Greater Manchester's Clean Air Plan to Tackle Nitrogen Dioxide Exceedances at the Roadside

Appendix 6 – Air Quality Modelling Report following Consultation and with COVID-19 impacts

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Version Status:	APPROVED	**Prepared by:**	Transport for Greater Manchester on behalf of the 10 Local Authorities of Greater Manchester
Date:	20th June 2021		

This document is **not** a formal submission, but a draft and unfinished document, prepared ahead of the consultation and submitted so that JAQU can have sight of Greater Manchester's approach to the components that will make up the Full Business Case and provide feedback as work on the measure progresses.

The document and the work within it will therefore be subject to change. Furthermore, once the document is finished it will be subject to formal approval and governance by all 10 Greater Manchester authorities before it can constitute the final formal submission.

Contents

1 Executive Summary

1.1 The Secretary of State has instructed many local authorities across the UK to take quick action to reduce harmful nitrogen dioxide (NO2) levels, and has issued a direction under the Environment Act 1995 to many local authorities undertake feasibility studies to identify measures for reducing NO2 concentrations to within legal limit values in the "shortest possible time". In Greater Manchester (GM) this is being delivered via the Greater Manchester Clean Air Plan.

1.2 GM has been directed by the Government to introduce a charging Clean Air Zone (CAZ) Class C across the region. Certain vehicle types will pay a daily charge for driving inside the zone if they do not comply with emissions standards in the Government's CAZ Framework. Non-compliant vehicles that will be charged are: Buses, Coaches, Minibuses, Hackney Carriages and PHVs (Private Hire Vehicles), HGVs (Heavy Goods Vehicles) and LGVs (Light Goods Vehicles).

1.3 GM has been working to develop the detail of the GM CAZ and associated package of supporting funds, discounts and exemptions for impacted vehicle owners. Following the consultation in late 2020 GM has developed a Post-Consultation Package, which incorporates a Class C CAZ proposed to open in May 2022. This modelling report is based on the Clean Air Plan Policy[1] following consultation, which takes account of the consultation from 2020, and also the impacts of COVID-19 on GM and the CAP.

1.4 Throughout this process GM has used best practice methodology and assumptions to understand the effects of the measures, which have been reviewed and approved by the Joint Air Quality Unit (JAQU) and their Technical Independent Review Panel (TIRP). GM has continued to work closely with Government, including most recently updates to incorporate the impacts of Covid-19 to the Clean Air Plan in accordance with national guidance. GM's proposed approach to updating the modelling was approved by JAQU on 4th May 2021[2]. Updates include a representation of Covid-19 impacts on vehicle fleet and also local investment in electric buses.

1.5 The updated modelling predicts there to be exceedances in all districts with the exception of Oldham and Wigan in the Do Minimum scenarios for 2023. By 2025, exceedances are only predicted in Manchester, Salford, and Bury, which is consistent with the Consultation modelling scenarios. Modelling has not yet been updated for the pre-2023 scenario, but it is expected that all GM authorities would be in exceedance in 2022 without the CAP.

1.6 For the Post-Consultation Package, in 2023 when the GM CAP is fully opened with all measures in place, the proposed scheme is predicted to reduce the number of exceedances from 71 down to 5. These are located at:

[1] Supplied as Appendix 1 to the 25th June 2021 GMCA report 'Greater Manchester Clean Air Plan'
[2] See Appendix C

- A34 John Dalton St & Bridge St, Manchester (2 exceedances);
- A58 Bolton Road, Bury (2 exceedances); and
- A57 Regent Road, Salford (1 exceedance).

1.7 However, by 2024 with an extra year of natural fleet turnover, the associated additional improvement to vehicle emissions means that there are no exceedances predicted in GM as a result of the reduction in vehicle emissions produced by the GM CAP.

1.8 Therefore, 2024 is the first year of compliance with the legal limits for nitrogen dioxide within Greater Manchester. This is the same as produced by the Consultation Option, and meets the requirements of the Ministerial Direction for such compliance to be achieved by 2024 at the latest. Compliance is achieved three years earlier than predicted without the GM CAP in place. Achieving compliance in Greater Manchester is not possible sooner with the other options that have been suggested.

1.9 Note that a category C CAZ does not apply charges to M1 (or M1 Special Purpose) group of vehicles with a body-type of 'motorcaravan'. However, there is a lack of parity between this classification of vehicle and vehicles with a body type of 'motorcaravan[1]' that have a vehicle type approval of N1 or N2, which are currently liable for a charge under the GM CAZ scheme. To ensure the principle of parity of treatment of all vehicles with body type of 'motorcaravan' it is recommended therefore that that a consultation is held on the inclusion of motorhomes classified as M1 Special Purpose in the GM Clean Air Zone.

2 Introduction

2.1 Purpose of this Report

2.1.1 This report sets out the results of modelling carried out in May 2021 to forecast air quality in Greater Manchester (GM) in future years, taking into account the impacts of Covid-19, new investment in buses, and reflecting the revised GM Clean Air Plan (CAP) Policy post-consultation.

2.1.2 The report documents changes that have been made to the modelling methodology to reflect the impacts of the Covid-19 pandemic on factors that influence air quality, and other changes that have been made to reflect the newest evidence on investment in ultra low emission buses, as well as any other methodological changes that have been made to the 'Do Minimum' modelling methodology.

2.1.3 The report sets out how the GM CAP Policy following consultation has been represented in the modelling suite, and any relevant methodological changes to the 'Do Something' modelling methodology.

2.1.4 Finally, the report sets out the results of the Do Minimum and Do Something modelling, in other words, the forecast air quality with and without the GM CAP. To date, the modelling has been conducted for 2023 and 2025, with results interpolated for 2024.

2.2 Background to the GM CAP

2.2.1 The Secretary of State has instructed many local authorities across the UK to take quick action to reduce harmful Nitrogen Dioxide (NO_2) levels, issuing a direction under the Environment Act 1995 to many local authorities to undertake feasibility studies to identify measures for reducing NO_2 concentrations to within legal limit values in the "shortest possible time". In Greater Manchester, the 10 local authorities, the Greater Manchester Combined Authority (GMCA) and Transport for Greater Manchester (TfGM), collectively referred to as "Greater Manchester" or "GM", have worked together to develop a Clean Air Plan to tackle NO_2 Exceedances at the Roadside, referred to as the "GM CAP", in response to such a direction.

2.2.2 The core goal of the GM Clean Air Plan is to eliminate concentrations of NO_2 at locations within Greater Manchester identified through the target determination process that exceed the legal Limit Value (40 µg/m^3) in the "shortest possible time" in line with Government guidance.

2.2.3 GM has been directed by the Government to implement the local plan for NO_2 compliance, that includes a charging Clean Air Zone (CAZ) Class C across the region and certain additional measures. Certain vehicle types will pay a daily charge for driving inside such a zone if they do not comply with emissions standards in the Government's CAZ Framework[3]. Non-compliant vehicles that will be charged are: Buses, Coaches, Minibuses, Hackney

[3] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/863730/clean-air-zone-framework-feb2020.pdf

Carriages and PHVs (Private Hire Vehicles), HGVs (Heavy Goods Vehicles) and LGVs (Light Goods Vehicles).

2.2.4 A category C CAZ does not apply charges to M1 (or M1 Special Purpose) group of vehicles with a body-type of 'motorcaravan'. However, there is a lack of parity between this classification of vehicle and vehicles with a body type of 'motorcaravan[1]' that have a vehicle type approval of N1 or N2, which are currently liable for a charge under the GM CAZ scheme. To ensure the principle of parity of treatment of all vehicles with body type of 'motorcaravan' it is recommended, therefore, that that a consultation is held on the inclusion of motorhomes classified as M1 Special Purpose in the GM Clean Air Zone.

2.3 GM CAP Policy following consultation

2.3.1 This modelling report is based on the GM CAP Policy following consultation[4], which takes account of the consultation in late 2020, and also the impacts of Covid-19 on GM and the GM CAP.

2.3.2 The anticipated implementation date of the Category C Charging Clean Air Zone is Monday 30th May 2022, with LGVs, minibuses, coaches and GM-licensed hackney carriages and private hire vehicles proposed to be eligible for a temporary exemption from charges to 31st May 2023.

2.3.3 The boundary will cover the whole of Greater Manchester[5], excluding the strategic Road Network (SRN) which is managed by Highways England. The daily charges remain the same as proposed at consultation.

2.3.4 The support funds have changed in many cases from those within the policy for consultation. Feedback from the consultation and the impact of Covid-19 on GM has been used to better understand the requirements of those businesses, individuals and organisations who most need the support to upgrade. As a result, the proposed funding offered per vehicle has been increased for private hire vehicles, coaches, HGVs and larger vans whilst remaining the same for other vehicle types. There are also more options for replacement and retrofit for hackney carriages, PHVs, minibuses and vans.

[4] Supplied as Appendix 1 to the June 2021 GMCA report 'Greater Manchester Clean Air Plan'
[5] It is now proposed to include, in addition to the roads consulted on, the A575 and A580 at Worsley and a further consultation is proposed to take place on that.

3 Methodology

3.1 Overview of the modelling process

3.1.1 The GM CAP is underpinned by an evidence base derived from data collection, research, analysis and modelling. The results of that analysis were summarised in the report 'Data, Evidence and Modelling: Consultation Summary Report', and set out in detail in a series of Technical Reports and Technical Notes. All published materials can be found at https://cleanairgm.com/technical-documents.

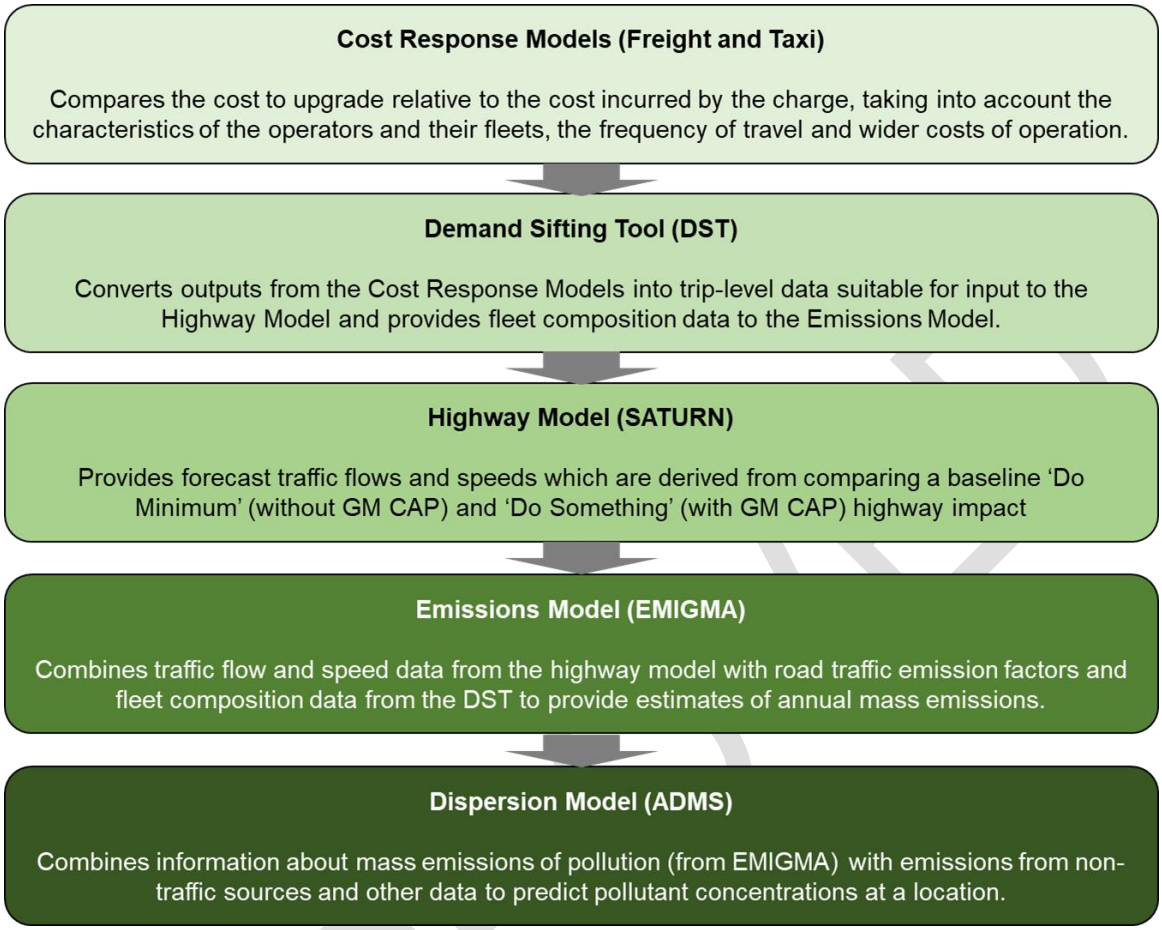
3.1.2 This section sets out a brief overview of the modelling approach followed to assess the air quality impacts of the GM CAP proposal. It sets out how the modelling approach has been updated to reflect the impacts of Covid-19 in line with JAQU guidance and changes to the GM CAP Policy following public consultation.

3.1.3 The purpose of the modelling process is to quantify the impact of traffic by vehicle type on emissions and consequently on concentrations of NO_2 at the roadside in GM.

3.1.4 The modelling process provides a forecast of NO_2 concentrations in the baseline, if no action is taken, and then allows GM to test the impact of different policies and proposals on vehicle fleets, traffic and emissions. Using these modelling tools, GM forecasts NOx emissions and NO_2 concentrations under a range of scenarios for years 2023 and 2025. NO_2 concentrations for interim years and beyond 2025 are interpolated from the results in modelled years. Further modelling will be carried out to assess NOx emissions and NO_2 concentrations for 2022, the opening year of the CAZ; this has not yet been completed.

3.1.5 A brief summary of the modelling input steps feeding into the appraisal is presented in **Figure 3-1**, which shows each of the modelling components and their linkages within the modelling suite. For a full description of the modelling methodology, please see the Technical Reports T1-4 and AQ1-3 (Option for Consultation); these reports will be updated to support the Full Business Case.

Figure 3-1 Overview of the Modelling Process



3.2 Changes to the modelling approach between OBC and consultation

3.2.1 Since the submission of the OBC, the modelling process has been refined to reflect an improved evidence base and collaboration with Government and stakeholders. As a result, there were several modelling updates which have impacted both the 'Do Minimum' and 'Do Something modelling scenarios which formed the Option for Consultation. Technical Note 24 sets out the updated approach to modelling the 'Do Minimum' scenario, whilst the various improvements that have been made to the 'Do Something' scenario are set out in Technical Note 29 and T4: Local Plan Transport Model Forecasting Report - Consultation Option January 2020.

3.3 Reflecting the delayed launch date

3.3.1 Due to the Covid-19 pandemic, the anticipated launch date of the CAZ has been delayed from 2021 to 2022. Within the modelling suite, the years 2021, 2023 and 2025 can be directly modelled, with interim years estimated via an interpolation process. GM has agreed an approach to representing the 2022 launch date with JAQU[6] and this report presents results from the 2023 and 2025 models only, with interpolated results for 2024.

[6] For details of GM's proposed methodology, see Appendix D and for JAQU's letter of approval see Appendix C to this report.

3.4 Reflecting the impacts of the Covid-19 pandemic in the modelling approach

3.4.1 To understand the wider impacts of COVID-19 the GM CAP team have undertaken an assessment of the possible impacts of COVID-19 to inform a number of technical briefing note for decision makers. The results of this assessment are set out in an Impacts of Covid-19 Report[7].

3.4.2 GM have been in regular liaison with JAQU's technical team to agree methodology, seek guidance and inputs and share early results emerging from the pandemic throughout 2020 and 2021. JAQU supplied written guidance, set out in **Table 3-1**, to inform local authorities how to consider Covid-19 impacts, what sensitivity testing they would like local authorities to carry out and how to consider Covid-19 within economic appraisal and distributional impact assessments. This has been reflected within GM's work programme.

3.4.3 JAQU has approved GM's methodology to assess Covid-19 impacts and reflect those impacts within the modelling and analysis process.

3.4.4 There remains considerable uncertainty with regards to the potential impacts of COVID-19 on travel patterns and services. However, it is already clear that, as a result of the pandemic, vehicle owners will not be starting from the same position as had been previously assumed in terms of their fleets.

3.4.5 Capital investment in replacement vehicles has been delayed and as a result the fleet on GM's roads is older and more non-compliant than would otherwise have been the case, worsening emissions. In particular, the car and taxi fleets are estimated to be up to a year older as a result of the pandemic, and these lost upgrades are not expected to be recovered by 2025. LGV upgrades have also been delayed, but the current sales trajectory suggests that much of this delay will have been recovered by 2025.

3.4.6 As a result, the modelling has been updated to reflect an older and more non-compliant fleet of cars, taxis and LGVs in the 'Do Minimum' and 'Do Something' scenarios.

3.4.7 A change has been applied to the cost modelling process such that those non-compliant LGVs and taxis - hackney carriage and PHV - that would have upgraded to a compliant vehicle without the pandemic but have not done so are assumed not to upgrade as a result of the GM CAP.

3.4.8 Overall, the delay to fleet upgrades has the effect of worsening emissions from those vehicle fleets and brings more taxis and LGVs in scope for charging than previously assumed. Sensitivity testing identified the age of the fleet as the most impactful factor, so by incorporating changes within the

[7] Supplied as Appendix 5 to the June 2021 GMCA report 'Greater Manchester Clean Air Plan'

core scenario at this stage GM is less sensitive to the impacts of the pandemic.

3.4.9 In terms of the vehicles in scope for the scheme, bus and commercial vehicle traffic has largely returned to pre-pandemic levels (taxi and coach travel remain suppressed). Therefore, it is reasonable to assume that the prior assumptions about traffic volumes for these vehicle types remain valid.

3.4.10 Uncertainty remains around car traffic. Although there is some evidence that, for example, commuter traffic may not return to pre-pandemic levels, GM has taken the conservative approach of assuming that car traffic volumes remain as previously forecast. This is in line with JAQU guidance. Sensitivity testing carried out at OBC suggested that GM was not highly sensitive to small changes in car traffic; further sensitivity testing will be carried out at FBC.

3.4.11 Any other possible impacts of the pandemic that have been identified by GM as plausible and potentially impactful will be considered via sensitivity testing, reflecting JAQU's guidance and continued uncertainty as to the longer-term impacts of the pandemic.

Table 3-1: Covid-19 related JAQU guidance and GM's response

Date received	JAQU guidance	GM response (all approved by JAQU)
26/05/2020	Requesting sensitivity testing of the 'with measures' scenarios wherein the natural fleet turnover is 'paused' at the level of the previous year; and a second sensitivity test applying a 0% upgrade in response to a CAZ scenario.	GM has conducted sensitivity testing of the impact of a one-year-older fleet. GM agreed with JAQU that a 0% upgrade response test would not be informative in the GM CAP context, as it would be essentially a near Do Minimum position. Instead, GM has conducted a number of sensitivity tests of the assumed behavioural responses. The results of these tests are summarised in the Report: Impacts of Covid-19 on the GM CAP
17/07/2020	Guidance on considering the possible effect of Covid-19 on the economic analysis of the plan, including the value for money assessment, distributional impact and the development of Clean Air Fund bids.	GM has undertaken sensitivity testing of the possible effects of Covid-19 on the value for money assessment, based on a methodology as agreed with JAQU. GM has also carried out a review of the distributional impacts assessment and produced supporting analysis of the impact of the pandemic on each vehicle type in scope for charging under the proposed GM CAZ C.
22/02/2021	Ministerial guidance on the approach to be taken by local authorities in representing the impacts of Covid-19 on their Clean Air Plans (see **Appendix A**). This guidance sets out a Red/Amber/Green (RAG) rating determining whether local authorities are able to apply the results of sensitivity testing of a given factor within their central scenario i.e. whether Covid-related changes to assumptions can be incorporated within the core modelling scenario, or whether they should be considered as sensitivity tests.	GM has conducted a review of the JAQU guidance and considered an approach to revising the modelling methodology in accordance with this guidance and reflecting both (i) sensitivity testing determining which factors could impact the GM CAP and (ii) locally collected evidence on the extent to which these impacts are being realised as a result of the pandemic. GM's approach to revising the local modelling methodology to represent the impacts of Covid-19 is set out in this note, alongside a supporting discussion of the impact of Covid-19 on uncertainty and how this will be reflected within the core scenario and sensitivity testing. (See **Appendix A, Annex 1** for description of RAG rating)

3.5 Other changes to the modelling approach since consultation

3.5.1 GM has reviewed the assumptions underpinning the highway assignment modelling including bus services and fleet, taxi upgrade assumptions, traffic volumes and composition and future schemes.

3.5.2 Since the previous review of bus services, a fleet of zero emission buses has been deployed on routes in the city centre and further zero emission buses are funded and planned to be in operation from 2023. The highway model will be updated to reflect these new buses, operating on the following services:

- 111, 43 (Chorlton to Manchester City Centre, Manchester Airport to Manchester City Centre) – from 2020.
- Manchester Metroshuttle Free Bus Services (within the City Centre) – from 2023.
- Vantage services (operating through Salford to Manchester City Centre, including along the A34 Bridge St/John Dalton St) – from 2023.

3.5.3 In addition, following the feedback from consultation, evidence of the impact of Covid-19 on the trade, research and stakeholder engagement with the taxi trade, GM has revised its assumption about the proportion of taxis that will upgrade to ZEC, rather than a compliant Euro 6 vehicle, to make it more conservative. It is possible that future regulatory reform, licensing policy, or the impact of investment in charging infrastructure will mean that more taxis than forecast upgrade to ZEC.

3.5.4 The values of time and distance that are used in the Saturn model assignments have been updated based on values of time, GDP growth rates and vehicle operating costs derived from the latest TAG data book, July 2020. This produced modest changes in the assignment parameters and minor changes in routing.

3.6 Considering modelling uncertainty

3.6.1 GM have followed Government guidance in terms of considering modelling uncertainties. A discussion of uncertainty in the modelling of the Option for Consultation is set out in the Analytical Assurance Statement[8].

[8] Available at https://assets.ctfassets.net/tlpgbvy1k6h2/H7Az0lK4HE78gzyZz0YPy/8a0c304567c41293ac6262d291777405/Analytical_Assurance_Statement.pdf

3.6.2 GM have considered the impacts of Covid-19 on the GM CAP, as set out in the 'Impacts of Covid-19 on the GM CAP Report'[9] and have specifically considered the impact on uncertainty, in line with Government guidance. At the time of writing, the UK is still operating under pandemic-related restrictions on activity and travel. It is therefore too early to say with certainty what the impacts of Covid-19 will be post-pandemic on behaviour, travel patterns, businesses and the economy. The Government's guidance on reflecting the impacts of Covid-19 within the modelling is set out in Appendix A and GM's proposed approach to representing the impact of Covid-19 in core modelling scenarios is set out in Appendix D. This includes a discussion of uncertainty, as section 7 of Appendix D; concluding that there is greater uncertainty as a result of the pandemic, with some aspects potentially worsening air quality and others potentially providing air quality improvements. Overall, Appendix D concludes that it is very unlikely that any improvements to air quality would be of a sufficient scale to mean that action was no longer required.

3.6.3 In order to achieve compliance in the shortest possible time, GM needs to progress the modelling underpinning the GM CAP based on a set of reasonable assumptions about the medium-to-long term impacts of the pandemic. GM has supplied in this report its best estimates of what is likely to happen based on the available evidence.

3.6.4 Nonetheless, uncertainty remains and as a result, sensitivity testing is planned and underway to consider the possible impacts of delayed development plans, increased homeworking, changes to GDP, impacts on public transport, and changes to vehicle purchasing costs and the affordability, feasibility or appeal of upgrade as a result of the pandemic. Sensitivity testing will also be conducted to assess the possible impact of other factors affecting certainty, unrelated to the pandemic.

3.6.5 If the sensitivity testing identifies any potential issues with the plan as it stands, this will indicate that adaptive planning is required and GM will need to work with JAQU to agree mechanisms to facilitate this. Adaptations could include reviewing the charge levels; funding offers; or eligibility criteria for funding, with the aim of further encouraging upgrade if it appears that more people are choosing to stay and pay than forecast. GM could also review permanent discounts and exemptions if it becomes apparent that non-compliant vehicles constitute a greater proportion of the on-the-road fleet than expected.

[9] Supplied as Appendix 5 to the June GMCA Report 'Greater Manchester Clean Air Plan'

3.6.6 Once the plan is in place, monitoring will be required to ensure that the policy and proposals contained in the GM CAP remain appropriate throughout the lifetime of the interventions. GM will ensure that the Monitoring and Evaluation Plan sets out to address issues where uncertainty remains as to post-pandemic conditions (or for other reasons), as identified in the sensitivity testing, and for example in terms of vehicle fleets, travel patterns and the provision of bus services. If the monitoring reveals issues with the performance of the measures that form the plan, again, an adaptive planning approach will be required, such that GM and JAQU can agree any changes to the plan that would make it more effective.

3.7 Summary of changes to the modelling approach since consultation

3.7.1 In summary, GM has made the following changes to the modelling process since consultation:

- Representation of delayed CAZ launch date of 2022;
- Apply a delay to normal fleet upgrades to the private car, van, and taxi fleets;
- Apply a change to the cost modelling process such that those non-compliant LGVs and taxis - hackney carriage and PHV - that would have upgraded to a compliant vehicle without the pandemic but have not done so are assumed not to upgrade as a result of the GM CAP;
- Update to bus fleet reflecting current deployment of zero emission buses;
- Revision of assumptions about taxi upgrade to ZEC; and
- Updates to assumed values of time and distance, reflecting latest Government guidance.

4 Representation of the proposed final GM CAP Policy within the modelling approach

4.1.1 The following changes have been made to the package as modelled to reflect the post-Consultation proposed final GM CAP Policy and how this has changed from the Policy for Consultation.

4.2 CAZ Charges

4.2.1 No changes to CAZ charges from the Option for Consultation. Assumed CAZ charges are:

- £60 daily charge – HGV, Bus, Coach;
- £10 daily charge – LGV, Minibus; and
- £7.50 daily charge – Taxi (Hackney & PHV)[10].

4.3 Temporary Exemptions

4.3.1 Temporary exemptions have been extended to end May 2023 for LGVs, minibuses and coaches. Within the modelling, charges assumed to apply to those vehicle types for 2023 (where they are directly modelled).

4.3.2 All GM licensed taxis (Hackneys & PHVs) will be temporarily exempt from the CAZ charge until the end of May 2023, whereas previously only WAV taxis were proposed to be exempt. This will affect the modelling of earlier years but does not impact on the modelling for 2023, 2024 and 2025 as presented here.

Grant Levels

4.3.3 Updated grant levels as modelled are discussed in **Tables 4-1 and 4-2**. It is not possible to reflect the full range of grant options available to vehicle owners within the models, and therefore the tables set out the simplified representation of the grant offer as modelled.

4.3.4 Constraints have been applied within the modelling to reflect the total amount of funding available for each vehicle type. It is not possible to perfectly replicate the funding totals and therefore the constraints applied mean that somewhat less funding is applied within the modelling than will be available in practice. Therefore, the models slightly under-estimate uptake of funds and potentially the total upgrade response for LGVs. This was considered more cautious and appropriate than allowing the funding uptake within the modelling to exceed the total funding allocation.

[10] Note – the package modelling includes an assumption of a discount in PHV charges for use more the 5 days per week, where the CAZ charge is capped at the 5 day charge. This proposal has now been removed from the policy, but remains within the package modelling. Removing this discount from the modelling, would support a further increase in PHV upgrade response, but analysis shows that the impact would be very small.

Table 4-1: Grant and Retrofit Offers for Commercial Vehicles to be applied in the Cost Response Models

	Option for Consultation	Revised Grant Level
Mode:	**LGV**	
Euro 6 Grant	£3,500 all LGVs	£3,500 1.6t, £4,500 3.5t
Retrofit Grant	n/a	£5,000
Mode:	**HGV**	
7.5t	£2,500	£5,000
18t	£3,500	£7,000
26t	£4,500	£9,000
32t	£5,500	£12,000
44t	£4,500	£6,500
Retrofit		Up to £16,000 (off model calculation assumes £3m allocation)

Table 4-2: Grant and Retrofit Offers for Taxis to be applied in the Cost Response Models

	Option for Consultation	Revised Grant Level
Mode:	**PHV**	
Grant Euro 6	£3,000	£3,000
Grant EV	£3,000	£6,000
Retrofit	n/a	n/a
Mode:	**Hackney (WAV)**	
	London Style	**WAV**
Grant Euro 6	n/a	£5,000
Grant EV	£10,000	£10,000
Retrofit	£5,000	£5,000 (WAV only)
Mode:	**Hackney (Non-WAV)**	
	Non-London	**Non-WAV**
	n/a	As Revised PHV

4.3.5 Measures to promote the increased uptake of electric vehicles have been modelled using the taxi cost response model to assess the behavioural responses to the CAP and the introduction of incentives for operators to upgrade their vehicles. For the Consultation modelling it was estimated that approximately 15% of taxi and private hire car drivers who operate a compliant vehicle would either purchase an electric vehicle or choose to lease an electric vehicle. A more pessimistic assumption based on the revised behavioural model has been adopted for the latest forecasts, assuming that 3% of taxi drivers would upgrade to an electric vehicle. The air quality impacts of this assumption have been modelled post assignment by reducing the compliant taxi flows that are output from the Saturn model (and that are input to EMIGMA) by 3%, based on the assumption that electric vehicles generate zero emissions at the exhaust.

4.3.6 The forecast behavioral responses generated due to the updated package modelling are presented in **Appendix B**.

5 Emissions in the Do Minimum and Do Something scenarios

5.1 Modelled scenarios

5.1.1 This section sets out the results of emissions modelling. Modelling has been undertaken for the following scenarios:

- **Do Minimum**, which represents what is forecast to happen in the absence of the CAP proposals; and
- **Final GM CAP Policy** – the Do Something, which represents what is forecast to happen when the GM CAP is introduced.

5.2 Mass Emissions Outputs

5.2.1 Summary results from the EMIGMA modelling for the tests are presented below in **Table 5-1**, which shows modelled mass NOx emission totals for 2023 and 2025 for Greater Manchester as-a-whole, disaggregated by vehicle type.

5.2.2 The results indicate that the CAP is forecast to deliver reductions in mass NOx emissions of approximately 20% relative to the Do Minimum in 2023 and 15% in 2025. These figures are similar to the results for the Consultation Option modelling, which forecast that the Consultation proposals would deliver reductions in NOx of about 22% (relative to the consultation Do Minimum) in 2023 and 17% in 2025.

5.2.3 It should be noted that overall emissions in post-Consultation Do Minimum are approximately 3% greater than the Do Minimum scenario used for the Consultation in 2023 as a result of the increased age of the car, LGV and taxi fleets due to Covid-19. This total mass emissions value also includes a reduction in emissions associated with new electric buses, but these emission improvements are confined to specific bus route corridors.

Table 5-1 Mass NOx Emission Totals from EMIGMA Modelling (Greater Manchester, Tonnes per Year, with Percentage Changes Relative to the Do Minimum)

2023						
Scenario	**Car**	**LGV**	**HGV**	**Taxi**	**Bus**	**Total**
Do-Minimum	2,799	1,887	796	357	484	6,324
Final Post-Consultation Package	2,803	1,475	378	316	106	5,078
% Change (DM)	0.1%	-21.9%	-52.5%	-11.6%	-78.0%	-19.7%
2025						
Scenario	**Car**	**LGV**	**HGV**	**Taxi**	**Bus**	**Total**
Do-Minimum	2,412	1,610	523	294	344	5,183
Final Post-Consultation Package	2,412	1,287	312	271	106	4,389
% Change (DM)	0.0%	-20.1%	-40.4%	-7.9%	-69.0%	-15.3%

Notes:

Taxis comprise Private Hire Vehicles and Hackney Carriages combined

% Changes for the Final Post-Consultation Package are relative to the Do Minimum

Totals may not sum due to rounding

6 Air Quality in the Do Minimum and Do Something scenarios

6.1 Overview

6.1.1 This section sets out the results of air quality modelling for the Do Minimum and Do Something scenarios.

6.2 Air quality in the Do Minimum scenario

6.2.1 **Table 6-1** summarises the Consultation modelling results, and the updated modelling post-Consultation incorporating the impacts of Covid-19 results for the Do Minimum years of 2023 and 2025, 2021 model results have not yet been completed. The location of the predicted exceedances in each year are shown in **Figures 6-1 and 6-2** with the spatial pattern closely resembling that in the Consultation modelling.

6.2.2 There is an increase in the number of points of exceedance in 2023 from the Consultation model Do Minimum (from 69 to 71). This is primarily associated with the wider road network outside of the regional centre where car and van emissions have increased due to an older fleet profile due to Covid-19, leading to increases in NO_2 concentrations of typically 0.5 µg/m^3 up to 1.0 µg/m^3. However, on the route corridors where the new electric buses will operate there are improvements, with a reduction in exceedances inside the Inner Ring Road (IRR) on these routes.

6.2.3 By 2025, the number of exceedances reduces due to the natural upgrade of the vehicle fleet, which is expected to continue despite the depressive effect of Covid-19 on some markets, and which has been accounted for where relevant. Compared with the Consultation Do Minimum scenario, there has been a decrease in the overall number of exceedances (from 12 to 11). This is because the most persistent exceedances which still remain are predominantly associated with bus routes, and a proportion of these will now have electric buses in operation.

6.2.4 There are predicted to be exceedances in all districts with the exception of Oldham and Wigan in the Do Minimum scenarios for 2023[11]. By 2025, exceedances are only predicted in Manchester, Salford, and Bury, which is consistent with the Consultation modelling scenarios.

6.2.5 The updated modelling shows results consistent with the methodological modelling alterations described previously. The locations where car and van flows are greatest have an increased number of exceedances, typically sites classed as 'Other Locations'. Those sites in the IRR where bus contributions are most significant have a decreased number of exceedances due to the presence of electric buses. The last points of exceedance (11 in total) in 2025 still remain at:

[11] Note that analysis carried out based upon the Do Minimum modelling as at consultation suggested that all local authorities would remain non-compliant in 2022. Updated analysis for 2022 has not yet been completed.

- Inside the IRR, including the A34 Bridge St /John Dalton St;
- A57 Regent Rd, Salford;
- A6 Chapel St, Salford; and
- A58 Bolton Road, Bury.

Table 6-1: Predicted annual mean NO_2 concentrations at points on the Greater Manchester road network – 2021 (Consultation Option version only), 2023 and 2025 without further action ('Do Minimum')

Consultation Option Data – Do Minimum

Road classification[12]	Compliant sites		Non-compliant sites			
	Very compliant (below 35 µg/m³)	Compliant but marginal (35 to 40 µg/m³)	Non-compliant (>40 to 45 µg/m³)	Very non-compliant (>45 to 50 µg/m³)	Extremely non-compliant (>50 µg/m³)	Total non-compliant (>40 µg/m³)
2021						
Inside Manchester-Salford Inner Relief Route (IRR)	150	72	29	19	5	**53**
Urban centres	170	48	14	5	0	**19**
Other locations	1,531	365	100	25	6	**131**
Total	**1,851**	**485**	**143**	**49**	**11**	**203**
2023						
Inside IRR	205	39	21	9	1	**31**
Urban centres	213	20	4	0	0	**4**
Other locations	1,869	150	30	4	0	**34**
Total	**2,287**	**209**	**55**	**13**	**1**	**69**
2025						
Inside IRR	240	27	8	0	0	**8**
Urban centres	233	4	0	0	0	**0**
Other locations	1,990	78	4	0	0	**4**
Total	**2,463**	**109**	**12**	**0**	**0**	**12**

Post-Consultation including Covid-19 Data – Do Minimum

Road classification[3]	Compliant sites		Non-compliant sites			
	Very compliant (below 35 µg/m³)	Compliant but marginal (35 to 40 µg/m³)	Non-compliant (>40 to 45 µg/m³)	Very non-compliant (>45 to 50 µg/m³)	Extremely non-compliant (>50 µg/m³)	Total non-compliant (>40 µg/m³)
2021						
Inside Manchester-Salford Inner Relief Route (IRR)	n/a	n/a	n/a	n/a	n/a	n/a
Urban centres	n/a	n/a	n/a	n/a	n/a	n/a
Other locations	n/a	n/a	n/a	n/a	n/a	n/a
Total	n/a	n/a	n/a	n/a	n/a	n/a
2023						
Inside IRR	209	37	21	8	0	**29**
Urban centres	210	23	4	0	0	**4**
Other locations	1,847	145	31	7	0	**38**
Total	**2,266**	**205**	**56**	**15**	**0**	**71**
2025						
Inside IRR	245	23	7	0	0	**7**
Urban centres	233	4	0	0	0	**0**
Other locations	1,991	35	4	0	0	**4**
Total	**2,469**	**62**	**11**	**0**	**0**	**11**

n/a: Results for 2021 are not available for the Post-Consultation modelling

Note: The total number of predicted points and distribution of those points changes between 2021 and 2023/2025 due to planned changes to the road network.

12 "Inside Inner Relief Route" is the area encircled by the Inner Relief Route. "Urban centres" are areas that met a definition used for the purposes of air quality modelling for OBC Option testing. "Other locations" are roads outside of Urban centres and the Inner Relief Route.

Figure 6-1: Do Minimum Exceedances in 2023, updated modelling post-consultation and with Covid-19 impacts

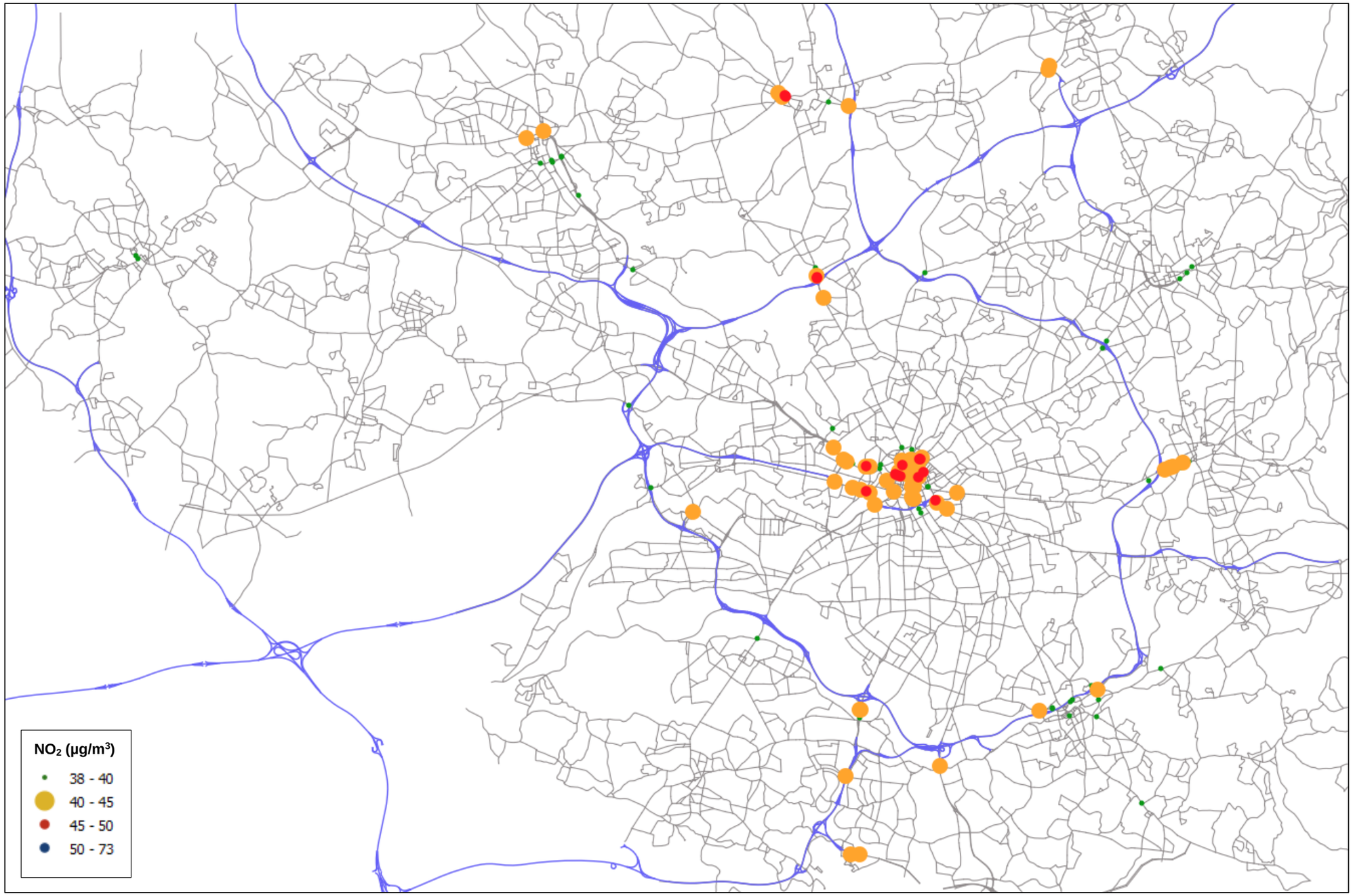
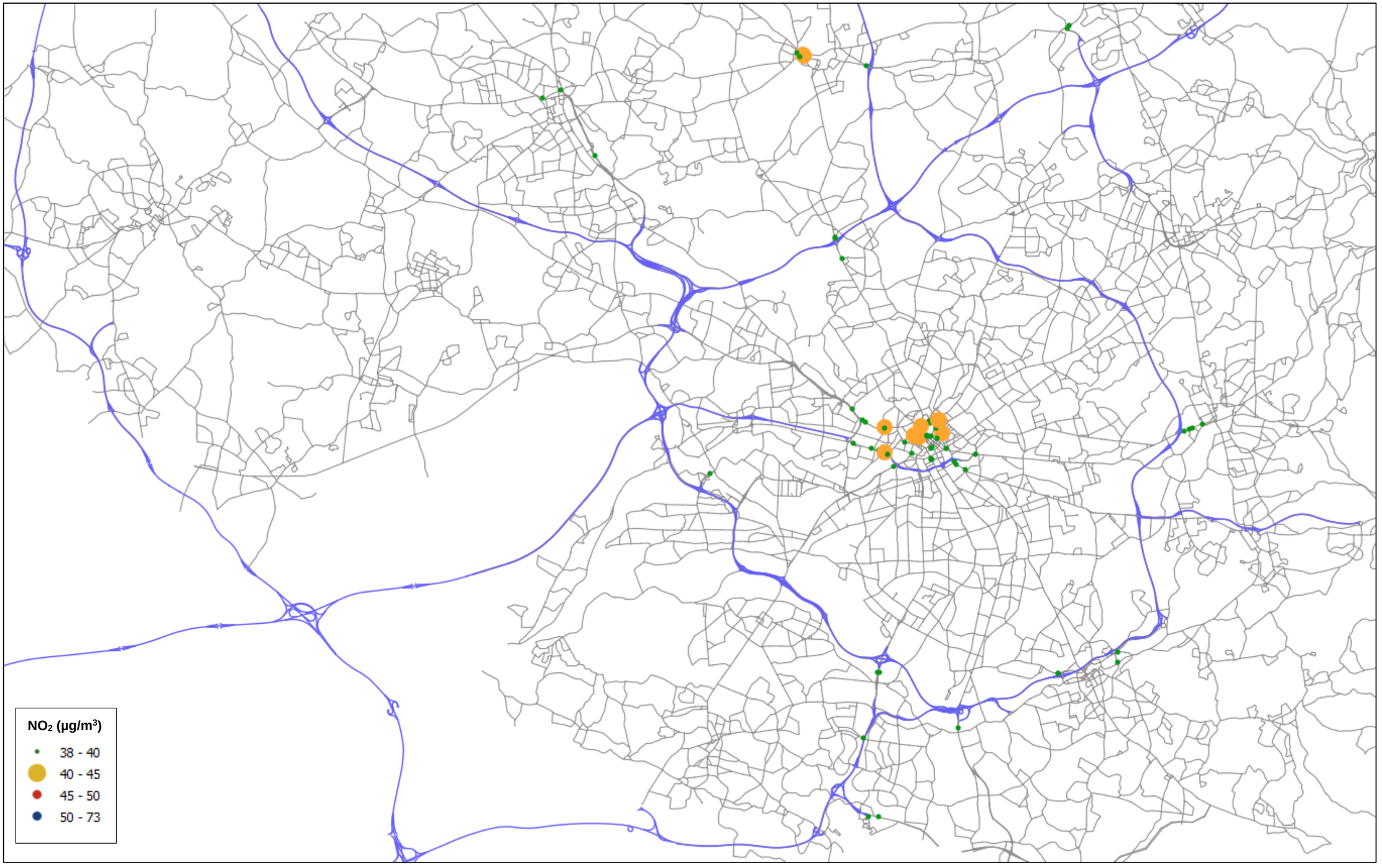


Figure 6-2: Do Minimum Exceedances in 2025, updated modelling post-consultation and with Covid-19 impacts



6.3 Air quality with the final GM CAP Policy

6.3.1 The section summarises the Consultation Option results and the Final Post-Consultation GM CAP Policy, including the impacts of Covid-19, for 2023 and 2025. The exceedances in 2023 are shown in **Figure 6-3**, there are no exceedances remaining in 2025.

6.3.2 With the Final Post-Consultation GM CAP Policy, in 2023 when the GM CAP is fully opened with all measures in place, the proposed scheme is predicted to reduce the number of exceedances from 71 down to 5. These are located at the:

- A34 John Dalton St & Bridge St, Manchester (2 exceedances)
- A58 Bolton Road, Bury (2 exceedances)
- A57 Regent Road, Salford (1 exceedance)

6.3.3 However, in 2024 with an extra year of natural fleet turnover, the additional improvement means that there are no exceedances predicted in GM as a result of the reduction in vehicle emissions produced by the CAP. The 2024 concentrations are calculated by linear interpolation of the 2023 and 2025 model years.

6.3.4 Therefore, 2024 is the first year of compliance within Greater Manchester. This is the same year as produced by the Consultation Option, and meets the requirements of the Ministerial Direction for the local plan for NO_2 compliance by 2024 at the latest. This is three years earlier than the year of compliance predicted without the GM CAP in place. Achieving compliance in Greater Manchester is not possible sooner with the other options that have been suggested.

6.3.5 The points of compliance with the highest concentrations are the A58 Bolton Road, Bury and A57 Regent Road, Salford which in 2024 are both 40.3 µg/m^3 [13]. These sites have received an improvement of 4.8 ug/m^3 and 4.3 µg/m^3, respectively. **Table 6-2** shows the number of sites by local authority, and **Table 6-3** shows the number of sites by scale of exceedance with the Consultation Option and Final GM CAP Policy.

[13] Noting that values under 40.5 are considered to be compliant.

Table 6-2: Number of sites remaining in exceedance of legal limits for NO2 concentrations by year, Greater Manchester, by local authority

Consultation Option Data

LA	2021		2023		2024 (Interpolated)		2025	
	Do Min	Cons. Option	Do Min	Cons. Option	Do Min	Cons. Option	Do Min	Cons. Option
Bolton	13	6	1	0	1	0	0	0
Bury	16	7	8	1	4	0	1	0
Manchester	76	22	39	4	20	0	9	0
Oldham	9	1	0	0	0	0	0	0
Rochdale	5	2	2	0	2	0	0	0
Salford	36	10	11	0	4	0	2	0
Stockport	21	5	3	0	0	0	0	0
Tameside	13	5	4	0	0	0	0	0
Trafford	7	0	1	0	0	0	0	0
Wigan	7	0	0	0	0	0	0	0
GM Total	**203**	**58**	**69**	**5**	**31**	**0**	**12**	**0**

Final GM CAP Policy Data

LA	2021		2023		2024 (Interpolated)		2025	
	Do Min	Final Package	Do Min	Final Package	Do Min	Final Package	Do Min	Final Package
Bolton	n/a	n/a	2	0	1	0	0	0
Bury	n/a	n/a	9	2	6	0	2	0
Manchester	n/a	n/a	38	2	18	0	7	0
Oldham	n/a	n/a	0	0	0	0	0	0
Rochdale	n/a	n/a	2	0	2	0	0	0
Salford	n/a	n/a	12	1	6	0	2	0
Stockport	n/a	n/a	3	0	1	0	0	0
Tameside	n/a	n/a	4	0	1	0	0	0
Trafford	n/a	n/a	1	0	0	0	0	0
Wigan	n/a	n/a	0	0	0	0	0	0
GM Total	n/a	n/a	**71**	**5**	**35**	**0**	**11**	**0**

n/a: Results for 2021 are not yet available for the Post-Consultation modelling

Table 6-3: Number of sites by scale of exceedance by year, Greater Manchester road network - 2021, 2023 and 2025

Consultation Option Data

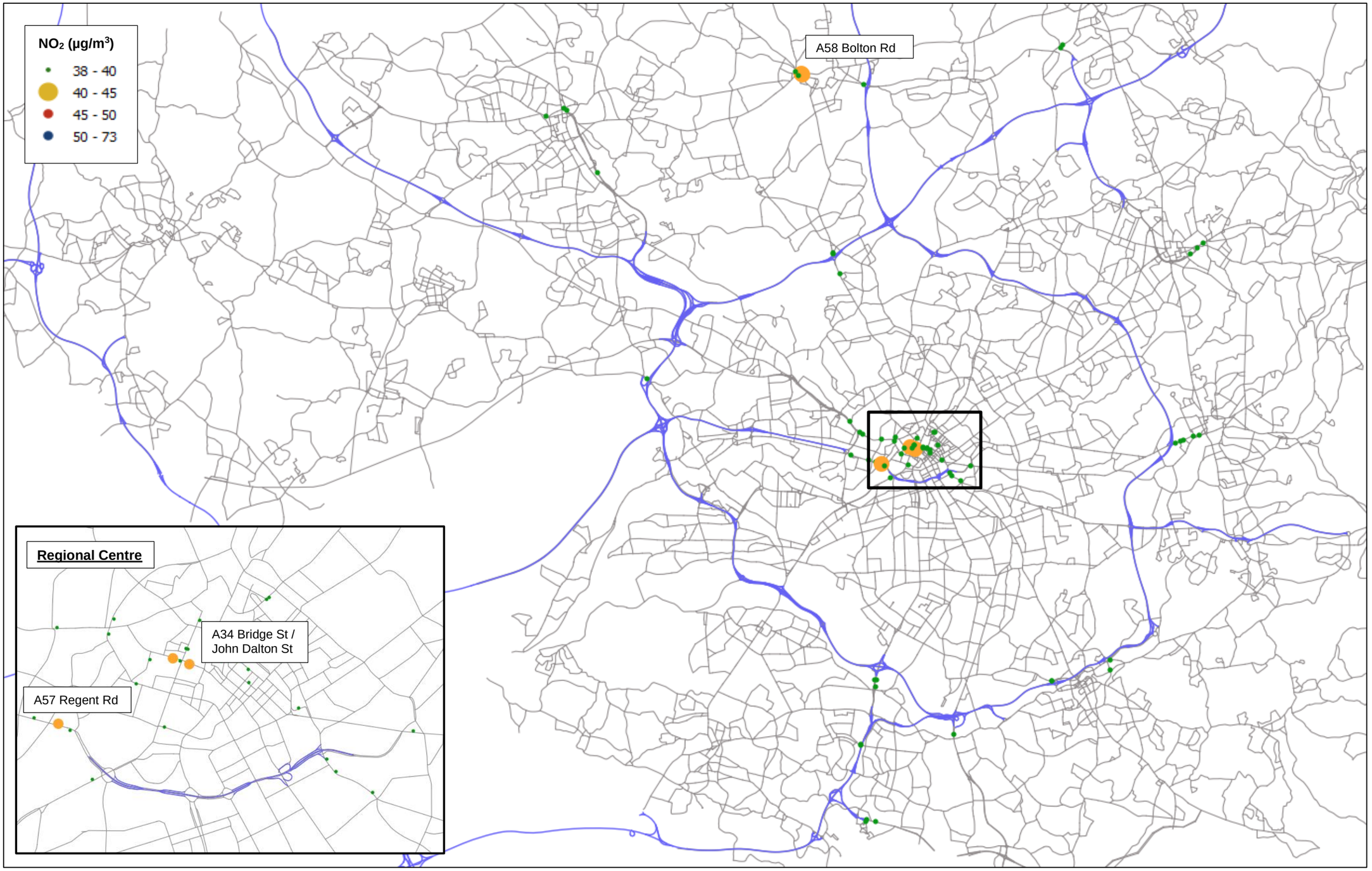
Scheme Option	Compliant sites		Non-compliant sites			
	Very compliant (below 35 µg/m^3)	Compliant but marginal (35 to 40 µg/m^3)	Non-compliant (>40 to 45 µg/m^3)	Very non-compliant (>45 to 50 µg/m^3)	Extremely non-compliant (>50 µg/m^3)	Total non-compliant (>40 µg/m^3)
2021						
Do Minimum	1,851	485	143	49	11	**203**
Consultation Option	2,266	216	52	5	0	**57**
2023						
Do Minimum	2,287	209	55	13	1	**69**
Consultation Option	2,486	33	5	0	0	**5**
2025						
Do Minimum	2,463	109	12	0	0	**12**
Consultation Option	2,522	9	0	0	0	**0**

Final GM CAP Policy Data

Scheme Option	Compliant sites		Non-compliant sites			
	Very compliant (below 35 µg/m^3)	Compliant but marginal (35 to 40 µg/m^3)	Non-compliant (>40 to 45 µg/m^3)	Very non-compliant (>45 to 50 µg/m^3)	Extremely non-compliant (>50 µg/m^3)	Total non-compliant (>40 µg/m^3)
2021						
Do Minimum	n/a	n/a	n/a	n/a	n/a	n/a
Final Post-Consultation Package	n/a	n/a	n/a	n/a	n/a	n/a
2023						
Do Minimum	2266	205	56	15	0	**71**
Final Post-Consultation Package	2471	66	5	0	0	**5**
2025						
Do Minimum	2469	62	11	0	0	**11**
Final Post-Consultation Package	2,526	16	0	0	0	**0**

n/a: Results for 2021 are not yet available for the Post-Consultation modelling

Figure 6-3: Final Post-Consultation Package 2023 Exceedances



7 Summary & Conclusions

7.1.1 This report sets out the changes to, and results of, modelling to forecast air quality in GM, taking into account the impacts of COVID-19, new investment in ultra low emission buses, and reflecting the revised GM CAP Final Policy based on the outcomes of the consultation.

7.1.2 These changes to the modelling apply the assumptions, methodology and sensitivity tests developed in agreement with JAQU based on the extant JAQU guidance for assessing the impact of Covid-19 provided to GM.

7.1.3 The report sets out the results of the Do Minimum and Do Something modelling scenarios, in other words, the forecast air quality with and without the GM CAP, and also compares these with the air quality modelling results for the Option for Consultation. The modelling has been conducted for 2023 and 2025, with results interpolated for 2024.

7.1.4 The impact of Covid-19 is expected to slow the natural turnover of vehicle fleet, as a result of lost new vehicle sales for cars, LGVs and taxis during 2020/21. This has the effect of increasing vehicle emissions in the future worsening air quality predictions, and also increases the number of non-compliant LGVs and taxis in-scope for the CAZ charge. In contrast the investment in electric buses will reduce emissions in both the Do Minimum and Do Something scenarios, along the specific route corridors of operation.

7.1.5 The results of the air quality modelling show that there is a slight increase in the number of points of exceedance in 2023 from the Consultation model Do Minimum (from 69 to 71), and a decrease in 2025 (from 12 to 11). There is a worsening on the general road network where car and LGV emissions have increased due to an older fleet resulting from delayed investment due to Covid-19. However, on the route corridors where the new electric buses will operate there are improvements, with a reduction in exceedances inside the IRR on these routes.

7.1.6 The reason that there is a slight decrease in 2025 versus an increase in 2023 is because the most persistent exceedances which still remain in 2025 are predominantly associated with bus routes, and a proportion of these will now have electric buses in operation.

7.1.7 There are predicted to be exceedances in all districts with the exception of Oldham and Wigan in the Do Minimum scenarios for 2023[14]. By 2025, exceedances are only predicted in Manchester, Salford, and Bury, which is consistent with the Consultation modelling scenarios. Modelling has not yet been updated for the pre-2023 scenario, but it is expected that all GM authorities would be in exceedance in 2022 without the CAP.

[14] The scale and distribution of exceedances remains similar to the forecast as set out in the OBC. The OBC sets out the options appraisal process which determined that a GM-wide CAZ C with supporting measures was the best performing option to achieve compliance in the shortest possible time, and that measures involving local CAZs did not achieve compliance as quickly. See OBC documentation at Technical Documents | Clean Air Greater Manchester (cleanairgm.com)

7.1.8 The key last points of exceedance (11 in total) in 2025 still remain at:

- Inside the IRR, including the A34 Bridge St /John Dalton St;
- A57 Regent Rd, Salford;
- A6 Chapel St, Salford; and
- A58 Bolton Road, Bury.

7.1.9 For the Final Post-Consultation Package, in 2023 when the GM CAP is fully opened with all measures in place the proposed scheme is predicted to reduce the number of exceedances from 71 down to 5. These are located at:

- A34 John Dalton St & Bridge St, Manchester (2 exceedances);
- A58 Bolton Road, Bury (2 exceedances); and
- A57 Regent Road, Salford (1 exceedance).

7.1.10 However, in 2024 with an extra year of natural fleet turnover, the additional improvement means that there are no exceedances predicted in GM as a result of the reduction in vehicle emissions produced by the CAP.

7.1.11 Therefore, 2024 is the first year of compliance within Greater Manchester. This is the same year as produced by the Consultation Option, and meets the requirements of the Ministerial Direction for the local plan for NO_2 compliance by 2024 at the latest. This is three years earlier than the year of compliance predicted without the GM CAP in place. Achieving compliance in Greater Manchester is not possible sooner with the other options that have been suggested.

7.1.12 Analysis has been conducted assessing the proposed discounts and exemptions, derived from the updated analysis. A report setting out the results of this analysis is supplied as Appendix E.

Appendix A: JAQU's guidance to local authorities, February 2021

Department for Transport

Department for Environment Food & Rural Affairs

Cllr Andrew Western
Trafford Council,
Trafford Town Hall,
Talbot Road,
Stretford,
M32 0TH

22 February 2021

Dear Andrew,

The Government is implementing the 2017 Air Quality Plan to ensure that compliance with roadside nitrogen dioxide concentrations is achieved in the shortest possible time. Due to the impacts of Covid-19, we are now operating in an environment of considerable uncertainty. Despite these uncertainties we must continue to deliver cleaner air. The future impact of the pandemic on traffic levels and nitrogen dioxide emissions/concentrations will be difficult to predict. Roadside nitrogen dioxide levels will be impacted in the short term by how quickly local traffic flows re-start and in the longer term by several factors (e.g. fleet evolution, home working, modal shift, etc). Analysis and modelling can provide an indication of possible outcomes, however, given the considerable uncertainty we must accept that there is a risk of putting in place clean air measures that overachieve, however, this is preferable to inaction which leads to poor air quality.

JAQU officials have been working with Local Authorities to review the impacts of Covid-19 on their delivery plans and NO_2 levels. Based on these conversations, the data LAs have supplied to us, discussions with our expert panel and our internal review of evidence, we are now in a position to confirm next steps as to how Covid-19 impacts can be applied to central scenarios.

LAs will be able to apply some, but not all, of the results of sensitivity tests to central scenarios, depending on the level of uncertainty associated with underlying assumptions and the impact of the result on the plan. JAQU (with TIRP steer) have RAG rated the sensitivity tests that LAs have discussed with us in **Annex 1**.

LAs can use the test results as follows:

- **"Green"** rated – results can be used to influence central scenario modelling due to a higher level of confidence in the evidence (lower level of uncertainty) and/or small impact on outcomes.
- **"Amber"** rated – results may be used to influence central scenario modelling if the LA has appropriate supporting evidence. The degree of change brought about by these results will also play a factor. JAQU will require the LA to make a strong case for their inclusion, which will be assessed by JAQU and TIRP, with

a recommendation given to Ministers as to whether JAQU supports inclusion of this impact in their core modelling.

- **"Red"** rated – due to the high level of uncertainty with these tests, LAs will not be able to use the results to influence central scenario modelling, however results can be included in business cases to indicate degree of shift possible within the plan.

LAs must note that the evidence required to support Covid-19 assumptions is expected to be of at least the same level of robustness as evidence included in plans as standard. Where evidence does not achieve the required standard the results from the sensitivity tests cannot be applied to the central scenario modelling but may be included as a sensitivity test in the business case submission. LAs that include Covid-19 impacts in the central scenarios will be expected to include KPIs to monitor and evaluate these in their Monitoring & Evaluation plan.

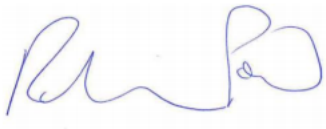
The steps for LAs who intend to apply Covid-19 impacts to their plans are set out in **Annex 2**. The process has been designed to minimise additional delays and provide a swift decision that will enable Local Authorities to proceed in finalising their plans and implementing their measures. LAs will be expected to proceed with applying any approved Covid-19 impacts following a single TIRP and JAQU recommendation and direction or letter (as appropriate). LAs will be expected to agree a timeline with JAQU officials on the submission of their sensitivity test results by 1st March 2021. After TIRP review it is anticipated that should any further modelling be required that an LA should complete this within a maximum of 8 weeks and be done in parallel to current work.

Please do not hesitate to contact your account manager if you have any questions.

Yours sincerely,

RACHEL MACLEAN

PARLIAMENTARY UNDER SECRETARY OF STATE FOR TRANSPORT



REBECCA POW

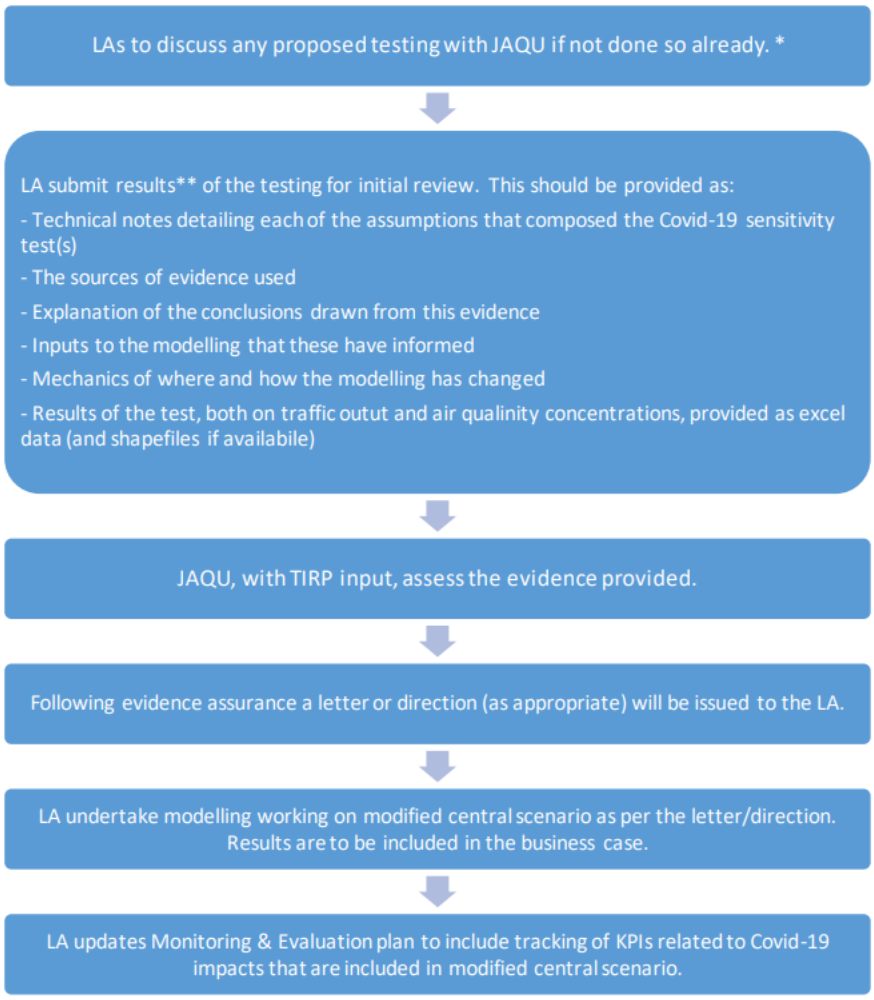
PARLIAMENTARY UNDER SECRETARY OF STATE FOR ENVIRONMENT AND RURAL AFFAIRS

Annex 1: RAG rating for sensitivity tests

Test & RAG status	Justification for categorisation and guidance on what evidence to include
Impacts of a CAZ implementation delay	• Robust evidence within LAs of any delay to CAZ go-live. • Delays simple to model.
Green recovery/measures	• Robust evidence as some LAs have developed measures that have been agreed and in places already implemented through other funding initiatives. • Impact of these tends to be highly localised (single roads, junctions, etc.)
Delayed development plans (new residential or commercial developments /infrastructure, etc.)	• Robust evidence as planning already in progress for these schemes. The original assumed demand for such schemes was known to the LA. • Only schemes of significant size will have a high impact, but most large schemes will have been considered already by LA modelling.
Fleet upgrade delay impacts	• Delay simple to model and national data readily available. • LA may have evidence to support such a delay derived from observed purchasing trends throughout 2020. • Fleet upgrade could be influenced by economic performance depending on timing of CAZ and length/depth of recession.
Reduction in CAZ charges	• LAs set these responses in their modelling based on either locally gathered surveys, central gov estimates or a literature review of similar schemes during plan development. • JAQU does not want to rule out (by putting in red) that an LA may be able to bring together a body of evidence that indicates an adjustment to these assumed response levels is warranted. • Note: JAQU central assumptions will not be updated at this time in respect to Covid-19.
Increased Stay & Pay response	• LAs set these responses in their modelling based on either locally gathered surveys, central gov estimates or a literature review of similar schemes during plan development. • JAQU does not want to rule out (by putting in red) that the LA is able to bring together a body of evidence that indicates an adjustment to these assumed response levels is warranted. • JAQU central assumptions will not be updated at this time in respect to Covid-19.
LGV/HGV change response	• Trend in goods vehicle trips and GDP growth tend to mirror each other.

	• LAs may be able to adequately source bespoke local evidence to warrant a change. Changes to this response would be inspired by local understanding of the types of businesses serviced in the CAZ area and the adaptation/ survival of those businesses post-Covid. • Note: JAQU central assumptions will not be updated at this time in respect to Covid-19.
Increased homeworking	• Level of continued homeworking post-Covid is highly speculative.
Shopping/Leisure trips (increase due to home working and/or reduction due to online shopping)	• Level of shopping and leisure trips post-Covid is highly speculative.
GDP impacts (reduced employment)	• GDP performance is highly speculative.
Impacts on public transport/modal shift (reduction in demand/capacity/supply)	• Short term aversion to public transport is driven primarily by the immediate threat of transmission of the virus so there is an expectation that this does not impact longer term behaviour. • Model limitations used in LA plans may prevent adequate modelling of these impacts (i.e. economic impact and social distancing; change in transport mode preference due to perceived fear of virus, cost of mode, etc.).
Change in car ownership assumptions	• We do not support inclusion of changes of these factors in central scenario modelling. • These factors are highly speculative (based on long term behaviours & GDP, as well as international factors). • Subcategory/consequence of GDP - wider economic, employment forecasting would need to be taken into account. Driven by length and depth of long/short term recession. Also dependent on price of oil/level of subsidy.
Changes to vehicle purchase costs/pricing (fare)	• Speculative (long term behaviours & GDP). • Subcategory/consequence of GDP - wider economic, employment forecasting would need to be taken into account. Dependent on price of oil/level of subsidy/fare.

Annex 2: Steps for LAs to follow



*LAs that have not submitted a baseline at IES stage should include green-rated tests in their baseline.

**Data needed: In addition to those items explained above, if LAs have tested a potential revised package of measures on top of the sensitivity test baseline, this should be provided for review.

***If they wish, LAs are welcome to update Monitoring & Evaluation plans to track KPIs associated with Covid-19 impacts that informed sensitivity tests but were not taken forward into the modified central scenario.

Appendix B: Output Behavioural Responses

The estimated behavioural response for the Final GM CAP Policy 'Do Something' scenario for each of the core modelled modes are presented below for the 2025 forecast year.

LGV (Trips)

	2023	2025
a) Pay Charge	17.8%	16.1%
b) Change Mode (to Car)	3.7%	0.0%
c) Cancel Trip	0.0%	0.0%
d) Upgrade Vehicle	78.6%	83.9%

HGV (Trips)

	2023	2025
Pay Charge	4.9%	1.9%
Change mode (to LGV)	0.0%	0.0%
Cancel Trip	0.0%	0.0%
Upgrade Vehicle	95.1%	98.1%

PHV (Trips)

	2023	2025
a) Pay Charge	19.1%	18.3%
b) Change Mode	0.0%	0.0%
c) Cancel Trip	0.1%	0.0%
d) Upgrade Vehicle	80.7%	81.7%

Hackneys (Trips)

	2023	2025
a) Pay Charge	14.7%	18.6%
b) Change Mode	0.0%	0.0%
c) Cancel Trip	0.0%	0.0%
d) Upgrade Vehicle	85.3%	81.4%

Appendix C: JAQU's approval of GM's proposed methodology for incorporating Covid-19 impacts with the modelling (May 2021)

Department for Environment Food & Rural Affairs

Department for Transport

Simon Warburton
Transport Strategy Director
TfGM
2 Piccadilly Place
Manchester M1 3BG

4 May 2021

Dear Simon,

The Government is implementing the 2017 UK Plan for Tackling Roadside Nitrogen Dioxide Concentrations to ensure that compliance with legal nitrogen dioxide limits is achieved in the shortest possible time. As described in Minister Pow and Minister Maclean's joint letter dated 22 February 2021, due to the impacts of Covid-19, we are now operating in an environment of considerable uncertainty. Despite these uncertainties we must continue to deliver cleaner air.

Thank you for supplying the results of your sensitivity testing on the impacts of Covid-19 on your local plan. JAQU officials have reviewed the documents and considered the evidence provided along with advice from the Technical Independent Review Panel (TIRP). On this basis, JAQU will support the following impacts being included in your baseline modelling that you presented in "Proposed Approach to representing covid-19 in core modelling":

- Fleet Upgrade Delay
- Change in Implementation Year (2022)
- Green Recovery Measures
- Stay and Pay Changes (with outputs of "Option b" of Table 5.1 also presented, see Annex 1)

More detailed TIRP feedback can be found in Annex 1.

Due to the high level of uncertainty associated with the following impacts, JAQU will not support inclusion in your baseline modelling of the following elements, however they can be included in the business case as sensitivity tests to indicate the degree of shift possible within the plan:

- Delayed development plans

- Increased homeworking
- GDP impacts
- Impacts on Public Transport
- Changes to vehicle purchasing costs

Should you wish to monitor these aspects you are welcome to include additional KPIs in your Monitoring and Evaluation plan, however, you are not required to do so.

The application of the approved impacts to baseline modelling must be completed within 8 weeks from the date of this letter and be done in parallel to current work.

JAQU and the TIRP will review the outputs of these adjustments to baseline modelling, and the outputs to the post-consultation package modelling, in June.

Please do not hesitate to contact your account manager if you have any questions.

Yours sincerely,

ANDREW JACKSON
HEAD OF THE JOINT AIR QUALITY UNIT

Annex 1: TIRP feedback report on "Proposed approach to representing Covid 19 in core modelling"

From meeting of 27.4.2021

Section	Commentary	Agree with proposed changes?
3: 2022 model year	Very detailed explanation of method, thanks. It is fortunate that 2021 and 2023 both exist to allow an interpolation between two years with close proximity. Please highlight any risks around this approach and include them in the final reporting.	Yes, agree with proposed changes.
4: Fleet Upgrade Delay	Have examined the current position (what delay has occurred as of Jan 2021) and the current evidence base is well presented. A key assumption is that over the next 12 months there won't either be a "catch up" or indeed further delays, however the proposed approach represents a relatively neutral position. The sensitivities already explored (no upgrade delay and 1 year delay) provide useful benchmarks to the potential scale of impact. Please include these sensitivities the post-modelling AAS. The panel query whether wider TfGM plans (or the changes to plans that may have been precipitated due to covid) could play a part in the upgrade delay	Yes, agree with proposed changes.

	or any further delay or "catch up".	
5: adjusting behavioural responses	Speculation is impossible to avoid here however, option c of table 5.1 does follow evidentially from the fleet upgrade evidence presented in section 4. These pieces of evidence build the new construct in option c. Acknowledge that c is the more cautionary approach (in terms of impact on air quality) however it is difficult to decide which is the likelier to occur as neither b nor c have definitive evidence. Please consider whether it is feasible to perform both options to illustrate the scale of the difference between these two sensitivities.	If b were to be followed instead of c, how much of a difference in the transport outputs (extrapolated loosely through to emissions) would this make? Please include reference to this in reporting if c is selected.
7: adaptation to AAS	Thanks, these points are thoughtful and detailed. To what extent will these revisions affect work that's being done? Table provided illustrates vulnerabilities but does not specify whether action can/will be taken. If no action can feasibly be taken that is okay.	n/a
Further comments	GM have done a very good job in terms of capturing all the uncertainty.	n/a

Appendix D: GM's proposed approach to representing the impact of Covid 19 in core modelling scenarios

See separate document

Appendix E: Note 38: Discounts & Exemptions – updated with final GM CAP Policy

See separate document