Site	Verification Zone	Local Authority	X	Y	Background NO_2 (µg/m^3)	Monitored NO_2 (µg/m^3)	Measured road-NOx (µg/m^3) (from NOx to NO_2 calculator)	Modelled road-NOx (µg/m^3)	Modelled NO_2 Total before adjustment (µg/m^3)	Adjusted Modelled NO_x (Road) (µg/m^3)	Adjusted Total NO_2 (µg/m^3)	Ratio (measured NO_2/ modelled NO_2)
14	AQMA	CCC	546080	257944	12.7	21.0	15.6	5.2	15.6	14.3	20.3	-0.03
38	AQMA	CCC	545566	259579	12.8	23.0	19.4	5.4	15.7	14.8	20.7	-0.10
44	AQMA	CCC	545430	258271	15.3	21.0	10.7	5.5	18.2	15.0	23.2	0.10
50	AQMA	CCC	545854	257229	13.9	23.0	17.2	8.6	18.6	23.6	26.2	0.14
64	AQMA	CCC	544952	258856	14.2	23.0	16.6	4.5	16.7	12.4	20.8	-0.10
65	AQMA	CCC	545896	257025	13.9	22.0	15.2	6.5	17.4	17.7	23.3	0.06
3	Street canyon	CCC	544677	258992	14.2	20.0	10.8	8.9	19.0	16.2	22.8	0.14
5	Street canyon	CCC	544770	258112	14.2	24.0	18.6	12.5	20.9	22.8	26.1	0.09
18	Street canyon	CCC	544884	258098	14.2	30.0	30.8	6.5	17.8	11.9	20.6	-0.31
21	Street canyon	CCC	544425	259560	13.6	22.0	15.9	15.9	22.0	29.1	28.5	0.30
31	Street canyon	CCC	544529	257730	11.4	29.0	34.3	22.7	23.3	41.3	32.3	0.11
33	Street canyon	CCC	545333	259439	12.8	31.0	35.8	15.7	21.1	28.6	27.6	-0.11
34	Street canyon	CCC	545390	258390	15.3	31.0	30.8	13.2	22.3	24.0	27.7	-0.11
41	Street canyon	CCC	545162	258240	15.3	27.0	22.6	3.6	17.2	6.5	18.8	-0.30
42	Street canyon	CCC	544981	257890	11.4	20.0	16.1	10.5	17.1	19.2	21.6	0.08
CM4 Parker Street	Street canyon	CCC	545366	258391	15.3	33.0	35.0	4.6	17.8	8.4	19.8	-0.40

Calculation and Application of the Verification Factors

For each verification zone, the road-NO_x adjustment factor was determined as the slope of the best fit line between the 'measured' road contributions and the model derived road contributions, forced through zero (see **Plate TR2-G-1 – TR2-G-6**) utilising the diffusion tubes assigned to that verification zone.

The relevant factors calculated for each of the verification zones were subsequently applied to the modelled road-NO_x concentrations for the relevant monitoring sites in order to provide adjusted modelled road-NO_x concentrations. Total NO_2 concentrations were then determined by inputting the adjusted modelled road-NO_x concentrations and the background NO_2 concentrations into the NO_x to NO_2 calculator.

Plate TR2-G-1 – City Centre AQMA - Comparison of Measured Road-NO_x with Unadjusted Modelled Road-NO_x

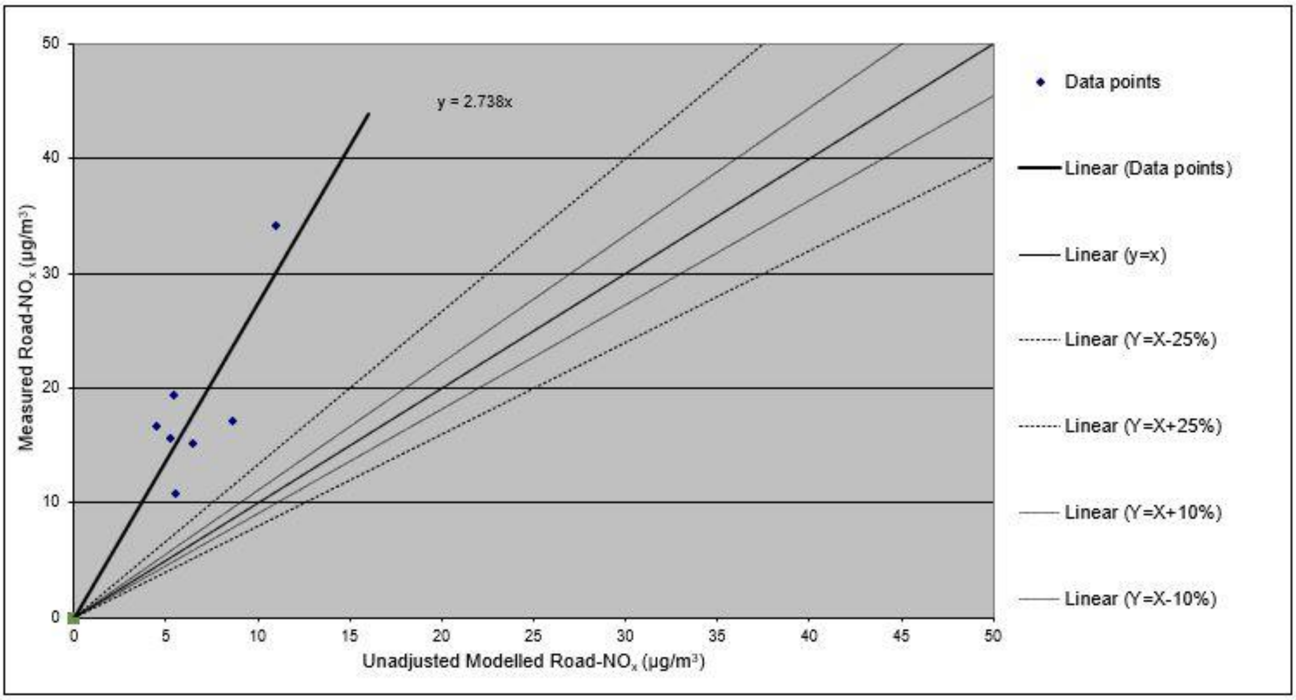


Plate TR2-G-2 – Street Canyon - Comparison of Measured Road-NO_x with Unadjusted Modelled Road-NO_x

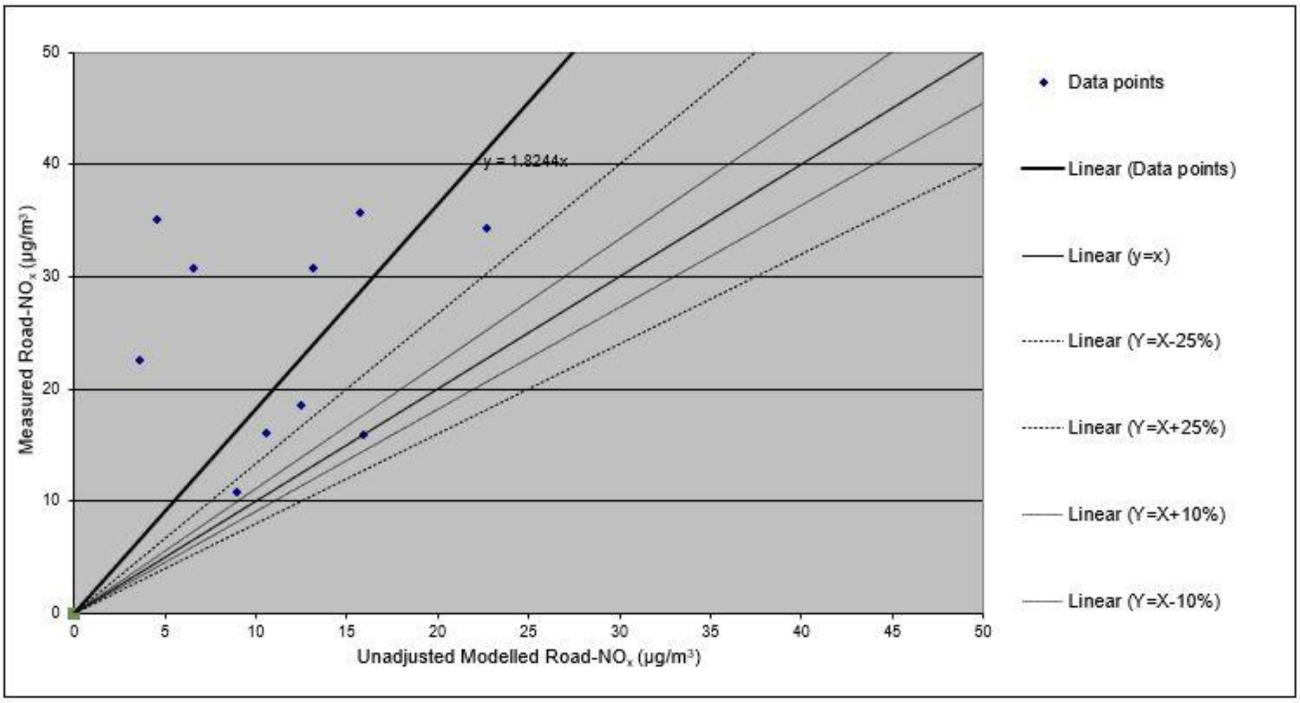


Plate TR2-G-3 – A14 - Comparison of Measured Road-NO_x with Unadjusted Modelled Road-NO_x

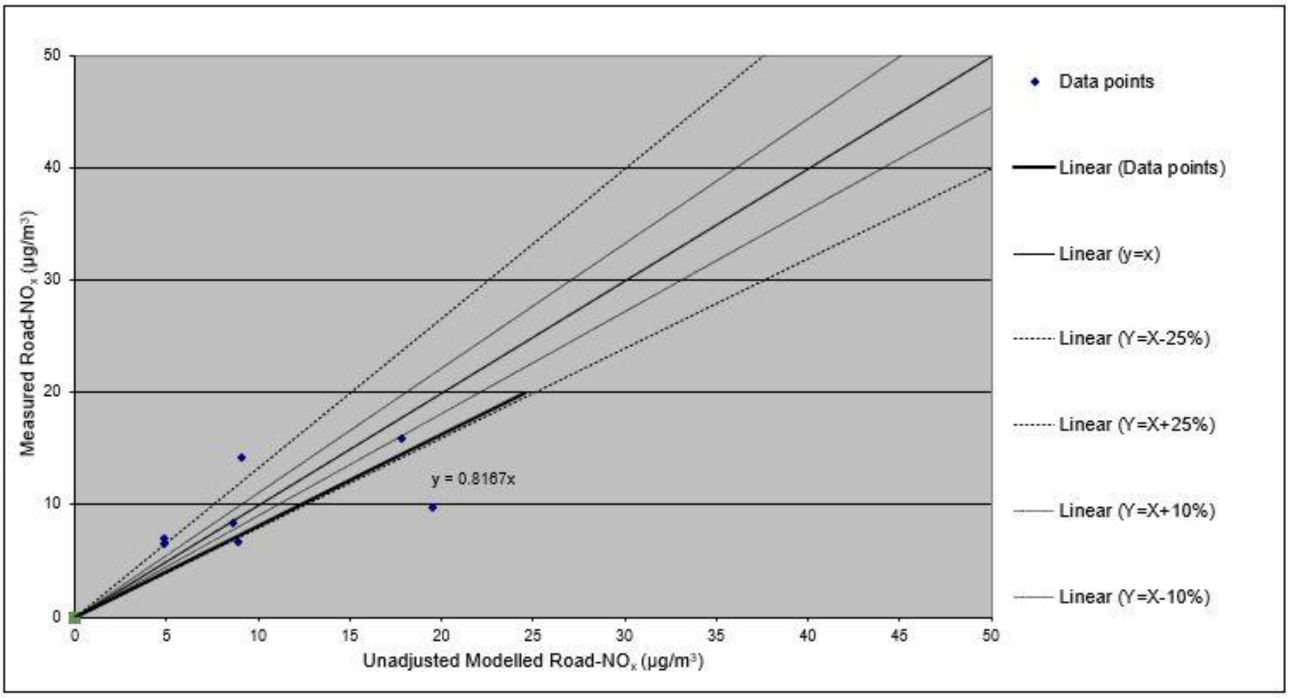


Plate TR2-G-4 – A603 - Comparison of Measured Road-NO_x with Unadjusted Modelled Road-NO_x

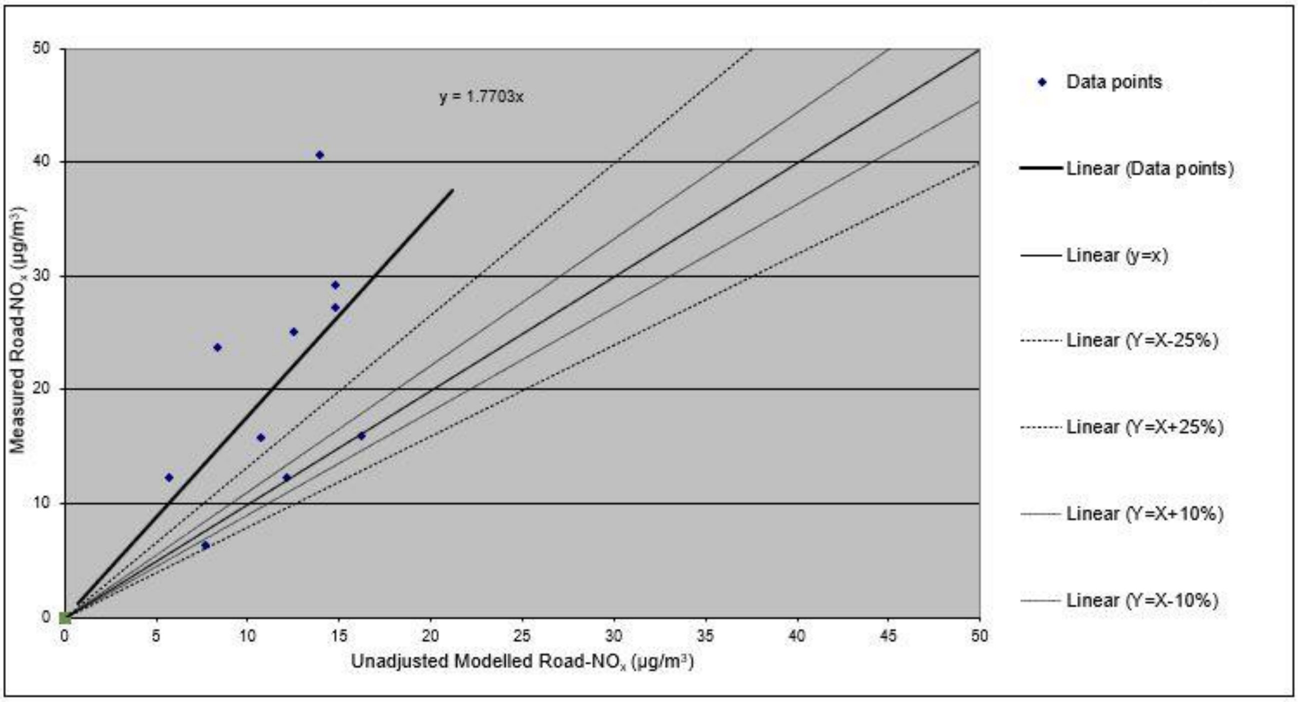


Plate TR2-G-5 – A1303 - Comparison of Measured Road-NO_x with Unadjusted Modelled Road-NO_x

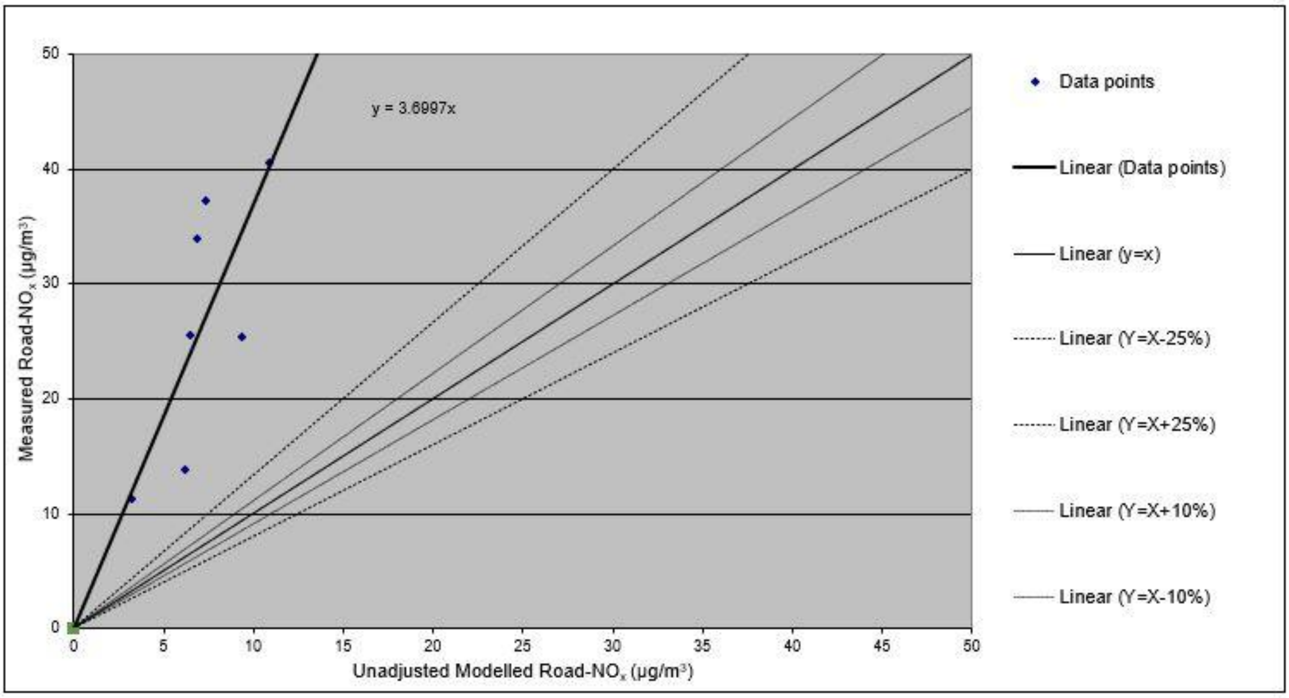
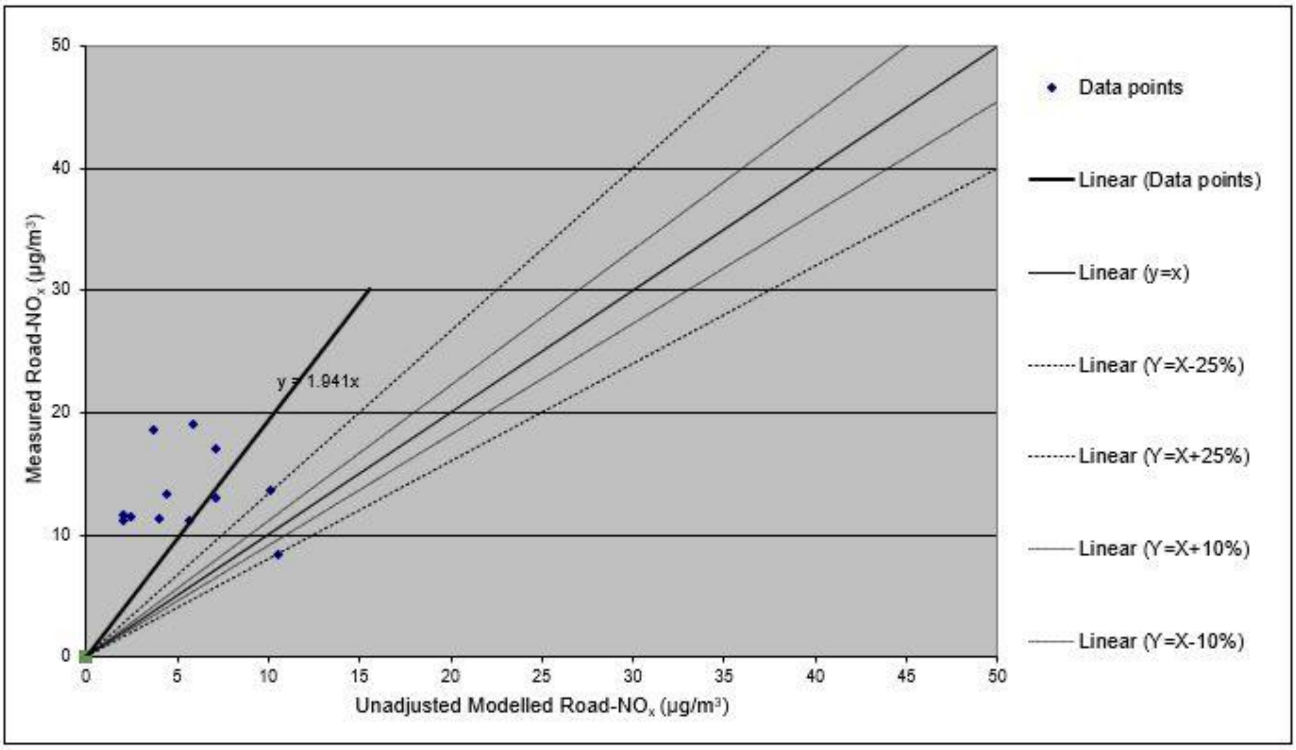


Plate TR2-G-6 – All other urban roads - Comparison of Measured Road-NO_x with Unadjusted Modelled Road-NO_x



The verification factors calculated for each of the verification zones are as follows:

- Within AQMA = 2.738;
- Street canyon = 1.824;
- A14 = 0.817;
- A603 = 1.770;
- A1303 = 3.700; and
- All other urban roads = 1.941.

The verification factors indicate that the model was over-predicting at motorway locations (A14) and under-predicting at all other adjustment locations (to varying degrees).

Model Uncertainty

An evaluation of model performance has been undertaken to establish confidence in model results. LAQM.TG(16) identifies a number of statistical procedures that are appropriate to evaluate model performance and assess the uncertainty. These include:

a) Root mean square error (RMSE);

b) Fractional bias (FB); and

c) Correlation coefficient (CC).

These parameters estimate how the model results agree or diverge from the observations. These calculations can be carried out prior to, and after adjustment, or based on different options for adjustment, and can provide useful information on model improvement. A brief for explanation of each statistic is provided in **Table TR2-G-2**, and further details can be found in Box 7.17 of LAQM.TG(16).

Table TR2-G-2 – Model Performance Statistics

Statistical Parameter	Comments	Ideal value
RMSE	RMSE is used to define the average error or uncertainty of the model. The units of RMSE are the same as the quantities compared. If the RMSE values are higher than 25% of the objective being assessed, it is recommended that the model inputs and verification should be revisited in order to make improvements. For example, if the model predictions are for the annual mean NO_2 objective of 40µg/m^3, if an RMSE of 10µg/m^3 or above is determined for a model it is advised to revisit the model parameters and model verification. Ideally an RMSE within 10% of the air quality objective would be derived, which equates to 4µg/m^3 for the annual mean NO_2 objective.	0.00
Fractional Bias	It is used to identify if the model shows a systematic tendency to over or under predict. FB values vary between +2 and -2 and has an ideal value of zero. Negative values suggest a model over-prediction and positive values suggest a model under-prediction.	0.00
Correlation Coefficient	It is used to measure the linear relationship between predicted and observed data. A value of zero means no relationship and a value of 1 means absolute relationship. This statistic can be particularly useful when comparing a large number of model and observed data points.	1.00

These parameters highlight how the model results agree or diverge from the observations.

Model uncertainty for this assessment has been evaluated by considering both the Root Mean Square Error (RMSE) and Fractional Bias statistic. **Table TR2-G-2** provides details of the calculations for each modelled zone.

Table TR2-G-3 – Verification Zone Model Performance Statistics

	All other urban	Street Canyon	A14	A603	AQMA	A1303
NO_X Rd Factor	1.941	1.824	0.817	1.770	2.738	3.700
RMSE	3.68	6.50	2.04	4.05	2.12	3.49

	All other urban	Street Canyon	A14	A603	AQMA	A1303
R^2	0.21	0.00	0.17	0.42	0.59	0.62
Fractional Bias	0.10	0.08	0.04	0.00	0.00	0.00
Within +10%	1	2	1	1	1	1
Within -10%	2	0	3	4	3	2
Within +-10%	3	2	4	5	4	3
Within +10 to 25%	1	2	1	1	2	1
Within -10 to -25%	7	5	2	2	1	2
Within +-10 to +-25%	1	2	1	1	2	1
Over +25%	1	1	0	2	0	1
Under -25%	0	0	0	0	0	0
Greater +- 25%	1	1	0	2	0	1
Within +- 25%	11	9	7	8	7	6
% of sites within 25%	92	90	100	80	100	86

A comparison of the performance of the modelled concentrations from the air quality model against the monitoring data was undertaken. The results show that the verification performance for each individual verification zones are satisfactory. The model performance statistics show that the uncertainty in the predictions of adjusted total NO_2 was acceptable as the RMSE is less than 10µg/m^3 for each verification zone.

Appendix H

MODELLED RECEPTORS

Table TR2-H-1: Modelled Receptors Location

Receptor ID	X	Y	Z	Location/Address	Verification Zone
1	530921	259216	1.5	School Lane, Cambourne	All other urban roads
2	531345	259475	1.5	Orchard Way, Cambourne	All other urban roads
3	531216	259374	1.5	School Lane, Cambourne	All other urban roads
4	531523	260215	1.5	Sheepfold Lane, Cambourne	All other urban roads
5	531937	260150	1.5	New Hall Lane, Cambourne	All other urban roads
6	533440	259753	1.5	Hudson Road, Cambourne	All other urban roads
7	533250	258974	1.5	Gladiator Road, Cambourne	All other urban roads
8	536687	259709	1.5	Saint Neots Road, Hardwick	All other urban roads
9	535597	259679	1.5	Saint Neots Road, Hardwick	All other urban roads
10	536875	260137	1.5	Scotland Road, Hardwick	All other urban roads
11	538253	259497	1.5	Saint Neots Road, Hardwick	A1303
12	539478	259417	1.5	Madingley Road, Madingley	A1303
13	540034	259380	1.5	Madingley Road, Madingley	A1303
14	541139	258950	1.5	Cambridge Road	All other urban roads
15	541119	258949	1.5	Cambridge Road	All other urban roads
16	541281	258839	1.5	Brook Lane	All other urban roads
17	541950	261177	1.5	Huntingdon Road	All other urban roads
18	542553	261392	1.5	Girton Road	A14
19	544205	261664	1.5	Cambridge Road	A14
20	544312	261894	1.5	Cambridge Road	A14
21	545695	262064	1.5	A14	A14
22	544043	259064	1.5	Madingley Road	A1303
23	544004	258302	1.5	Grange Road	AQMA
24	543996	258105	1.5	Grange Road	AQMA
25	543981	257876	1.5	Grange Road	AQMA
26	543964	257513	1.5	Grange road	A603
27	544323	257442	1.5	Grantchester Street	A603
28	544545	257851	1.5	A1134	AQMA
29	544520	257713	4.5	A1134	canyon
30	544400	258164	1.5	West Road	AQMA
31	544393	258927	1.5	A1134	AQMA
32	544400	257883	1.5	Ridley Hall Road	AQMA
33	543885	258261	1.5	College lane, Grange Road	All other urban roads
34	545116	257582	1.5	The Fen Causeway	A603
35	545204	257353	1.5	Brookside, Bateman Street	AQMA
36	545192	257456	1.5	Brookside, A1134	AQMA

Receptor ID	X	Y	Z	Location/Address	Verification Zone
37	545176	257651	1.5	A603	A603
38	545239	257653	1.5	A603	A603
39	545545	257678	1.5	Union Road	AQMA
40	545570	257638	1.5	A1307	AQMA
41	545521	257845	1.5	A603	A603
42	546062	257974	1.5	Mill Road	AQMA
43	546122	257922	4.5	Mill Road	AQMA
44	543958	258330	1.5	Herschel Road	AQMA
45	543895	258306	1.5	Herschel Road	All other urban roads
46	544003	258247	1.5	Grange Road	AQMA
47	543793	258324	1.5	Herschel Road	All other urban roads
48	543900	258501	1.5	Adams Road	All other urban roads
49	543745	258530	1.5	Adams Road	All other urban roads
50	544015	258508	1.5	Grange Road	AQMA
51	543990	258634	1.5	Grange Road	AQMA
52	544172	259034	1.5	Madingley Road	A1303
53	544410	258962	1.5	Northampton Street	AQMA
54	544484	259000	1.5	Northampton Street	AQMA
55	544660	259007	1.5	Bridge Street	Canyon
56	544852	258815	4.5	Bridge Street	Canyon
57	545604	257930	1.5	A603	A603
58	545585	257613	1.5	A1307	AQMA
59	544278	257456	1.5	A603	A603
60	542162	259332	1.5	Madingley Road, A1303	A1303
61	542843	259296	1.5	Madingley Road, A1303	A1303
62	543427	259137	1.5	Madingley Road, A1303	A1303
63	541151	259046	1.5	Cambridge Road	All other urban roads
64	540443	259447	1.5	A1303	A1303
65	540770	259479	1.5	Mandingley Road, A1303	A1303
66	536975	260184	1.5	Scotland Road	All other urban roads
67	537099	259658	1.5	St Neots Road	All other urban roads
68	535957	259668	1.5	St Neots Road	All other urban roads
69	536338	259721	1.5	St Neots Road	All other urban roads
70	532412	260251	1.5	A428	A1303
71	532378	260085	1.5	A428	All other urban roads
72	533442	259986	1.5	St Neots Road	A1303
73	533423	259577	1.5	Broadway	All other urban roads

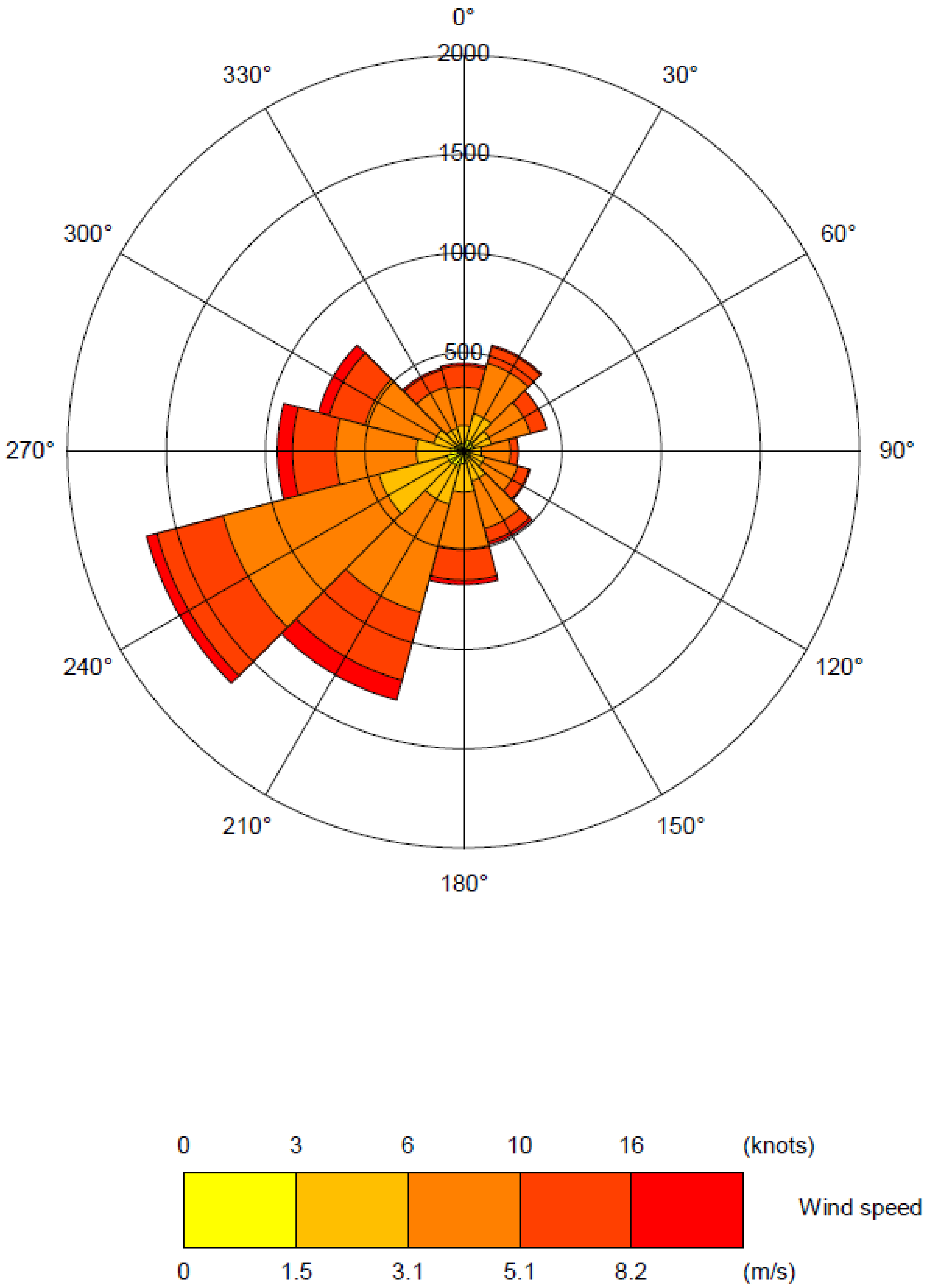
Receptor ID	X	Y	Z	Location/Address	Verification Zone
74	533518	259489	1.5	Broadway	All other urban roads
75	532971	257704	1.5	Broadway	All other urban roads
76	537079	258111	1.5	Main Street	All other urban roads
77	542558	261483	1.5	Girton Road	A14
78	545026	259376	1.5	Chesterton Road	AQMA
79	544766	259193	1.5	Chesterton Road	AQMA
80	544790	259230	1.5	Hertford Street, Chesterton Road	AQMA
81	541022	262111	1.5	Grange Farm, M11	All other urban roads
82	541090	261895	1.5	Grange Farm Cottage, M11	All other urban roads
83	544340	259351	1.5	Castle Street	AQMA
84	544344	259382	1.5	Castle Street	AQMA
85	544319	259362	1.5	Mount Pleasent	AQMA
86	544437	259300	1.5	Castle Street	AQMA
87	535029	258217	1.5	Main Street	All other urban roads
88	535968	256179	1.5	B1046	All other urban roads
89	536307	256140	1.5	B1046	All other urban roads
90	537944	256205	1.5	Long Road	All other urban roads
91	538829	256414	1.5	Long Road	All other urban roads
92	538756	258549	1.5	Long Road	All other urban roads
93	530662	258021	1.5	Bourn Road	All other urban roads
94	532514	256818	1.5	Alms Hill	All other urban roads
95	543238	257684	1.5	Barton Riad, A603	A603
96	533125	259609	1.5	Sterling Way	All other urban roads
97	534601	259832	1.5	St Neots Road	A1303
98	535455	259774	1.5	A428	A1303
99	537514	259611	1.5	St Neots Road	A1303
100	540003	259271	1.5	Madingley Road	All other urban roads
101	542165	259006	1.5	High Cross	All other urban roads
102	542123	258973	1.5	Ada Lovelace Road	All other urban roads
103	543706	258321	1.5	Herschel Road	All other urban roads
104	543579	258333	1.5	Herschel Road	All other urban roads
105	539847	262816	1.5	Huntingdon Road	All other urban roads
106	544236	261793	1.5	Bridge Road	A14
107	544567	261642	1.5	Ring Fort Road	A14
108	544587	261744	1.5	A14	A14
109	544466	261696	1.5	Cambridge Road	A14

Receptor ID	X	Y	Z	Location/Address	Verification Zone
110	545425	261911	1.5	Busway NCN51, A14	A14
111	545260	258152	1.5	Regent Street	Canyon
112	545230	258261	1.5	St Andrew's Street	Canyon
113	544440	258115	1.5	Queen's Road	AQMA
114	545016	258180	1.5	Pembroke street-Tennis Ct Road	Canyon
115	545098	258230	1.5	Dowing Street	Canyon
116	544758	258119	1.5	Queens Lane, Silver Street	Canyon
117	544700	258093	1.5	Silver Street	Canyon
118	544592	258023	1.5	Silver Street	AQMA
119	545418	258266	1.5	Park Terrace	AQMA
120	545420	258375	1.5	Parker Street	Canyon
121	545968	256972	1.5	A1307	AQMA

Appendix I

WIND ROSE

Plate TR2-I-1 - 2019 Bedford Station Windrose



Appendix J

MITIGATION MEASURES FOR THE CONSTRUCTION PHASE

Public

MITIGATION MEASURES FOR CONSTRUCTION PHASE

IAQM recommended mitigation measures for High Risk site are provided below. These measures is incorporated in the C2C Scheme's Code of Construction Practices (CoCP)[17].

General Communication

- A stakeholder communications plan that includes community engagement before work commences on site should be developed and implemented; and
- The name and contact details of person(s) accountable for air quality and dust issues should be displayed on the site boundary. This may be the environment manager/engineer or the site manager. The head or regional office contact information should also be displayed.

General Dust Management

- A Dust Management Plan (DMP) which may include measures to control other emissions, in addition to the dust and PM_{10} mitigation measures given in this report, should be developed and implemented, and approved by the local authorities. The DMP may include a requirement for monitoring of dust deposition, dust flux, real-time PM_{10} continuous monitoring and/or visual inspections. The requirement of monitoring to be confirmed by the local authorities; and
- For major sites, the DMP may be integrated into a Code of Construction Practice or the Construction Environmental Management Plan.

Site Management

- All dust and air quality complaints should be recorded and causes identified. Appropriate remedial action should be taken in a timely manner with a record kept of actions taken including of any additional measures put in-place to avoid reoccurrence;
- The complaints log should be made available to the local authority on request;
- Any exceptional incidents that cause dust and/or air emissions, either on- or offsite should be recorded, and then the action taken to resolve the situation recorded in the log book; and
- Regular liaison meetings with other high risk construction sites within 500m of the site boundary should be held, to ensure plans are co-ordinated and dust and particulate matter emissions are minimised. It is important to understand the interactions of the off-site transport/deliveries which might be using the same strategic road network routes.

Monitoring

- Daily on-site and off-site inspections should be undertaken, where receptors (including roads) are nearby to monitor dust. The inspection results should be recorded and made available to the local authority when asked. This should include regular dust soiling checks of surfaces such as street furniture, cars and window sills within 100m of site boundary, with cleaning to be provided if necessary;
- Regular site inspections to monitor compliance with the DMP should be carried out, inspection results recorded, and an inspection log made available to the local authority when asked;
- The frequency of site inspections should be increased when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions; and

- The requirement for dust deposition, dust flux, and/or real-time PM_{10} continuous monitoring (including the type and number of monitoring locations) will be confirmed with the two local authorities. If required, baseline monitoring should start at least three months before work commences on site or, if it a large site, before work on a phase commences.

Preparing and maintaining the site

- Plan the site layout so that machinery and dust causing activities are located away from receptors, as far as is practicable;
- Where practicable, erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site;
- Where practicable, fully enclose site or specific operations where there is a high potential for dust production and the site is active for an extensive period;
- Avoid site runoff of water or mud;
- Keep site fencing, barriers and scaffolding clean using wet methods;
- Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If they are being re-used on-site cover appropriately; and
- Where practicable, cover, seed or fence stockpiles to prevent wind whipping.

Operating vehicle/machinery and sustainable travel

- Ensure all vehicle operators switch off engines when stationary - no idling vehicles;
- Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where practicable;
- A maximum-speed-limit of 15 mph on surfaced and 10 mph on unsurfaced haul roads and work areas should be imposed (if long haul routes are required these speeds may be increased with suitable additional control measures provided, subject to the approval of the nominated undertaker and with the agreement of the local authority, where appropriate);
- A Construction Logistics Plan will be produced to manage the sustainable delivery of goods and materials; and
- A Travel Plan that supports and encourages sustainable travel (public transport, cycling, walking, and car-sharing) will also be produced.

Operations

- Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g., suitable local exhaust ventilation systems;
- Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate;
- Use enclosed chutes and conveyors and covered skips;
- Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate; and

- Ensure equipment is readily available on site to clean any dry spillages and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.

Waste management

- Avoid bonfires and burning of waste materials.

Measures Specific to Demolition

- Soft strip inside buildings before demolition (retaining walls and windows in the rest of the building where possible, to provide a screen against dust);
- Ensure effective water suppression is used during demolition operations. Hand-held sprays are more effective than hoses attached to equipment as the water can be directed to where it is needed. In addition high volume water suppression systems, manually controlled, can produce fine water droplets that effectively bring the dust particles to the ground;
- Avoid explosive blasting, using appropriate manual or mechanical alternatives; and
- Bag and remove any biological debris or damp down such material before demolition.

Measures Specific to Earthworks

- Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable;
- Use Hessian, mulches or tackifiers where it is not possible to re-vegetate or cover with topsoil, as soon as practicable;
- Where practicable, only remove the cover in small areas during work and not all at once;
- Stockpile surface areas should be minimised (subject to health and safety and visual constraints regarding slope gradients and visual intrusion) to reduce area of surfaces exposed to wind pick-up;
- Where practicable, windbreak netting/screening should be positioned around material stockpiles and vehicle loading/unloading areas, as well as exposed excavation and material handling operations, to provide a physical barrier between the Site and the surrounding;
- Where practicable, stockpiles of soils and materials should be located as far as possible from sensitive properties, taking account of the prevailing wind direction; and
- During dry or windy weather, material stockpiles and exposed surfaces should be dampened down using a water spray to minimise the potential for wind pick-up.

Measures Specific to Construction

- Avoid scabbling (roughening of concrete surfaces) if possible;
- Ensure sand and other aggregates are stored in bunded areas and are not allow to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place;
- Ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored in silos with suitable emission control systems to prevent escape of material and overfilling during delivery;

- For small supplies of fine powder materials ensure bags are sealed after use and stored appropriately to prevent dust; and
- All construction plant and equipment should be maintained in good working order and not left running when not in use.

Measures Specific to Trackout

- Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the site. This may require the sweeper being in frequent use;
- Avoid dry sweeping of large areas;
- Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport;
- Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable;
- Record all inspections of haul routes and any subsequent action in a site log book;
- Where practicable, hard surfaced haul routes should be regularly damped down with fixed or mobile sprinkler systems, or mobile water bowsers and regularly cleaned;
- Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site, where reasonably practicable);
- Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit, wherever site size and layout permits; and
- Access gates to be located at least 10m from receptors where possible.

Detailed mitigation measures to control construction traffic should be discussed with both CCC and SCDC to establish the most suitable access and haul routes for the site traffic. The most effective mitigation will be achieved by ensuring that construction traffic does not pass along sensitive roads (residential roads, congested roads, via unsuitable junctions, etc.) where possible, and that vehicles are kept clean (through the use of wheel washers, etc.) and sheeted when on public highways. Timing of large-scale vehicle movements to avoid peak hours on the local road network will also be beneficial.

Appendix K

MODEL RESULTS

MODEL RESULTS

Table TR2-K-1 - Annual Mean NO_2 Concentration

Receptor ID	X	Y	Z	Annual Mean NO_2 Concentrations (µg/m^3)					
				2019 Baseline	2041 Baseline	2041 With Dev	Change (µg/m^3)	% Change Relative to Objective	Impact
1	530921	259216	1.5	11.3	6.9	6.8	-0.1	0.0	Negligible
2	531345	259475	1.5	11.5	7.3	7.2	-0.1	0.0	Negligible
3	531216	259374	1.5	11.4	7.3	7.2	-0.1	0.0	Negligible
4	531523	260215	1.5	9.4	6.7	6.7	0.0	0.0	Negligible
5	531937	260150	1.5	11.4	7.6	7.5	-0.1	0.0	Negligible
6	533440	259753	1.5	9.6	6.8	6.7	-0.1	0.0	Negligible
7	533250	258974	1.5	7.9	5.8	5.7	-0.1	0.0	Negligible
8	536687	259709	1.5	10.0	6.8	6.7	-0.1	0.0	Negligible
9	535597	259679	1.5	11.6	8.0	7.9	-0.1	0.0	Negligible
10	536875	260137	1.5	10.0	6.9	6.9	0.0	0.0	Negligible
11	538253	259497	1.5	15.9	10.4	9.5	-0.9	-2.0	Negligible
12	539478	259417	1.5	14.4	8.9	8.7	-0.2	-1.0	Negligible
13	540034	259380	1.5	13.1	8.2	8.1	-0.1	0.0	Negligible
14	541139	258950	1.5	14.6	8.8	8.9	0.1	0.0	Negligible
15	541119	258949	1.5	11.8	7.6	7.6	0.0	0.0	Negligible
16	541281	258839	1.5	14.1	8.6	8.6	0.0	0.0	Negligible
17	541950	261177	1.5	16.5	9.3	9.3	0.0	0.0	Negligible
18	542553	261392	1.5	16.2	9.5	9.5	0.0	0.0	Negligible
19	544205	261664	1.5	14.4	9.2	9.1	-0.1	0.0	Negligible
20	544312	261894	1.5	15.2	9.3	9.3	0.0	0.0	Negligible
21	545695	262064	1.5	14.5	8.8	8.8	0.0	0.0	Negligible
22	544043	259064	1.5	26.1	14.6	13.3	-1.3	-3.0	Negligible
23	544004	258302	1.5	18.0	12.9	12.5	-0.4	-1.0	Negligible
24	543996	258105	1.5	16.2	9.8	9.7	-0.1	0.0	Negligible
25	543981	257876	1.5	17.2	9.6	9.5	-0.1	0.0	Negligible
26	543964	257513	1.5	16.3	9.5	9.4	-0.1	0.0	Negligible
27	544323	257442	1.5	15.8	10.3	10.3	0.0	0.0	Negligible
28	544545	257851	1.5	23.1	12.7	12.5	-0.2	-1.0	Negligible
29	544520	257713	4.5	17.0	10.8	10.8	0.0	0.0	Negligible
30	544400	258164	1.5	21.1	13.9	13.7	-0.2	-1.0	Negligible

Receptor ID	X	Y	Z	Annual Mean NO_2 Concentrations (µg/m^3)					
				2019 Baseline	2041 Baseline	2041 With Dev	Change (µg/m^3)	% Change Relative to Objective	Impact
31	544393	258927	1.5	23.4	14.5	14.3	-0.2	-1.0	Negligible
32	544400	257883	1.5	16.0	10.3	10.2	-0.1	0.0	Negligible
33	543885	258261	1.5	14.3	8.4	8.3	-0.1	0.0	Negligible
34	545116	257582	1.5	26.3	16.0	15.6	-0.4	-1.0	Negligible
35	545204	257353	1.5	21.0	13.2	13.0	-0.2	-1.0	Negligible
36	545192	257456	1.5	20.6	13.4	13.2	-0.2	-1.0	Negligible
37	545176	257651	1.5	27.2	16.2	15.6	-0.6	-2.0	Negligible
38	545239	257653	1.5	22.8	14.2	13.9	-0.3	-1.0	Negligible
39	545545	257678	1.5	21.9	14.2	13.7	-0.5	-1.0	Negligible
40	545570	257638	1.5	20.6	13.4	13.0	-0.4	-1.0	Negligible
41	545521	257845	1.5	26.6	16.3	15.0	-1.3	-3.0	Negligible
42	546062	257974	1.5	25.7	12.9	12.3	-0.6	-2.0	Negligible
43	546122	257922	4.5	18.3	11.0	10.8	-0.2	-1.0	Negligible
44	543958	258330	1.5	13.1	8.9	8.6	-0.3	-1.0	Negligible
45	543895	258306	1.5	12.4	8.5	8.4	-0.1	0.0	Negligible
46	544003	258247	1.5	18.8	12.9	12.5	-0.4	-1.0	Negligible
47	543793	258324	1.5	12.2	8.5	8.3	-0.2	-1.0	Negligible
48	543900	258501	1.5	12.0	8.3	8.3	0.0	0.0	Negligible
49	543745	258530	1.5	11.8	8.3	8.3	0.0	0.0	Negligible
50	544015	258508	1.5	17.8	12.7	12.4	-0.3	-1.0	Negligible
51	543990	258634	1.5	13.2	8.7	8.5	-0.2	-1.0	Negligible
52	544172	259034	1.5	24.2	13.5	13.2	-0.3	-1.0	Negligible
53	544410	258962	1.5	27.5	15.5	15.3	-0.2	-1.0	Negligible
54	544484	259000	1.5	28.9	15.0	14.7	-0.3	-1.0	Negligible
55	544660	259007	1.5	25.8	15.1	13.1	-2.0	-5.0	Negligible
56	544852	258815	4.5	16.8	12.4	12.2	-0.2	-1.0	Negligible
57	545604	257930	1.5	21.7	13.9	13.5	-0.4	-1.0	Negligible
58	545585	257613	1.5	20.6	13.3	13.0	-0.3	-1.0	Negligible
59	544278	257456	1.5	17.7	11.0	10.9	-0.1	0.0	Negligible
60	542162	259332	1.5	29.9	15.3	15.0	-0.3	-1.0	Negligible
61	542843	259296	1.5	18.6	9.5	9.2	-0.3	-1.0	Negligible
62	543427	259137	1.5	19.6	10.1	9.9	-0.2	-1.0	Negligible
63	541151	259046	1.5	11.9	7.6	7.6	0.0	0.0	Negligible

Receptor ID	X	Y	Z	Annual Mean NO_2 Concentrations (µg/m³)					
				2019 Baseline	2041 Baseline	2041 With Dev	Change (µg/m³)	% Change Relative to Objective	Impact
64	540443	259447	1.5	18.5	10.8	10.6	-0.2	-1.0	Negligible
65	540770	259479	1.5	22.9	13.0	12.7	-0.3	-1.0	Negligible
66	536975	260184	1.5	10.4	7.3	7.4	0.1	0.0	Negligible
67	537099	259658	1.5	11.1	7.3	7.2	-0.1	0.0	Negligible
68	535957	259668	1.5	10.5	7.2	7.2	0.0	0.0	Negligible
69	536338	259721	1.5	9.9	6.9	6.8	-0.1	0.0	Negligible
70	532412	260251	1.5	17.9	11.4	11.2	-0.2	-1.0	Negligible
71	532378	260085	1.5	9.9	6.8	6.7	-0.1	0.0	Negligible
72	533442	259986	1.5	16.4	10.9	10.8	-0.1	0.0	Negligible
73	533423	259577	1.5	8.7	6.3	6.2	-0.1	0.0	Negligible
74	533518	259489	1.5	9.1	7.0	6.4	-0.6	-2.0	Negligible
75	532971	257704	1.5	8.6	5.9	5.8	-0.1	0.0	Negligible
76	537079	258111	1.5	8.0	5.9	5.9	0.0	0.0	Negligible
77	542558	261483	1.5	17.1	9.9	9.9	0.0	0.0	Negligible
78	545026	259376	1.5	20.7	12.0	12.0	0.0	0.0	Negligible
79	544766	259193	1.5	24.3	13.6	13.5	-0.1	0.0	Negligible
80	544790	259230	1.5	25.8	13.9	13.7	-0.2	-1.0	Negligible
81	541022	262111	1.5	15.7	9.1	9.1	0.0	0.0	Negligible
82	541090	261895	1.5	25.7	12.8	12.8	0.0	0.0	Negligible
83	544340	259351	1.5	27.3	15.2	14.9	-0.3	-1.0	Negligible
84	544344	259382	1.5	38.4	19.6	18.2	-1.4	-4.0	Negligible
85	544319	259362	1.5	26.5	15.0	14.6	-0.4	-1.0	Negligible
86	544437	259300	1.5	22.3	13.3	12.8	-0.5	-1.0	Negligible
87	535029	258217	1.5	8.3	5.9	5.9	0.0	0.0	Negligible
88	535968	256179	1.5	9.3	6.2	6.2	0.0	0.0	Negligible
89	536307	256140	1.5	9.6	6.3	6.3	0.0	0.0	Negligible
90	537944	256205	1.5	10.2	6.5	6.4	-0.1	0.0	Negligible
91	538829	256414	1.5	9.2	6.4	6.4	0.0	0.0	Negligible
92	538756	258549	1.5	8.2	5.9	5.9	0.0	0.0	Negligible
93	530662	258021	1.5	8.7	6.1	6.1	0.0	0.0	Negligible
94	532514	256818	1.5	9.8	6.6	6.3	-0.3	-1.0	Negligible
95	543238	257684	1.5	14.1	8.8	8.7	-0.10	0.0	Negligible
96	533125	259609	1.5	8.5	6.2	6.1	-0.1	0.0	Negligible

Receptor ID	X	Y	Z	Annual Mean NO_2 Concentrations ($\mu g/m^3$)					
				2019 Baseline	2041 Baseline	2041 With Dev	Change ($\mu g/m^3$)	% Change Relative to Objective	Impact
97	534601	259832	1.5	18.7	10.9	10.8	-0.1	0.0	Negligible
98	535455	259774	1.5	16.1	9.9	9.9	0.0	0.0	Negligible
99	537514	259611	1.5	17.1	10.3	10.1	-0.2	-1.0	Negligible
100	540003	259271	1.5	9.8	6.6	6.6	0.0	0.0	Negligible
101	542165	259006	1.5	15.6	9.2	9.2	0.0	0.0	Negligible
102	542123	258973	1.5	18.1	10.2	10.1	-0.1	0.0	Negligible
103	543706	258321	1.5	12.4	8.3	8.3	0.0	0.0	Negligible
104	543579	258333	1.5	11.8	8.3	8.3	0.0	0.0	Negligible
105	539847	262816	1.5	24.2	11.9	11.8	-0.1	0.0	Negligible
106	544236	261793	1.5	16.4	10.1	10.0	-0.10	0.0	Negligible
107	544567	261642	1.5	12.9	8.4	8.4	0.0	0.0	Negligible
108	544587	261744	1.5	15.2	9.3	9.3	0.0	0.0	Negligible
109	544466	261696	1.5	15.1	9.3	9.3	0.0	0.0	Negligible
110	545425	261911	1.5	16.8	10.4	10.4	0.0	0.0	Negligible
111	545260	258152	1.5	18.3	13.2	12.9	-0.3	-1.0	Negligible
112	545230	258261	1.5	19.9	13.8	13.0	-0.8	-2.0	Negligible
113	544440	258115	1.5	25.0	14.9	14.7	-0.2	-1.0	Negligible
114	545016	258180	1.5	19.4	13.5	13.3	-0.2	-1.0	Negligible
115	545098	258230	1.5	18.9	13.6	13.2	-0.4	-1.0	Negligible
116	544758	258119	1.5	18.8	12.4	12.2	-0.2	-1.0	Negligible
117	544700	258093	1.5	18.8	12.4	12.2	-0.2	-1.0	Negligible
118	544592	258023	1.5	18.9	12.8	12.7	-0.1	0.0	Negligible
119	545418	258266	1.5	21.5	14.0	13.5	-0.5	-1.0	Negligible
120	545420	258375	1.5	28.9	16.9	14.6	-2.3	-6.0	Slight Beneficial
121	545968	256972	1.5	21.7	13.3	12.5	-0.8	-2.0	Negligible

Results rounded to 1.d.p

Table TR2-K-2 - Annual Mean PM_{10} Concentration

Receptor ID	X	Y	Z	Annual Mean PM_{10} Concentrations (µg/m^3)					
				2019 Baseline	2041 Baseline	2041 With Dev	Change (µg/m^3)	% Change Relative to Objective	Impact
1	530921	259216	1.5	17.0	15.9	15.9	0.0	0.0	Negligible
2	531345	259475	1.5	16.4	15.3	15.3	0.0	0.0	Negligible
3	531216	259374	1.5	16.4	15.3	15.2	-0.1	0.0	Negligible
4	531523	260215	1.5	17.6	16.7	16.7	0.0	0.0	Negligible
5	531937	260150	1.5	18.0	17.2	17.2	0.0	0.0	Negligible
6	533440	259753	1.5	17.1	16.0	16.0	0.0	0.0	Negligible
7	533250	258974	1.5	15.6	14.6	14.5	-0.1	0.0	Negligible
8	536687	259709	1.5	16.0	15.0	15.0	0.0	0.0	Negligible
9	535597	259679	1.5	16.6	15.8	15.8	0.0	0.0	Negligible
10	536875	260137	1.5	15.8	14.9	14.9	0.0	0.0	Negligible
11	538253	259497	1.5	17.6	16.8	16.9	0.1	0.0	Negligible
12	539478	259417	1.5	17.0	16.2	16.2	0.0	0.0	Negligible
13	540034	259380	1.5	16.2	15.2	15.2	0.0	0.0	Negligible
14	541139	258950	1.5	17.5	16.5	16.5	0.0	0.0	Negligible
15	541119	258949	1.5	17.0	16.0	16.0	0.0	0.0	Negligible
16	541281	258839	1.5	17.4	16.4	16.4	0.0	0.0	Negligible
17	541950	261177	1.5	18.9	17.8	17.9	0.1	0.0	Negligible
18	542553	261392	1.5	18.2	17.1	17.1	0.0	0.0	Negligible
19	544205	261664	1.5	18.5	17.5	17.5	0.0	0.0	Negligible
20	544312	261894	1.5	18.5	17.4	17.4	0.0	0.0	Negligible
21	545695	262064	1.5	18.1	17.1	17.1	0.0	0.0	Negligible
22	544043	259064	1.5	17.6	15.8	15.8	0.0	0.0	Negligible
23	544004	258302	1.5	15.5	14.3	14.2	-0.1	0.0	Negligible
24	543996	258105	1.5	16.1	14.8	14.8	0.0	0.0	Negligible
25	543981	257876	1.5	16.5	15.1	15.1	0.0	0.0	Negligible
26	543964	257513	1.5	16.3	15.0	15.0	0.0	0.0	Negligible
27	544323	257442	1.5	15.6	14.4	14.4	0.0	0.0	Negligible
28	544545	257851	1.5	16.7	15.4	15.4	0.0	0.0	Negligible
29	544520	257713	4.5	15.9	14.7	14.7	0.0	0.0	Negligible
30	544400	258164	1.5	16.0	14.7	14.7	0.0	0.0	Negligible
31	544393	258927	1.5	16.4	15.0	15.0	0.0	0.0	Negligible
32	544400	257883	1.5	15.7	14.4	14.4	0.0	0.0	Negligible

Receptor ID	X	Y	Z	Annual Mean PM_{10} Concentrations (µg/m^3)					
				2019 Baseline	2041 Baseline	2041 With Dev	Change (µg/m^3)	% Change Relative to Objective	Impact
33	543885	258261	1.5	15.8	14.2	14.3	0.1	0.0	Negligible
34	545116	257582	1.5	17.2	15.9	15.9	0.0	0.0	Negligible
35	545204	257353	1.5	16.5	15.1	15.1	0.0	0.0	Negligible
36	545192	257456	1.5	16.5	15.2	15.2	0.0	0.0	Negligible
37	545176	257651	1.5	17.5	16.2	16.2	0.0	0.0	Negligible
38	545239	257653	1.5	16.8	15.5	15.5	0.0	0.0	Negligible
39	545545	257678	1.5	16.6	15.4	15.3	-0.1	0.0	Negligible
40	545570	257638	1.5	16.4	15.1	15.1	0.0	0.0	Negligible
41	545521	257845	1.5	17.1	15.6	15.6	0.0	0.0	Negligible
42	546062	257974	1.5	17.6	15.7	15.7	0.0	0.0	Negligible
43	546122	257922	4.5	16.4	14.9	14.9	0.0	0.0	Negligible
44	543958	258330	1.5	15.6	14.5	14.4	-0.1	0.0	Negligible
45	543895	258306	1.5	15.5	14.3	14.3	0.0	0.0	Negligible
46	544003	258247	1.5	15.7	14.3	14.2	-0.1	0.0	Negligible
47	543793	258324	1.5	15.5	14.3	14.2	-0.1	0.0	Negligible
48	543900	258501	1.5	15.4	14.2	14.2	0.0	0.0	Negligible
49	543745	258530	1.5	15.4	14.2	14.2	0.0	0.0	Negligible
50	544015	258508	1.5	15.5	14.1	14.1	0.0	0.0	Negligible
51	543990	258634	1.5	15.6	14.4	14.3	-0.1	0.0	Negligible
52	544172	259034	1.5	17.3	15.7	15.7	0.0	0.0	Negligible
53	544410	258962	1.5	17.0	15.4	15.4	0.0	0.0	Negligible
54	544484	259000	1.5	18.1	16.3	16.3	0.0	0.0	Negligible
55	544660	259007	1.5	17.0	15.6	15.6	0.0	0.0	Negligible
56	544852	258815	4.5	15.3	14.0	14.0	0.0	0.0	Negligible
57	545604	257930	1.5	16.5	15.1	15.1	0.0	0.0	Negligible
58	545585	257613	1.5	16.4	15.1	15.1	0.0	0.0	Negligible
59	544278	257456	1.5	15.9	14.7	14.7	0.0	0.0	Negligible
60	542162	259332	1.5	20.5	20.0	20.0	0.0	0.0	Negligible
61	542843	259296	1.5	18.7	17.1	17.0	-0.1	0.0	Negligible
62	543427	259137	1.5	17.2	15.6	15.6	0.0	0.0	Negligible
63	541151	259046	1.5	16.0	14.9	14.9	0.0	0.0	Negligible
64	540443	259447	1.5	17.0	16.3	16.3	0.0	0.0	Negligible
65	540770	259479	1.5	17.7	17.2	17.2	0.0	0.0	Negligible

Receptor ID	X	Y	Z	Annual Mean PM_{10} Concentrations (µg/m^3)					
				2019 Baseline	2041 Baseline	2041 With Dev	Change (µg/m^3)	% Change Relative to Objective	Impact
66	536975	260184	1.5	15.9	15.2	15.1	-0.1	0.0	Negligible
67	537099	259658	1.5	16.3	15.4	15.3	-0.1	0.0	Negligible
68	535957	259668	1.5	16.5	15.6	15.6	0.0	0.0	Negligible
69	536338	259721	1.5	15.9	15.0	15.0	0.0	0.0	Negligible
70	532412	260251	1.5	17.7	17.6	17.5	-0.1	0.0	Negligible
71	532378	260085	1.5	16.5	15.5	15.5	0.0	0.0	Negligible
72	533442	259986	1.5	18.1	18.1	18.0	-0.1	0.0	Negligible
73	533423	259577	1.5	17.0	15.9	15.9	0.0	0.0	Negligible
74	533518	259489	1.5	17.0	16.1	15.9	-0.2	-1.0	Negligible
75	532971	257704	1.5	15.1	13.9	13.8	-0.1	0.0	Negligible
76	537079	258111	1.5	14.7	13.7	13.7	0.0	0.0	Negligible
77	542558	261483	1.5	18.3	17.3	17.3	0.0	0.0	Negligible
78	545026	259376	1.5	16.8	15.3	15.3	0.0	0.0	Negligible
79	544766	259193	1.5	17.3	15.8	15.8	0.0	0.0	Negligible
80	544790	259230	1.5	17.7	15.9	15.9	0.0	0.0	Negligible
81	541022	262111	1.5	17.5	16.4	16.4	0.0	0.0	Negligible
82	541090	261895	1.5	22.0	20.6	20.7	0.1	0.0	Negligible
83	544340	259351	1.5	17.9	16.5	16.5	0.0	0.0	Negligible
84	544344	259382	1.5	19.0	17.4	17.4	0.0	0.0	Negligible
85	544319	259362	1.5	17.6	16.2	16.2	0.0	0.0	Negligible
86	544437	259300	1.5	17.0	15.6	15.5	-0.1	0.0	Negligible
87	535029	258217	1.5	14.7	13.6	13.6	0.0	0.0	Negligible
88	535968	256179	1.5	15.9	14.8	14.8	0.0	0.0	Negligible
89	536307	256140	1.5	16.0	14.9	14.9	0.0	0.0	Negligible
90	537944	256205	1.5	15.9	14.7	14.7	0.0	0.0	Negligible
91	538829	256414	1.5	15.4	14.3	14.3	0.0	0.0	Negligible
92	538756	258549	1.5	15.4	14.3	14.3	0.0	0.0	Negligible
93	530662	258021	1.5	15.6	14.6	14.6	0.0	0.0	Negligible
94	532514	256818	1.5	14.7	13.7	13.6	-0.1	0.0	Negligible
95	543238	257684	1.5	15.9	14.7	14.7	0.0	0.0	Negligible
96	533125	259609	1.5	16.9	15.9	15.9	0.0	0.0	Negligible
97	534601	259832	1.5	18.0	17.3	17.3	0.0	0.0	Negligible
98	535455	259774	1.5	17.2	16.5	16.6	0.1	0.0	Negligible

Receptor ID	X	Y	Z	Annual Mean PM_{10} Concentrations (µg/m^3)					
				2019 Baseline	2041 Baseline	2041 With Dev	Change (µg/m^3)	% Change Relative to Objective	Impact
99	537514	259611	1.5	17.2	16.5	16.5	0.0	0.0	Negligible
100	540003	259271	1.5	15.7	14.6	14.6	0.0	0.0	Negligible
101	542165	259006	1.5	18.1	17.0	17.0	0.0	0.0	Negligible
102	542123	258973	1.5	18.4	17.3	17.3	0.0	0.0	Negligible
103	543706	258321	1.5	15.5	14.2	14.2	0.0	0.0	Negligible
104	543579	258333	1.5	15.4	14.2	14.2	0.0	0.0	Negligible
105	539847	262816	1.5	20.2	19.3	19.4	0.1	0.0	Negligible
106	544236	261793	1.5	18.9	18.0	18.0	0.0	0.0	Negligible
107	544567	261642	1.5	18.2	17.0	17.0	0.0	0.0	Negligible
108	544587	261744	1.5	18.7	17.6	17.6	0.0	0.0	Negligible
109	544466	261696	1.5	18.6	17.5	17.5	0.0	0.0	Negligible
110	545425	261911	1.5	18.6	17.5	17.5	0.0	0.0	Negligible
111	545260	258152	1.5	15.7	14.4	14.4	0.0	0.0	Negligible
112	545230	258261	1.5	15.8	14.6	14.6	0.0	0.0	Negligible
113	544440	258115	1.5	16.7	15.2	15.2	0.0	0.0	Negligible
114	545016	258180	1.5	15.9	14.6	14.6	0.0	0.0	Negligible
115	545098	258230	1.5	15.8	14.5	14.5	0.0	0.0	Negligible
116	544758	258119	1.5	15.6	14.1	14.1	0.0	0.0	Negligible
117	544700	258093	1.5	15.6	14.0	14.0	0.0	0.0	Negligible
118	544592	258023	1.5	15.6	14.2	14.2	0.0	0.0	Negligible
119	545418	258266	1.5	16.0	14.7	14.7	0.0	0.0	Negligible
120	545420	258375	1.5	16.8	15.7	15.7	0.0	0.0	Negligible
121	545968	256972	1.5	16.5	15.4	15.4	0.0	0.0	Negligible

Results rounded to 1.d.p

Table TR2-K-3 - Annual Mean $PM_{2.5}$ Concentration

Receptor ID	X	Y	Z	Annual Mean $PM_{2.5}$ Concentrations (µg/m³)					
				2019 Baseline	2041 Baseline	2041 With Dev	Change (µg/m³)	% Change Relative to Objective	Impact
1	530921	259216	1.5	10.0	9.1	9.0	-0.1	-1.0	Negligible
2	531345	259475	1.5	9.9	9.0	9.0	0.0	0.0	Negligible
3	531216	259374	1.5	9.9	9.0	9.0	0.0	0.0	Negligible
4	531523	260215	1.5	10.2	9.4	9.4	0.0	0.0	Negligible
5	531937	260150	1.5	10.4	9.7	9.7	0.0	0.0	Negligible
6	533440	259753	1.5	10.1	9.2	9.2	0.0	0.0	Negligible
7	533250	258974	1.5	9.4	8.6	8.5	-0.1	-1.0	Negligible
8	536687	259709	1.5	9.9	9.1	9.0	-0.1	-1.0	Negligible
9	535597	259679	1.5	10.1	9.4	9.3	-0.1	-1.0	Negligible
10	536875	260137	1.5	9.6	8.9	8.9	0.0	0.0	Negligible
11	538253	259497	1.5	10.5	9.8	9.8	0.0	0.0	Negligible
12	539478	259417	1.5	10.3	9.6	9.6	0.0	0.0	Negligible
13	540034	259380	1.5	10.0	9.1	9.1	0.0	0.0	Negligible
14	541139	258950	1.5	10.7	9.8	9.8	0.0	0.0	Negligible
15	541119	258949	1.5	10.4	9.5	9.5	0.0	0.0	Negligible
16	541281	258839	1.5	10.6	9.8	9.7	-0.1	-1.0	Negligible
17	541950	261177	1.5	11.5	10.6	10.6	0.0	0.0	Negligible
18	542553	261392	1.5	11.3	10.4	10.4	0.0	0.0	Negligible
19	544205	261664	1.5	11.5	10.6	10.6	0.0	0.0	Negligible
20	544312	261894	1.5	11.5	10.6	10.6	0.0	0.0	Negligible
21	545695	262064	1.5	10.9	10.1	10.1	0.0	0.0	Negligible
22	544043	259064	1.5	11.4	10.1	10.1	0.0	0.0	Negligible
23	544004	258302	1.5	10.1	9.1	9.0	-0.1	-1.0	Negligible
24	543996	258105	1.5	10.1	9.1	9.1	0.0	0.0	Negligible
25	543981	257876	1.5	10.3	9.3	9.3	0.0	0.0	Negligible
26	543964	257513	1.5	10.2	9.2	9.2	0.0	0.0	Negligible
27	544323	257442	1.5	10.1	9.1	9.1	0.0	0.0	Negligible
28	544545	257851	1.5	10.7	9.7	9.7	0.0	0.0	Negligible
29	544520	257713	4.5	10.3	9.3	9.3	0.0	0.0	Negligible
30	544400	258164	1.5	10.4	9.3	9.3	0.0	0.0	Negligible
31	544393	258927	1.5	10.6	9.5	9.5	0.0	0.0	Negligible
32	544400	257883	1.5	10.2	9.1	9.1	0.0	0.0	Negligible

Receptor ID	X	Y	Z	Annual Mean $PM_{2.5}$ Concentrations (µg/m³)					
				2019 Baseline	2041 Baseline	2041 With Dev	Change (µg/m³)	% Change Relative to Objective	Impact
33	543885	258261	1.5	10.0	8.8	8.8	0.0	0.0	Negligible
34	545116	257582	1.5	11.2	10.1	10.1	0.0	0.0	Negligible
35	545204	257353	1.5	10.7	9.6	9.6	0.0	0.0	Negligible
36	545192	257456	1.5	10.7	9.7	9.7	0.0	0.0	Negligible
37	545176	257651	1.5	11.3	10.3	10.3	0.0	0.0	Negligible
38	545239	257653	1.5	10.9	9.8	9.8	0.0	0.0	Negligible
39	545545	257678	1.5	10.8	9.8	9.8	0.0	0.0	Negligible
40	545570	257638	1.5	10.7	9.6	9.6	0.0	0.0	Negligible
41	545521	257845	1.5	11.1	9.9	9.9	0.0	0.0	Negligible
42	546062	257974	1.5	11.6	10.2	10.2	0.0	0.0	Negligible
43	546122	257922	4.5	10.9	9.8	9.7	-0.1	-1.0	Negligible
44	543958	258330	1.5	9.9	8.9	8.9	0.0	0.0	Negligible
45	543895	258306	1.5	9.8	8.8	8.8	0.0	0.0	Negligible
46	544003	258247	1.5	10.1	9.1	9.0	-0.1	-1.0	Negligible
47	543793	258324	1.5	9.8	8.8	8.8	0.0	0.0	Negligible
48	543900	258501	1.5	9.7	8.8	8.8	0.0	0.0	Negligible
49	543745	258530	1.5	9.7	8.8	8.8	0.0	0.0	Negligible
50	544015	258508	1.5	10.0	9.0	9.0	0.0	0.0	Negligible
51	543990	258634	1.5	9.9	8.9	8.9	0.0	0.0	Negligible
52	544172	259034	1.5	11.3	10.0	10.0	0.0	0.0	Negligible
53	544410	258962	1.5	11.0	9.7	9.7	0.0	0.0	Negligible
54	544484	259000	1.5	11.7	10.4	10.4	0.0	0.0	Negligible
55	544660	259007	1.5	11.1	10.0	10.0	0.0	0.0	Negligible
56	544852	258815	4.5	9.9	9.0	8.9	-0.1	-1.0	Negligible
57	545604	257930	1.5	10.7	9.7	9.6	-0.1	-1.0	Negligible
58	545585	257613	1.5	10.7	9.6	9.6	0.0	0.0	Negligible
59	544278	257456	1.5	10.3	9.3	9.3	0.0	0.0	Negligible
60	542162	259332	1.5	12.7	12.0	12.0	0.0	0.0	Negligible
61	542843	259296	1.5	11.5	10.3	10.3	0.0	0.0	Negligible
62	543427	259137	1.5	10.8	9.6	9.6	0.0	0.0	Negligible
63	541151	259046	1.5	9.9	9.0	9.0	0.0	0.0	Negligible
64	540443	259447	1.5	10.5	9.8	9.8	0.0	0.0	Negligible
65	540770	259479	1.5	10.9	10.3	10.3	0.0	0.0	Negligible

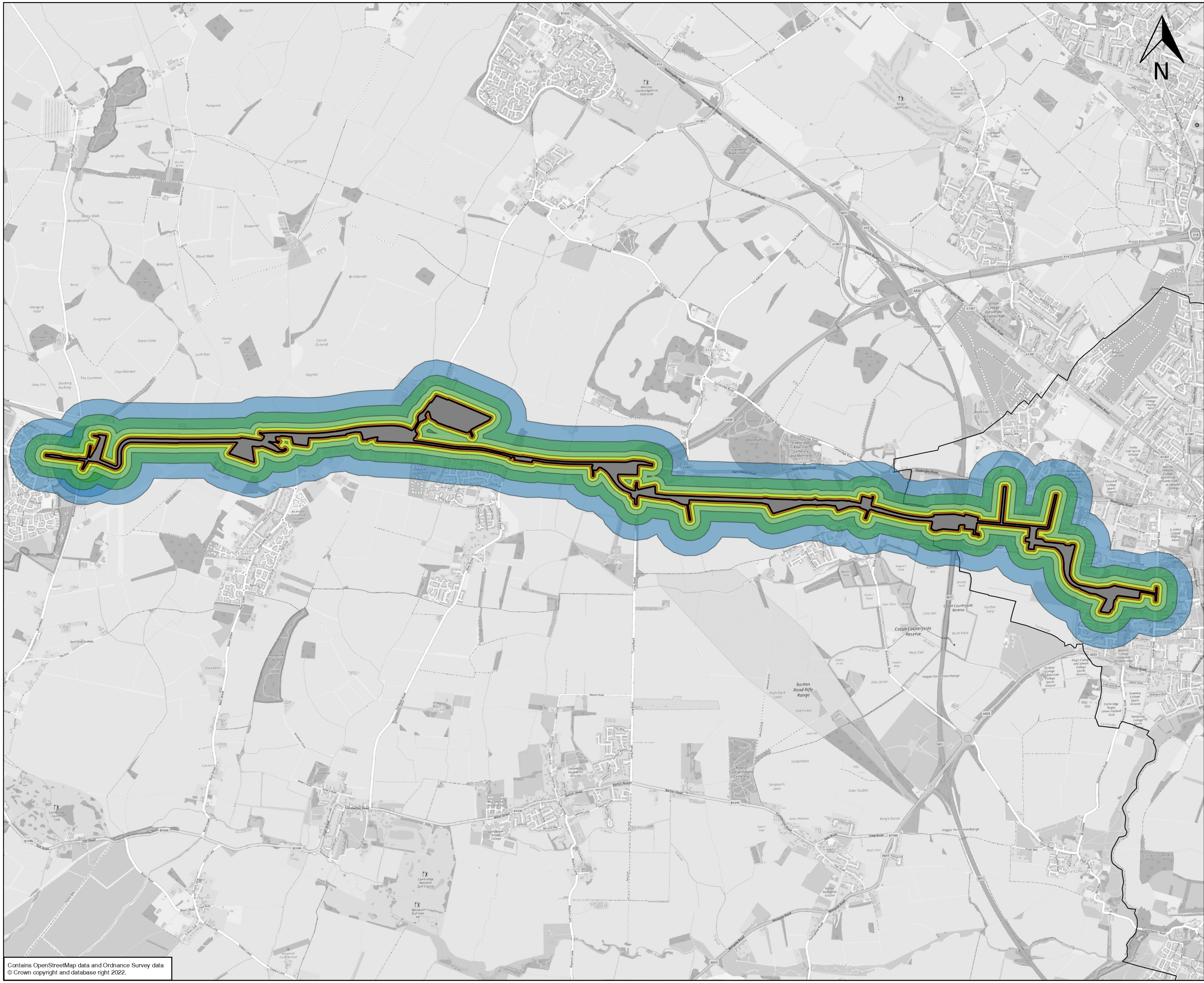
Receptor ID	X	Y	Z	Annual Mean $PM_{2.5}$ Concentrations (µg/m^3)					
				2019 Baseline	2041 Baseline	2041 With Dev	Change (µg/m^3)	% Change Relative to Objective	Impact
66	536975	260184	1.5	9.7	9.0	9.0	0.0	0.0	Negligible
67	537099	259658	1.5	10.1	9.3	9.3	0.0	0.0	Negligible
68	535957	259668	1.5	10.0	9.2	9.2	0.0	0.0	Negligible
69	536338	259721	1.5	9.8	9.0	9.0	0.0	0.0	Negligible
70	532412	260251	1.5	10.7	10.3	10.3	0.0	0.0	Negligible
71	532378	260085	1.5	9.9	9.1	9.1	0.0	0.0	Negligible
72	533442	259986	1.5	10.8	10.4	10.4	0.0	0.0	Negligible
73	533423	259577	1.5	10.0	9.1	9.1	0.0	0.0	Negligible
74	533518	259489	1.5	10.1	9.3	9.2	-0.1	-1.0	Negligible
75	532971	257704	1.5	9.3	8.4	8.4	0.0	0.0	Negligible
76	537079	258111	1.5	9.3	8.4	8.4	0.0	0.0	Negligible
77	542558	261483	1.5	11.4	10.5	10.5	0.0	0.0	Negligible
78	545026	259376	1.5	11.1	9.9	9.9	0.0	0.0	Negligible
79	544766	259193	1.5	11.3	10.1	10.1	0.0	0.0	Negligible
80	544790	259230	1.5	11.5	10.2	10.2	0.0	0.0	Negligible
81	541022	262111	1.5	10.7	9.7	9.7	0.0	0.0	Negligible
82	541090	261895	1.5	13.2	12.1	12.1	0.0	0.0	Negligible
83	544340	259351	1.5	11.6	10.5	10.5	0.0	0.0	Negligible
84	544344	259382	1.5	12.3	11.0	11.0	0.0	0.0	Negligible
85	544319	259362	1.5	11.5	10.3	10.3	0.0	0.0	Negligible
86	544437	259300	1.5	11.1	10.0	10.0	0.0	0.0	Negligible
87	535029	258217	1.5	9.3	8.4	8.4	0.0	0.0	Negligible
88	535968	256179	1.5	9.6	8.7	8.7	0.0	0.0	Negligible
89	536307	256140	1.5	9.6	8.7	8.7	0.0	0.0	Negligible
90	537944	256205	1.5	9.7	8.7	8.7	0.0	0.0	Negligible
91	538829	256414	1.5	9.7	8.8	8.8	0.0	0.0	Negligible
92	538756	258549	1.5	9.4	8.5	8.5	0.0	0.0	Negligible
93	530662	258021	1.5	9.5	8.6	8.6	0.0	0.0	Negligible
94	532514	256818	1.5	9.3	8.5	8.4	-0.1	-1.0	Negligible
95	543238	257684	1.5	10.0	9.1	9.1	0.0	0.0	Negligible
96	533125	259609	1.5	10.0	9.1	9.1	0.0	0.0	Negligible
97	534601	259832	1.5	10.8	10.1	10.1	0.0	0.0	Negligible
98	535455	259774	1.5	10.5	9.8	9.8	0.0	0.0	Negligible

Receptor ID	X	Y	Z	Annual Mean $PM_{2.5}$ Concentrations (µg/m^3)					
				2019 Baseline	2041 Baseline	2041 With Dev	Change (µg/m^3)	% Change Relative to Objective	Impact
99	537514	259611	1.5	10.7	10.0	10.0	0.0	0.0	Negligible
100	540003	259271	1.5	9.7	8.8	8.8	0.0	0.0	Negligible
101	542165	259006	1.5	11.2	10.3	10.3	0.0	0.0	Negligible
102	542123	258973	1.5	11.1	10.1	10.2	0.1	1.0	Negligible
103	543706	258321	1.5	9.8	8.8	8.8	0.0	0.0	Negligible
104	543579	258333	1.5	9.7	8.8	8.8	0.0	0.0	Negligible
105	539847	262816	1.5	12.0	11.2	11.2	0.0	0.0	Negligible
106	544236	261793	1.5	11.7	10.9	10.9	0.0	0.0	Negligible
107	544567	261642	1.5	11.3	10.4	10.4	0.0	0.0	Negligible
108	544587	261744	1.5	11.6	10.7	10.7	0.0	0.0	Negligible
109	544466	261696	1.5	11.5	10.6	10.6	0.0	0.0	Negligible
110	545425	261911	1.5	11.8	10.9	10.9	0.0	0.0	Negligible
111	545260	258152	1.5	10.3	9.3	9.3	0.0	0.0	Negligible
112	545230	258261	1.5	10.4	9.4	9.4	0.0	0.0	Negligible
113	544440	258115	1.5	10.8	9.6	9.6	0.0	0.0	Negligible
114	545016	258180	1.5	10.5	9.4	9.4	0.0	0.0	Negligible
115	545098	258230	1.5	10.4	9.4	9.4	0.0	0.0	Negligible
116	544758	258119	1.5	10.1	9.0	9.0	0.0	0.0	Negligible
117	544700	258093	1.5	10.1	8.9	8.9	0.0	0.0	Negligible
118	544592	258023	1.5	10.1	9.1	9.1	0.0	0.0	Negligible
119	545418	258266	1.5	10.5	9.5	9.5	0.0	0.0	Negligible
120	545420	258375	1.5	11.0	10.0	10.0	0.0	0.0	Negligible
121	545968	256972	1.5	10.7	9.8	9.7	-0.1	-1.0	Negligible

Results rounded to 1.d.p

Appendix L

FIGURES



KEY

N

- Redline boundary
- 20m Buffer
- 50m Buffer
- 100m Buffer
- 200m Buffer
- 350m Buffer

0 0.5 1 km

wsp

Client:

Cambridge County Council

Project:

Cambourne to Cambridge

Title:

Figure 1: Construction Dust Assessment

Figure:	Drawn: LKA
Date: 26/01/2023	Checked: CC
Scale: 1:33,000	Approved: BTJ

File Location: \\uk.wspgroup.com\Central Data\Projects\70086xxx\70086660 - C2C TWAO Stage\03 WIP\Air Quality\11 Report\Figures\C2C_Figure 1.qgz

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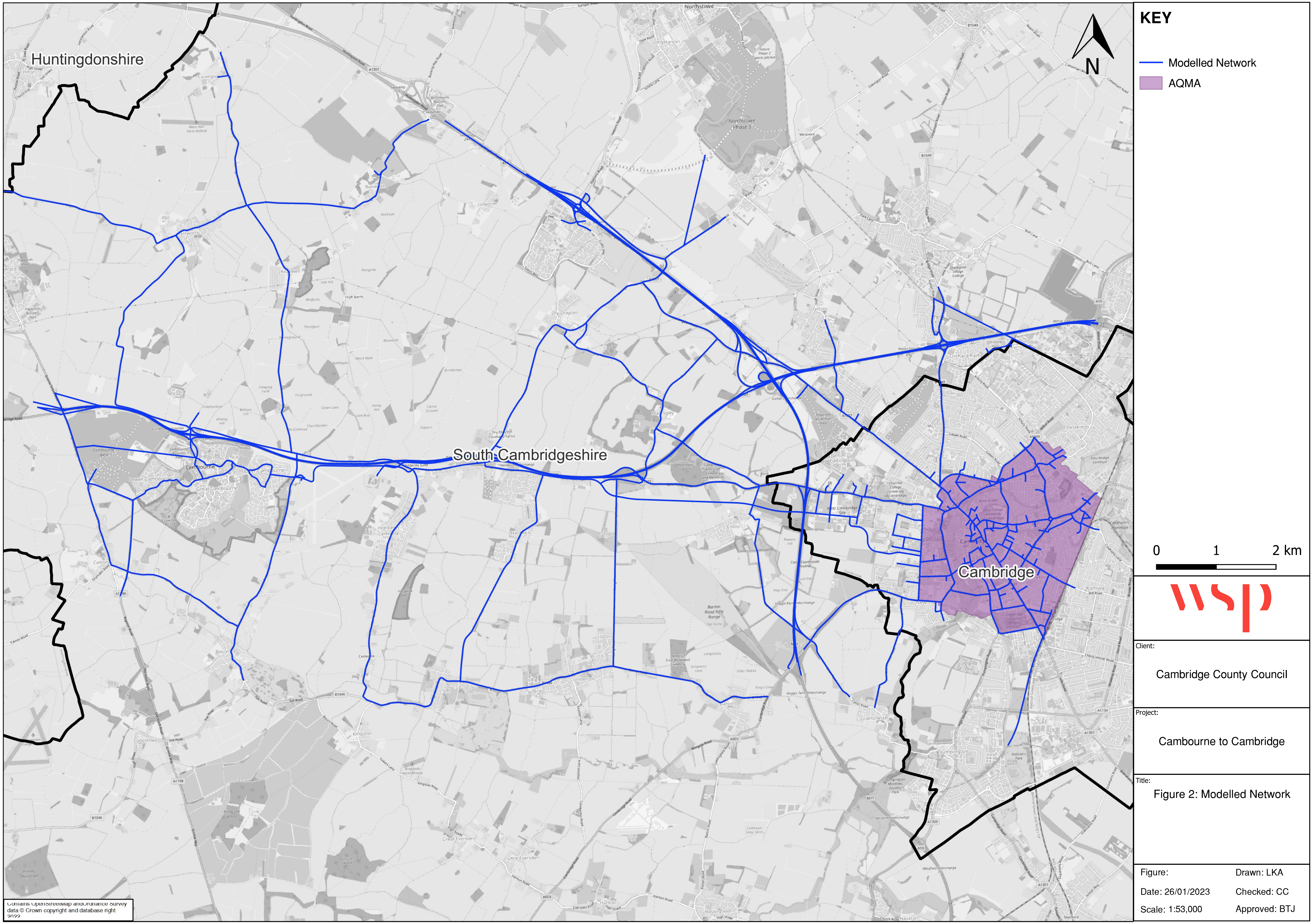


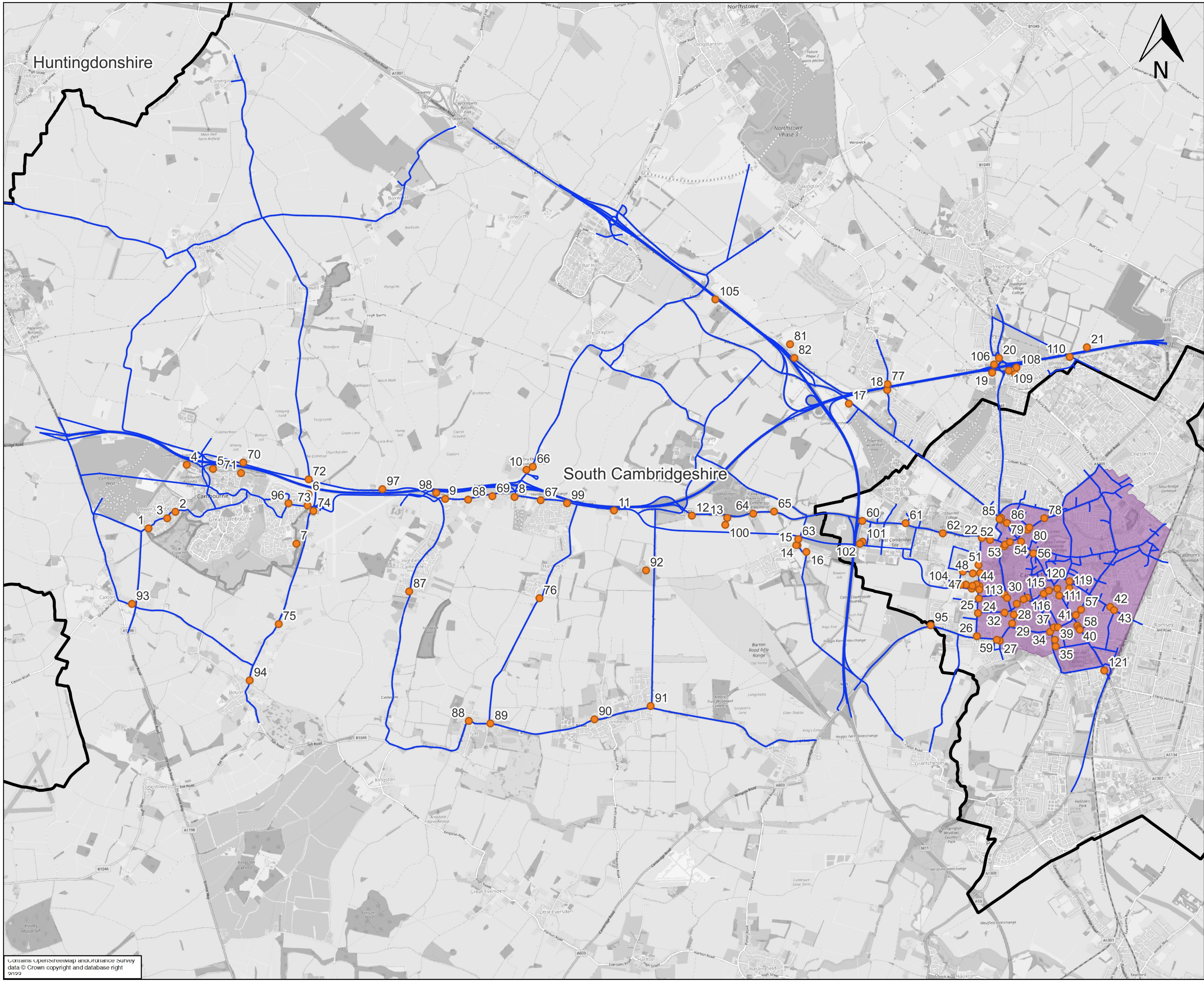
Client:
Cambridge County Council

Project:
Cambourne to Cambridge

Title:
Figure 2: Modelled Network

Figure:
Date: 26/01/2023
Scale: 1:53,000
Drawn: LKA
Checked: CC
Approved: BTJ

Created by: UKNXC028 File Location: \\uk.wspgroup.com\Central Data\Projects\70086xxx\70086660 - C2C TWAO Stage\03 WIP\Air Quality\11 Report\Figures\C2C_Figure 2.qgz



KEY

- Modelled Receptor
- Modelled Network
- AQMA

0 1 2 km

wsp

Client:

Cambridge County Council

Project:

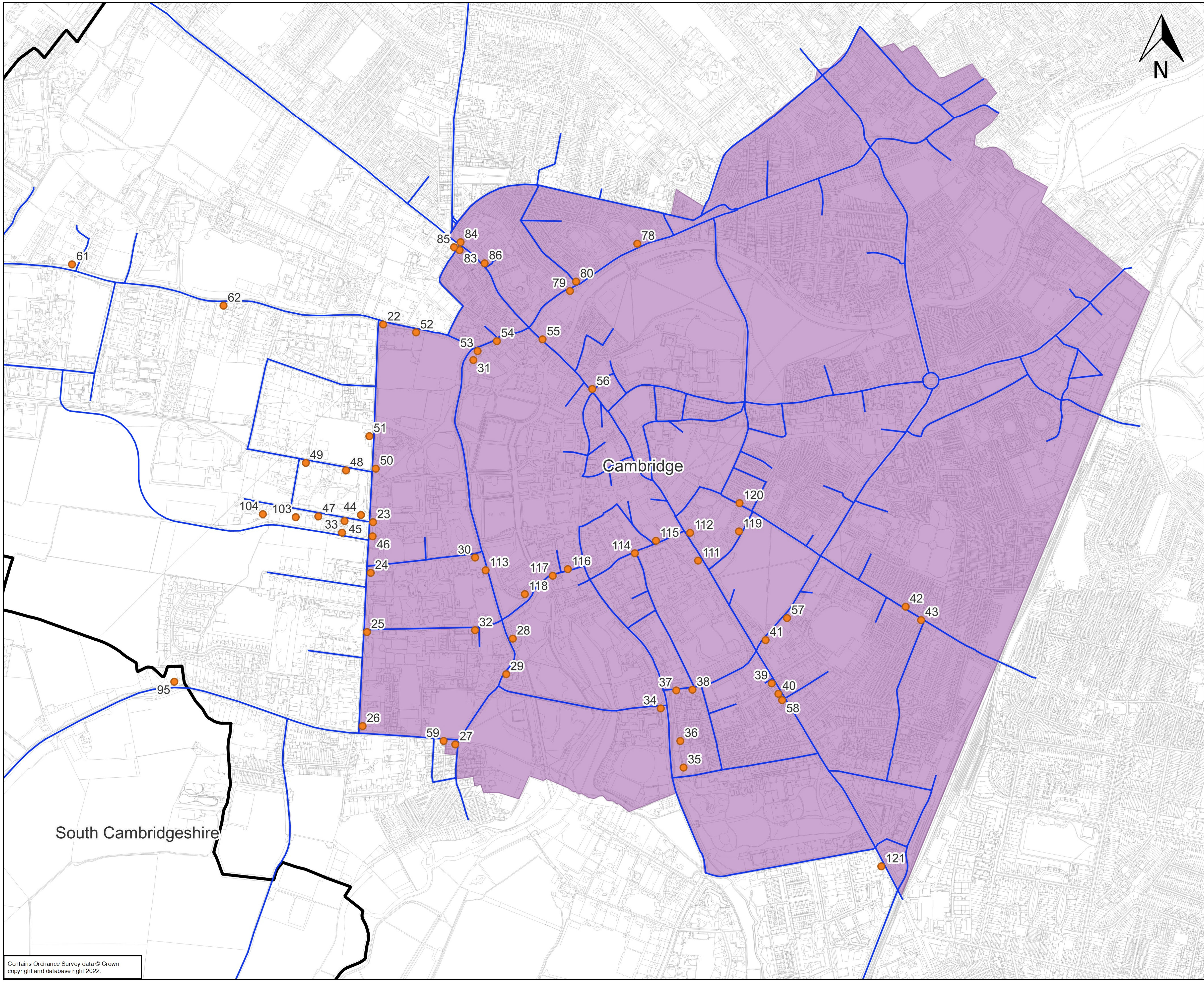
Cambourne to Cambridge

Title:

Figure 3: Modelled Receptor Locations

Figure:	Drawn: LKA
Date: 26/01/2023	Checked: CC
Scale: 1:53,000	Approved: BTJ

Created by: UKNXC028 File Location: \\uk.wspgroup.com\Central Data\Projects\70086xxx\70086660 - C2C TWAO Stage\03 WIP\Air Quality\11 Report\Figures\C2C_Figure 2.qgz



KEY

- Modelled Receptor
- Modelled Network
- AQMA

0 200 400 m

wsp

Client:

Cambridge County Council

Project:

Cambourne to Cambridge

Title:

Figure 4: Modelled Receptor Locations - Cambridge City Central

Figure:	Drawn: LKA
Date: 26/01/2023	Checked: CC
Scale: 1:13,000	Approved: BTJ

Created by: UKNXC028 File Location: \\uk.wspgroup.com\Central Data\Projects\70086xxx\70086660 - C2C TWAO Stage\03 WIP\Air Quality\11 Report\Figures\C2C_Figure 2.qgz

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