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

Evidence Submission for a new GM Clean Air Plan

Value for Money Note

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1 Purpose of this Document

1.1.1 This note provides a summary of the Value for Money (VfM) assessment, which has been undertaken for the Investment-led Plan and the CAZ Benchmark, providing further detail on the VfM approach and assessment set out in Section 9 of the *Appraisal Report*.

1.1.2 This note also provides narrative on the methodology and results of the quantified assessment which has been conducted on the relative assessment between the Investment-led Plan and the CAZ Benchmark.

2 Greater Manchester Clean Air Plan Overview

2.1 Background to the Clean Air Plan

2.1.1 In 2017 the Secretary of State (SoS) for Environment, Food and Rural Affairs issued directions under the Environment Act 1995 requiring many local authorities, to produce feasibility studies to identify the option which will deliver compliance with the requirement to meet legal limits for nitrogen dioxide (NO_2) in the shortest possible time. The legal limit being defined as the long-term annual mean legal limit of 40 µg/m^3.

2.1.2 In Greater Manchester (GM), the ten local authorities, the Greater Manchester Combined Authority (GMCA) and Transport for Greater Manchester (TfGM) are working together to develop a Clean Air Plan to tackle NO_2 exceedances at the roadside, herein known as Greater Manchester Clean Air Plan (GM CAP).

2.1.3 The development of the GM CAP is funded by government and is overseen by the Joint Air Quality Unit (JAQU), the joint Department for Environment, Food and Rural Affairs (DEFRA) and Department for Transport (DfT) unit established to deliver national plans to improve air quality and meet legal limits. The costs related to the business case, implementation and operation of the GM CAP are either directly funded or underwritten by government acting through JAQU and any net deficit over the life of the GM CAP will be covered by the New Burdens Doctrine, subject to a reasonableness test[1].

2.1.4 In March 2019, the ten GM Local Authorities collectively submitted an Outline Business Case (OBC)[2] for the GM CAP to JAQU outlining a package of measures to deliver regional compliance with legal limits for NO_2 emissions in the shortest possible time.

2.1.5 In July 2019, the Environment Act 1995 (Greater Manchester) Air Quality Direction 2019 was made, which required all ten of the GM local authorities to implement a charging Clean Air Zone Class C[3] with additional measures. There was also an obligation to provide further scenarios appraisal information to demonstrate the applicable Class of Charging CAZ and other matters to provide assurance that the local plan would deliver compliance in the shortest possible time and by 2024 at the latest.

[1] The new burdens doctrine is part of a suite of measures to ensure Council Tax payers do not face excessive increases. New burdens doctrine: guidance for government departments - GOV.UK (www.gov.uk)
[2] https://cleanairgm.com/technical-documents/#outline-business-case
[3] https://www.gov.uk/government/publications/air-quality-clean-air-zone-framework-for-england/annex-a-clean-air-zone-minimum-classes-and-standards

2.1.6 In March 2020, the Environment Act 1995 (Greater Manchester) Air Quality Direction 2020 was made, which required the submission of an Interim FBC (along with confirmation that all public consultation activity has completed) as soon as possible and by no later than 30 October 2020. The 2020 direction confirmed that legal duty remains to ensure the GM CAP (Charging Clean Air Zone Class C with additional measures) is implemented so that NO_2 compliance is achieved in the shortest possible time and by 2024 at the latest and that human exposure is reduced as quickly as possible. The Ministerial letter accompanying the March 2020 direction confirmed that the minister was satisfied that the main evidence queries from the July 2019 direction had been addressed.

2.1.7 A statutory consultation on the proposals took place in Autumn 2020.

2.1.8 The GMCA - Clean Air Final Plan report[4] on 25th June 2021[5] endorsed GM's Final CAP and policy in compliance with this direction, following a review of all of the information gathered through the GM CAP consultation and wider data, evidence and modelling work. Throughout the development of the previous Plan, the JAQU reviewed and approved all technical and delivery submissions. Within this document, this is referred to as the Previous GM CAP.

2.2 The Previous GM CAP and the impacts of Covid-19

2.2.1 Under the Previous GM CAP, GM was awarded £123 million by government for funds aimed at encouraging vehicle upgrades to secure compliance and mitigating the impacts of the GM-wide CAZ. The funds included £15.4 million for bus retrofit, £3.2 million for bus replacement, £10.2 million for Private Hire Vehicles (PHVs), £10.1 million for Hackney Carriages, £7.6 million for Heavy Goods Vehicles (HGVs), £4.4 million for coaches, £2.0 million for minibuses and £70.0 million for Light Goods Vehicles (LGVs).

2.2.2 The June 2021 Clean Air Final Plan report set out that the Air Quality Administration Committee (AQAC) had the authority to establish and distribute the funds set out in the agreed GM Clean Air Plan policy. On 21 September 2021 the AQAC approved the establishment and distribution of the agreed bus replacement funds.

2.2.3 On 13 October 2021 the AQAC agreed the distribution of Clean Air funds set out in the agreed GM Clean Air Plan policy as follows:

- From 30 November 2021 applications for funding would open for HGVs.
- From the end of January 2022 applications for funding would open for PHVs, Hackney Carriages, coaches, minibuses and LGVs.

[4] https://democracy.greatermanchester-ca.gov.uk/documents/s15281/GMCA%20210621%20Report%20Clean%20Air%20Plan%20-%20FINAL%20FINAL.pdf

[5] Also considered by the GM authorities through their own constitutional decision-making arrangements.

2.2.4 On 20th January 2022, the AQAC considered the findings of an initial review of conditions within the supply chain of LGVs in particular following Covid-19 related impacts, which were impacting the availability of compliant vehicles and supply-side constraints resulting in price increases, particularly in the second-hand market[6]. The AQAC agreed that a request should be made to the SoS to pause the opening of the next phase of Clean Air Funds. This was to allow an urgent and fundamental joint policy review with government, to identify how a revised policy could be agreed to deal with the supply issues and local businesses' ability to comply with the GM CAP.

2.2.5 On 8th February 2022, the AQAC noted the submission of a report "Issues Leading to Delayed Compliance Based on the Approved GM CAP Assumptions". The report concluded that on balance, the latest emerging evidence suggested that with the approved plan in place, it was no longer likely that compliance would be achieved in 2024. Members also requested that arrangements were put in place for those vehicles owners who had already placed orders pending funding opening at the end of January to ensure they are not detrimentally impacted by the decision to pause the opening of the funds. Government subsequently issued The Environment Act 1995 (Greater Manchester) Air Quality Direction 2022[7] which confirmed that the March 2020 Direction had been revoked and required that by 1st July 2022 the GM authorities should:

- Review the measures specified in the local plan for NO_2 compliance and associated mitigation measures; and
- Determine whether to propose any changes to the detailed design of those measures, or any additional measures.

2.2.6 This Direction ('the Direction') also stated that the local plan for NO_2 compliance, with any proposed changes, must ensure the achievement of NO_2 compliance in the shortest possible time and by 2026 at the latest. It should also ensure that human exposure to concentrations of NO_2 above the legal limit is reduced as quickly as possible.

2.3 The Case for a new GM CAP

2.3.1 On 1st July 2022, the AQAC noted that the 'Case for a new Greater Manchester Clean Air Plan[8] document and associated appendices would be submitted to the SoS as a draft document subject to any comments of GM Authorities.

2.3.2 On 17th August 2022, the AQAC agreed to submit the 'Case for a new Greater Manchester Clean Air Plan' to the SoS as a final version and approved the Case for a New Plan - Air Quality Modelling Report for submission to JAQU.

[6] https://democracy.greatermanchester-ca.gov.uk/documents/s18685/ARUP%20Technical%20Note.pdf
[7] The Environment Act 1995 (Greater Manchester) Air Quality Direction 2022 (publishing.service.gov.uk)
[8] https://assets.ctfassets.net/tlpgbvy1k6h2/7jtkDc5AODypDQIw0cYwsl/67091a85f26e7c503a19ec7aeb2e8137/Appendix_1_-_Case_for_a_new_Greater_Manchester_Clean_Air_Plan.pdf

2.3.3 The 'Case for a new Greater Manchester Clean Air Plan' set out that challenging economic conditions, rising vehicle prices and ongoing pandemic impacts meant that the original plan of a GM-wide charging CAZ was no longer the right solution to achieve compliance, instead proposing an investment-led, non-charging GM CAP.

2.3.4 The primary focus of the 'Case for a new Greater Manchester Clean Air Plan' was to identify a plan to achieve compliance with the legal limit value for NO_2 in a way that considered the cost-of-living crisis and associated economic challenges faced by businesses and residents. This would be achieved through an investment-led approach combined with wider measures that the GM Authorities are implementing and aimed to reduce NO_2 emissions to within legal limits, in the shortest possible time and at the latest by 2026.

2.3.5 The 'Case for a new Greater Manchester Clean Air Plan' proposed using the remaining funding that the government has awarded to GM for the Previous GM CAP to deliver an investment-led approach to invest in vehicle upgrades, rather than imposing daily charges, and deliver new Zero Emission Buses (ZEBs) as part of the Bee Network[9] (a London-style integrated transport network for GM). The new plan would ensure that the reduction of harmful emissions would be at the centre of GM's wider objectives. Within this document, this plan is referred to as the 'Investment-led Plan'.

2.3.6 The GM Authorities committed to a participatory approach to the development of the new plan to ensure that the GM Authorities' proposals would be well-grounded in evidence in terms of the circumstances of affected groups and possible impacts of the new plan on them, and therefore the deliverability and effectiveness of that plan.

2.3.7 Between August and November 2022, the GM Authorities carried out engagement and research with key stakeholders - vehicle-owning groups and representatives of other impacted individuals, such as community, business, environment and equality-based groups. This activity included targeted engagement sessions with all groups, and an online survey and supporting qualitative research activity with vehicle-owning groups.

2.3.8 Input from those engaged informed the ongoing policy development process as the GM Authorities developed the package of measures forming the Investment-led Plan.

[9] The Bee Network is Greater Manchester integrated transport system joining together bus, Metrolink, rail and active travel https://tfgm.com/corporate/business-plan/case-studies/bee-network

2.4 The Investment-led Plan and the impact of bus retrofit issues

2.4.1 Having submitted the 'Case for a new Greater Manchester Clean Air Plan'[10] in July 2022, the GM Authorities were asked by government in January[11] 2023 to:

- *Provide modelling results for a benchmark CAZ to address the persistent exceedances identified in central Manchester and Salford, in order for these to be compared against your proposals.*
- *Identify a suitable approach to address persistent exceedances identified in your data on the A58 Bolton Road in Bury in 2025, and to propose a suitable benchmark.*
- *Set out how the measures you have proposed will be modelled and evidenced overall, and to ensure that they are modelled without any unnecessary delay.*

2.4.2 The GM Authorities undertook the work required to supply this further evidence and on 8th March 2023 submitted the report 'Approach to Address Persistent Exceedances Identified on the A58 Bolton Road, Bury'[12]. GM Authorities also worked to address the remaining two requests from government by June 2023 on the basis of providing further information to support its Investment-led Plan and testing the proposal against a suitable benchmark CAZ, herein referred to as the 'CAZ Benchmark'.

2.4.3 In April 2023, government advised TfGM that it was to pause any new spending on bus retrofit as it had evidence that retrofitted buses have poor and highly variable performance in real-world conditions[13]. This new evidence followed a JAQU-funded study to quantify nitrogen oxide (NO_X) and NO_2 emissions from buses under real-world driving conditions in three cities across the UK, including Manchester (monitoring took place in Manchester City Centre between 21st November and 12th December 2022). The monitoring indicated that retrofitted buses were not reducing emissions as expected, with significant variation in performance between bus models with retrofit technologies. Furthermore, emissions of primary-NO_2 (as opposed to NO_X) were highly variable, potentially worsening roadside NO_2 concentrations despite an overall reduction in NO_X emissions.

2.4.4 Government therefore commenced a six-month focused research programme to quickly investigate the causes of this poor performance and scope how it could be improved, which was anticipated to be reported in Autumn 2023.

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[10] https://assets.ctfassets.net/tlpgbvy1k6h2/7jtkDc5AODypDQIw0cYwsl/67091a85f26e7c503a19ec7aeb2e8137/Appendix_1_-_Case_for_a_new_Greater_Manchester_Clean_Air_Plan.pdf

[11] https://democracy.greatermanchester-ca.gov.uk/documents/s24937/Appendix%201.%20Ministerial%20Letter%20to%20GM%20with%20attachment.pdf

[12] https://democracy.greatermanchester-ca.gov.uk/documents/s24939/Appendix%203.%20GM%20CAP%20A58%20Bury%20Measure%20Report%20DRAFT%20for%20AQAC%20Approval%20Feb%2023.pdf

[13] https://democracy.greatermanchester-ca.gov.uk/documents/s27699/Appendix%201.%20Letter%20from%20DfT%20to%20Greater%20Manchester%20regarding%20Bus%20Retrofit%20Update.pdf

2.4.5 In the light of government's new evidence, JAQU issued revised general guidance[14] to authorities producing CAPs nationwide. In summary, this required that air quality modelling should no longer assume any air quality benefits from a retrofitted bus.

2.4.6 GM incorporated the revised guidance, as agreed with JAQU, into the modelling which underpins the development of its CAP to produce a report that appraises the ability of the Investment-led Plan and the CAZ Benchmark to deliver compliance with the legal limit value in the shortest possible time and by no later than 2026. The key findings from government's six-month focused research programme were not available at the time this work was undertaken.

2.4.7 The first version of the *Appraisal Report* and supporting documentation was submitted to government in December 2023. The *Appraisal Report* concluded that GM's Investment-led Plan can deliver compliance in 2025 and performs better than a CAZ Benchmark.

2.5 Key developments since December 2023 submission

2.5.1 Since the submission of evidence to JAQU in December 2023 there have been a number of key developments, resulting in a need to update the modelling, the *Appraisal Report* and supporting documentation.

2.5.2 Further modelling was undertaken in Summer 2024 to consider and address the following key developments:

- Delay to Stockport all-electric bus depot;
- Changes to bus fleets (operational and planned); and
- Correction to Euro V retrofit bus modelling emission values.

2.5.3 Drafts of the *Appraisal Report* and supporting documentation were updated to take account of the key developments and the Summer 2024 modelling, in preparation for submission to government. These updates did not change GM's conclusion that the Investment-led, non-charging plan can deliver compliance in 2025 and performs better than a CAZ Benchmark.

2.6 Developments following Summer 2024 modelling

2.6.1 Following the substantial drafting to update the *Appraisal Report* and supporting material (to address the key developments since the December 2023 submission), two additional issues have arisen.

[14] Bus Retrofit Update - Technical Guidance for Local Authorities, JAQU Guidance, May 2023

2.6.2 Firstly, a risk identified in the December 2023 submission “Delays to bus depot electrification” has materialised and there is now a delivery delay to the electrification of Queens Road depot. This was due to take place by January 2025, which was the assumed delivery date in the modelling of the Investment-led Plan.

2.6.3 This poses a significant challenge to achieving compliance in 2025, as 73 ZEBs are to be operated out of Queens Road depot. The issue affects 12 bus services, which run through 17 forecast ‘Do Minimum’ exceedance sites in 2025.

2.6.4 Secondly, in July 2024 National Highways also advised TfGM that the temporary speed limit on the M602 is to be removed, and the 70mph speed limit reinstated. The M602 temporary speed limit is assumed to be in place in the Investment-led Plan modelling assumptions.

2.6.5 The implications of these two issues are addressed in the *Supplementary Appraisal Report*, included as part of this evidence submission documentation. Therefore, the *Appraisal Report* and associated documentation, including this report, should be read in conjunction with the *Supplementary Appraisal Report*.

2.6.6 In addition, since the drafting of the *Appraisal Report* and supporting material, government published the ‘Bus Retrofit Performance Report’[15] on the 12th September 2024. The key findings of this report include that the retrofit technology fitted onto retrofitted buses is not reducing NO_X emissions to the levels expected and retrofit performance is highly variable. These findings are consistent with the guidance issued in May 2023. Therefore, the publication of the study findings has no impact on the Investment-led Plan, the *Appraisal Report* and supporting material.

[15] https://assets.publishing.service.gov.uk/media/66e1ab11951c1776394a003c/bus-retrofit-performance-24.pdf

3 VfM Background

3.1.1 The original version of the *Appraisal Report*, submitted to government in December 2023, provided information on the Value for Money (VfM) approach undertaken by GM to support the appraisal of an Investment-led Plan and CAZ Benchmark. The VfM assessment summarised in the report was conducted on a qualitative basis supplemented by scheme costs.

3.1.2 JAQU have requested a greater level of economic analysis to help the government's decision-making process – specifically, to provide JAQU with evidence of the monetised VfM assessment, weighing the costs against benefits for the Investment-led Plan and the CAZ Benchmark as a Benefit Cost Ratio (BCR).

3.1.3 In discussion with JAQU and to inform a final decision by government, GM has undertaken a pragmatic and proportionate cost benefit analysis of both the Investment-led Plan and the CAZ Benchmark, to include a calculation on Net Present Value (NPV) and a BCR.

3.1.4 The outcome of the approach is a set of monetised cost benefit analysis (CBA) values, enabling a comparison between the Investment-led Plan and the CAZ Benchmark. This approach is considered appropriate and proportionate to determine the relative VfM between the Investment-led Plan and CAZ Benchmark and in context of VfM, under JAQU's Critical Success Factors, classified as 'secondary'.

3.2 Stage 1 – Initial Economic Assessment

3.2.1 As part of the Previous GM CAP, GM Authorities undertook work to progress an initial economic assessment in anticipation of submission of an FBC in January 2022. The material was based on proposals developed for the previous GM CAP ahead of the statutory consultation (which closed on 3rd December 2020) and before the scheme was placed under review in February 2022.

3.2.2 The content was to be updated to reflect the following:

- any changes to the scheme that are incorporated following analysis of the outputs of the consultation; and
- confirmation of the finalised costs.

3.2.3 In agreement with JAQU, GM Authorities have used this assessment to compare an Investment-led Plan against a CAZ Benchmark. This note relates the methodology and results derived from this updated assessment but draws upon the initial work conducted. The initial work conducted on the economic assessment is referred to in this note as the "Stage 1 – Initial Economic Assessment".

4 Methodology

4.1 Introduction

4.1.1 This section considers the methodological approach undertaken to produce an economic assessment of GM's Investment-led Plan and CAZ Benchmark.

4.1.2 VfM is normally assessed by considering the extent to which the monetised benefits (and unquantified benefits) outweigh the costs. The key decision in most cases is whether action is preferable to inaction i.e., is this scheme worth doing? Inaction is not an option in this instance. There is a legal duty to achieve compliance in the shortest possible time and by 2026 at the latest. Therefore, given the duty to act, the absolute VfM is less material than a comparison between the Investment-led Plan and CAZ Benchmark and hence the approach has been developed to assess the relative VfM between the two scenarios.

4.1.3 The economic assessment has drawn upon a range of sources and toolkits to quantify and monetise costs and benefits for the Investment-led Plan and the CAZ Benchmark. A number of assumptions and caveats have been applied in this pragmatic approach, which is considered appropriate and proportionate given the need to achieve NO_2 compliance in the shortest possible time as discussed with JAQU in order to minimise delay.

4.2 Pragmatic and Proportionate Approach

4.2.1 A pragmatic and proportionate approach, as outlined above, has been adopted to derive monetised costs and benefits resulting in a BCR for the Investment-led Plan and the CAZ Benchmark. In adopting this approach, necessary assumptions and caveats have been incorporated to derive these outputs.

- **Source data:** As set out in **Section 4.3** the adopted approach has used several different data sources to monetise the benefits and costs associated with the Investment-led Plan. The Investment-led Plan is materially different to the Previous GM CAP and different appraisal tools have therefore been used to monetise the impact of the package of measures adopting a proportionate approach as outlined above. Where possible, consistency with the Stage 1 initial economic assessment has been applied, using a factoring approach to understand the magnitude of the differences between the Investment-led Plan and the CAZ Benchmark.

- **Factoring approach**: A factoring approach has been applied to some of the Investment-led Plan and CAZ Benchmark estimated end economic values. The values pivot off the Stage 1 initial economic assessment equivalents. This approach has been taken in lieu of a full economic business case standard appraisal, and is considered a proportionate approach to identify the scale of relative difference between the Investment-led Plan and CAZ Benchmark in a timely manner. The factoring approach retains the same price base as the original sourced data, with the end values being proportionate to the number of vehicles impacted and therefore scaled to the Investment-led Plan and the CAZ Benchmark. The factoring approach is considered reasonable for this assessment as most of the unit benefits and costs will remain constant between the Stage 1 initial economic assessment and the current assessment and therefore the differentiation has been applied on the number of people benefitting. This approach is discussed further in **Section 4.4**.
- **Appraisal period**: The appraisal period is shorter compared to traditional transport projects, set at the JAQU defined 10-year timeframe. The nature of the appraisal timeframe influences most of the costs and benefits. The only exception to this is the local highway measures which are based on a 30 year appraisal year period using standard TAG factors to derive monetised benefits from congestion impacts. This has been monetised via the TfGM's Programme Entry Appraisal Tool, described in **Section 4.3**.
- **Modelled years**: The Investment-led Plan traffic / air quality impacts are derived using a single modelled forecast year of 2025, and the CAZ Benchmark modelled years are 2025 and 2026, fewer in number / range than the Stage 1 initial economic assessment equivalent.
- **Modelled scenarios**: The appraisal methodology applied worst-case assumptions for the Do Minimum case bus fleet, which was based on May 2023 bus service and operational fleet information. This identified where exceedances would occur in 2025 if the GM fleet was not upgraded from the 2023 operational fleet. A proportion of GM bus fleet will be upgraded by 2025 as a result of the new fleet that will be available as new vehicles arrive to support the Bus Franchising process and associated electrification programme The CAP appraisal process used these known future bus resources to be specifically targeted at bus routes that were contributing to exceedances, reducing emissions. Therefore, these cleaner buses were added into the Investment-led Plan modelling, reducing emissions of Nitrogen Oxides (NO_X), Particulate Matter (PM) and carbon. However, in reality, by 2025 new OEM Euro VI / ZEBs will be operating on GM roads reducing emissions in GM. This benefit is not captured in the Do Minimum scenario emissions modelling. The CAP appraisal was designed to be an efficient approach to determine how to improve air quality at the exceedance locations (and hence be reported in the shortest possible time) but will over-estimate the annual mass emissions change from the Do Minimum scenario as a result.

- **Appraisal profile**: The appraisal profile has been applied based on the factored approach from the Stage 1 initial economic assessment, which does not take into account the potential differing distribution of benefits and costs with respect to discounting and other aspects. However, this change is not considered to be material to compare the relative VfM difference between the Investment-led Plan and CAZ Benchmark.
- **Vehicle upgrade projection profile**: Differences in the vehicle upgrade profile projections are not captured beyond the initial impact year for the Investment-led Plan and the CAZ Benchmark. With the change in the opening date and changes to the nature of the Investment-led Plan and CAZ Benchmark, this would result in changes to the time (years) 'gap' between the Do Minimum and Do Something Investment-led Plan and the CAZ Benchmark scenarios in terms of when owners would choose to upgrade / scrap their vehicles. However, this change is not considered to be material to compare the relative VfM difference between the Investment-led Plan and CAZ Benchmark.
- **Number of vehicle upgrades**: The number of vehicle upgrades associated with the Investment-led Plan and CAZ Benchmark is broadly consistent with those reported in the *Appraisal Report* and are used to derive benefits across several categories (including financial cost to upgrade, financial subsidy, transaction cost and fuel consumption costs) and captured as part of the 'Implementation Costs – vehicle funds'. The number of vehicles upgrading for the Investment-led Plan and CAZ Benchmark are extrapolated to profile the carbon emissions savings based on the difference between the number of non-compliant vehicles in the Do Minimum and Do Something. The Do Minimum scenario includes forward projections of natural upgrades based on GM and non-GM vehicle figures (derived from the *T4 Appendix 1 – Technical Note 37 Vehicle Population Estimates*). These figures were projected using the ANPR data collated between September and October 2023. Observed vehicle Euro standards were rolled forward to 2035, reflecting the fleet's natural turnover. This method preserves the age distribution of the vehicle population for each vehicle type enabling the estimation of the proportion of non-compliant vehicles that 'become' compliant in that period. The Clean Taxi Fund as part of the Investment-led Plan, submitted as part of the Summer 2024 evidence submission, assumes that taxi drivers will wait until CAP funding is released to upgrade their vehicles and thus the vehicle volumes assumed in a Do-Something scenario will not have been naturally upgraded from 2023. However, for the purposes of this pragmatic and proportionate assessment, this assumed change in taxi driver behaviour delaying upgrading their vehicles has not been included and thus the number of vehicles eligible to take-up the funding is lower when compared against the Investment-led Plan funding ask. Both approaches assumes that the GM-licensed taxi fleet are 100% compliant by the end of 2025.
- **Exclusion of historic costs**: Costs to date associated with the GM CAP have been excluded from the Investment-led Plan and CAZ Benchmark. This is considered a proportionate approach to focus on the relative difference between the Investment-led Plan and the CAZ Benchmark.

- **Optimism bias**: This has been kept at the same level as the Stage 1 initial economic assessment as part of the overall factoring approach to estimating the economic costs.

4.2.2 This approach is considered appropriate in delivering JAQU the information requested in respect to VfM in a timely manner having regard to the duty to achieve compliance in the shortest possible time.

4.3 Methodology

4.3.1 As identified above, the economic assessment has been conducted through the use of multiple toolkits to appraise specific elements of the Investment-led Plan and the CAZ Benchmark. These are as follows:

- **Defra Damage Costs Appraisal Toolkit (February 2023) –** This tool has been used to estimate the emissions impact on health for PM and NO_X based on EMIGMA (GM's emissions model) outputs. The emissions outputs are based on the Do Something impact compared to the Do Minimum based on the modelled years and extrapolated based on the forecast vehicle churns, comparing the Do Minimum to Do Something forecasts to identify the narrowing difference. This toolkit has been used for the Investment-led Plan and the CAZ Benchmark with a consistent approach with the Stage 1 initial economic assessment albeit based on a newer toolkit version.

TfGM's Programme Entry Appraisal Tool (PEAT) Version 2.2 – This tool has been used to estimate the local measure traffic congestion impact, using the latest version of the PEAT (Version 2.2) which applies updates from the TAG databook, released in November 2023. This toolkit is a development based on the Department for Transport's (DfT) Active Mode Appraisal Toolkit typically assist with a quick, proportionate appraisal of active mode transport schemes. This toolkit is only applicable to the Investment-led Plan and was not used in the Stage 1 initial economic assessment (as a material impact on traffic performance was not identified for that).

4.3.2 Several data sources have been used to derive inputs for the economic assessment. These are listed below:

- **Stage 1 initial economic assessment Previous GM CAP (GM-wide CAZ)** – A factoring approach has been used to scale the Investment-led Plan and CAZ Benchmark based on either; 1) the number of vehicles upgrading, or 2) financial costs.
- **Transport Appraisal Guidance (TAG) databook (May 2024) Version 1.23 –** TAG databook values have been used to derive the monetised carbon impacts for the Investment-led Plan and the CAZ Benchmark. This approach has been applied consistently for the Investment-led Plan and the CAZ Benchmark and consistent with the Stage 1 initial economic assessment albeit based on a newer TAG version.

- **Scheme Costs** – Scheme economic costs have been developed based on high-level assumptions and comparative financial costs. Scheme costs have been inputted from the Investment-led Plan and CAZ Benchmark Financial Models. The costs used for the economic assessment exclude Quantified Risk Assessment and contingency. The scheme costs are based on current (2024) prices and are not discounted and not Optimism Bias adjusted, that is captured within the Stage 1 initial economic assessment values from which these costs are pivoted from, factored by the relative change in the corresponding financial values. The costs for each element under the Investment-led Plan and CAZ Benchmark are reported in the *Appraisal Report*.

4.4 Assessment Approach by Metric

4.4.1 The assessment approach used to derive economic calculations to be specified based on the following metrics is summarised in **Table 1** and each metric is considered in more detail below.

Table 1: Economic calculation methodology

Economic Metric Category	Economic Metric	Assessment Approach
Transport Users: benefits (+ve) and charges (-ve)	Financial cost to upgrade	Factoring Approach based on the Stage 1 initial economic assessment (Previous GM CAP) economic values
	Financial subsidy (vehicle upgrades)	Factoring Approach based on the Stage 1 initial economic assessment (Previous GM CAP) economic values
	Transaction cost	Factoring Approach based on the Stage 1 initial economic assessment (Previous GM CAP) economic values
	Fuel consumption changes	Factoring Approach based on the Stage 1 initial economic assessment (Previous GM CAP) economic values
	Local highway measure user impacts	Monetised via TfGM PEAT Tool
	Charge payments	Factoring Approach based on the Stage 1 initial economic assessment (Previous GM CAP) economic values
Air Quality/ Environment	Health and environmental impact	Monetised via Defra Air Quality Damage Cost Appraisal Toolkit
	Carbon reduction	Monetised via TAG Databook values
Costs (-ve) and Revenues (+ve)	Implementation cost	Factoring Approach based on the Stage 1 initial economic assessment (Previous GM CAP) economic values
	Operating & maintenance cost	Factoring Approach based on the Stage 1 initial economic assessment (Previous GM CAP) economic values
	Clean Air Zone revenues	Factoring Approach based on the Stage 1 initial economic assessment (Previous GM CAP) economic values

Note: The different shaded cells denote different approaches used to monetise benefits and costs including use of different appraisal tools.

Transport Users: Benefits and Charges

Financial cost to upgrade

4.4.2 The financial cost to upgrade to vehicle owners has been derived by applying a factoring approach from the Stage 1 initial economic assessment based on the number of vehicles upgrading between the previous scheme compared to the Investment-led Plan and CAZ Benchmark. The number of vehicles upgrading for the Investment-led Plan in 2025 has been updated since the December 2023 evidence submission to reflect the purchase of 40 new ZEBs and the upgrade of 77 buses to OEM Euro VI. The sum of vehicle upgrades, comprised of ZEBs and OEM Euro VI buses, have been factored in combination.

4.4.3 The Investment-led Plan costs have been inputted into the economic assessment from the Financial Models which provides a more granular breakdown of vehicle costs. The upgrade of OEM Euro VIs has been included as an operational cost within the Investment-led Plan Financial Model reflecting that these vehicles have been procured via the bus franchising mechanism, incurred at a cost to GM on an annual retention basis.

4.4.4 The number of upgrades and type of upgrade has a direct impact on the welfare cost associated with increased vehicle value and associated depreciation over the appraisal period. There are also impacts with respect to transaction costs, reduced CAZ payments (where relevant) and increased fuel efficiency as a result of upgrading to compliant, newer vehicles.

4.4.5 Whilst GM Authorities are upgrading their fleet to cleaner vehicles, the funding requested as part of the Investment-led Plan bus measures has been costed based on the targeted nature of identifying buses that operate on particular routes, some of which would not typically be chosen to upgrade, compared to other more frequent, high demand routes. Under bus franchising, the bus operators retain vehicle ownership which is consistent with the methodology which was applied to the Stage 1 initial economic assessment as part of the Clean Bus Fund. Additionally, the Investment-led Plan also includes vehicle upgrades for taxi.

4.4.6 The financial subsidy acts as transfer payment with associated costs captured in the 'implementation costs' of the Investment-led Plan. The number of bus upgrades for the Investment-led Plan reflect the combined total of ZEBs and OEM Euro VIs.

4.4.7 As the factoring approach has been derived from the Stage 1 initial economic assessment, no changes have been applied to the assumed vehicle prices, depreciation rates, unit transaction costs and other associated parameters. The profile of relative Do Something to Do Minimum vehicle upgrades / scrappages remains unchanged, though the quantum of vehicles upgrades reflects the revised scheme projections.

<u>Financial subsidy (vehicle upgrades)</u>

4.4.8 The financial subsidy payments to businesses to help the upgrade to compliant vehicles have been estimated by factoring the Stage 1 initial economic assessment values by the relative change in the equivalent financial values for the Investment-led Plan and CAZ Benchmark.

Transaction costs

4.4.9 The transaction costs have been factored based on the Investment-led Plan and the CAZ Benchmark's number of vehicles upgrading relative to the Stage 1 initial economic assessment equivalent. The transaction costs as part of the Stage 1 initial economic assessment are based on values within the cost response models which were understood to be more representative of the total costs associated with purchasing a new vehicle compared to the JAQU default selected during the Previous GM CAP OBC stage.

Fuel consumption changes

4.4.10 Fuel consumption changes are associated with the number of vehicles switching fuel type, calculated by the fuel cost and the average mileage. These values have been factored based on the Investment-led Plan and the CAZ Benchmark's number of vehicles upgrading relative to the Stage 1 initial economic assessment equivalent.

Local highway measures user impacts

4.4.11 The impact of traffic re-routing due to the local highway measures aimed at reducing the number of vehicles travelling through the exceedance locations has been modelled in the GM Saturn model and then TfGM's PEAT[16] tool has been used to convert journey time changes into appraisal values. This impact is associated with the Investment-led Plan only.

Charge payments

4.4.12 The CAZ charge reflects users which will continue to operate non-compliant vehicles and incur the charge and any penalty payments for consumers which are treated as disbenefits. This value has been factored based on the CAZ revenue forecast between the CAZ Benchmark and the Stage 1 initial economic assessment. This impact is associated with the CAZ Benchmark only.

[16] PEAT is a TfGM adaptation of the DfT's AMAT spreadsheet. PEAT stands for Programme Entry Active Travel https://assets.publishing.service.gov.uk/media/631744188fa8f50220e60d1a/active-model-appraisal-toolkit-user-guidance.pdf

Air Quality/Environment

Health and environmental impact

4.4.13 The health and environmental impact of PM and NO_X benefits have been derived using the same methodology that has been applied during the Stage 1 initial economic assessment. The outputs from the EMIGMA model runs for the Investment-led Plan and the CAZ Benchmark have been processed within a spreadsheet tool using the JAQU damage cost approach, applying the Defra toolkit. EMIGMA NO_X and $PM_{2.5}$ (and PM_{10}) values have been exported directly from the EMIGMA model, collated on an area type basis for input into the Air Quality Damage Cost Appraisal Toolkit.

4.4.14 The emissions outputs from EMIGMA are captured by link (A-node, B-node). A screenshot is provided below of individual A-node and B-node which correspond to individual annual mass emissions values for NO_X, PM_{10} and CO_2 for the Do Minimum and Do Something scenarios. The emissions outputs from EMIGMA are consistent with the GM CAP air quality modelling.

Anode	Bnode	RoadID2	LENGTH_KM	LSOA_CODE	LSOA_NAME	S
13051	14111	13051_14111	0.21	E01006239	Wigan 017A	
6770	14111	6770_14111	0.14	E01006239	Wigan 017A	
1486	14108	1486_14108	0.052	E01005191	Manchester 021C	

4.4.15 GIS Lower Super Output Area (LSOA) data combines the emissions by link results with LSOA data (shown in a screenshot below) which have individual rural-urban classifications which is joined between the Office for National Statistics and DEFRA classifications. The emissions totals are then presented in the DEFRA classifications.

		Emission Tonnage											
LSOA_CODE	LSOA_NAME	2025 DM NOX	2025 DM PM10	2025 DM CO2	2025 DS NOX	2025 DS PM10	2025 DS CO2	2026 DM NOX	2026 DM PM10	2026 DM CO2	2026 DS NOX	2026 DS PM10	2026 DS CO2
E01006335	Wigan 034E	1.37	0.12	663.48	1.37	0.12	663.06	1.27	0.11	638.40	1.27	0.11	638.46
E01006220	Wigan 035A	2.43	0.27	1340.08	2.43	0.27	1344.33	2.23	0.26	1299.39	2.22	0.26	1289.99

4.4.16 The second 'Road Transport Rural' has been used in relation to non-GM links, which are typically of a strategic route nature, generally away from urban centres.

4.4.17 The monetary costs associated with differing levels of emissions are derived from the application of TAG and JAQU cost, deflator and uplift parameters to the change in emissions. As per the damage cost toolkit, these values are based on a 10-year appraisal, extrapolated based on the relative difference between the Do Something and the Do Minimum natural upgrades.

4.4.18 This replicates the approach included within the Stage 1 initial economic assessment but uses the current version of the Air Quality Damage Cost Appraisal Toolkit.

Carbon reduction

4.4.19 Similar to health and environmental impacts, the same methodology has been applied to derive the carbon reduction benefits as per the Stage 1 initial economic assessment. The carbon values associated with the Investment-led Plan and the CAZ Benchmark have been exported directly from the EMIGMA model.

4.4.20 These values are based on a 10-year appraisal extrapolation, based on the relative difference between the Do Something and the Do Minimum natural upgrades and monetised via TAG Databook (version 1.23) carbon values and discounted. This follows the previously agreed Stage 1 initial economic assessment economic appraisal model approach.

Costs and Revenues

Implementation cost

4.4.21 The implementation costs comprise all the costs associated with establishing the GM CAP. The implementation costs have been split out into 'vehicle funds' and 'infrastructure & other' costs to better reflect alignment with the financial subsidy benefit.

4.4.22 The 'vehicle funds' costs relate to the provision of funding to upgrade non-compliant vehicles. The 'infrastructure & other' costs relate to costs associated with CAZ infrastructure (including decommissioning) and also include local traffic measure costs for the Investment-led Plan.

4.4.23 The implementation costs have been factored based on the relative difference between the Investment-led Plan and the CAZ Benchmark with the Stage 1 initial economic assessment. No historic costs have been included from the Previous GM CAP for either the Investment-led Plan or the CAZ Benchmark.

Operating & maintenance cost

4.4.24 The operating and maintenance costs of the GM CAP capture the ongoing cost of running the GM CAP over the appraisal period. Similar to the implementation costs, the operating and maintenance costs have been factored based on the relative difference between the Investment-led Plan and the CAZ Benchmark with the Stage 1 initial economic assessment. No historic costs have been included from the Previous GM CAP for either the Investment-led Plan or the CAZ Benchmark.

Local highway measures costs

4.4.25 The local highway measure costs have been estimated based on the package of targeted measures. The package of targeted local measures can be summarised into the following:

- Signal optimisation at A57 Regent Road and adjacent parallel routes;

- Speed restrictions on A57 Regent Road with supporting enforcement measures;
- Yellow box enforcement along the A57 Regent Road corridor; and
- Traffic management measures – St John's area.

4.4.26 The estimated cost of the local measures has been sourced from the Investment-led Plan Financial Model (presented in 2024 prices). The cost of the local measures has been represented by a separate cost item in the economic calculations spreadsheet and therefore they have been deducted from the implementation costs (infrastructure & other). The local highway measure costs are applicable to the Investment-led Plan only.

Clean Air Zone revenues

4.4.27 The estimated CAZ revenues have been estimated based on the number of non-compliant vehicles which enter the CAZ area based on a 'Stay and Pay' behavioural response with revenue raised through a combination of daily charges and penalties. The estimate has applied a factoring approach between the CAZ Benchmark and the Stage 1 initial economic assessment. This impact is associated with the CAZ Benchmark only.

5 Findings

5.1.1 **Table 2** shows the economic appraisal results for the Investment-led Plan and the CAZ Benchmark to derive a BCR. This table has been extracted from the updated economic calculations spreadsheet, shared with JAQU alongside this note and included for completeness to support this note. The inputs to generate appraisal results have been reviewed as part of the checking process undertaken on the economic calculations spreadsheet and associated inputs.

Table 2: Economic Appraisal Results – September 2024

Discounted 2018 prices £m	CAZ Benchmark	Investment-Led Plan	Marginal: Investment over CAZ
Transport Users: benefits (+ve) and charges (-ve)	**£m**	**£m**	**£m**
Financial cost to upgrade	-17	-20	-3.4
Financial subsidy (vehicle upgrades)	92	66	-26
Transaction cost	-1.2	-0.0	1.2
Fuel consumption changes	10.2	12	1.9
Local Highway Measure User Impacts	n/a	-1.8	-1.8
Charge Payments	-17	n/a	17
Sub-total	**67**	**56**	**-11.3**
Air Quality/Environment			
Health and environmental impact	0.8	3.3	2.5
Carbon reduction	0.4	6.0	5.6
Sub-total	**1.2**	**9.3**	**8.1**
Present Value of Benefits (PVB)	**68**	**65**	**-3.2**
Costs (-ve) and Revenues (+ve)			
Implementation Costs - Vehicle Funds	102	73	-29
Implementation Costs - Infrastructure & Other (inc. ILP early termination costs)	11	6	-5
Operating & Maintenance cost	59	31	-28
Local Highway Measure Costs	n/a	5.0	5.0
Clean Air Zone Revenues	-21	n/a	21
Present Value of Costs (PVC)	**151**	**116**	**-36**
Net Present Value (NPV)	**-83**	**-50**	**33**
BCR	**0.45**	**0.56**	**n/a**

Note: The different shaded cells denote different approaches used to monetise benefits and costs including use of different appraisal tools and the relationship between each benefit and cost line.

5.1.2 The results show:

- The Present Value of Benefits (PVB) is positive for both the Investment-led Plan and CAZ Benchmark with a marginal higher benefit for the CAZ Benchmark which is due to the higher financial subsidy associated with the number of vehicle upgrades assumed in the CAZ Benchmark.
- Whilst there are a higher number of vehicle upgrades assumed under the CAZ Benchmark, the health, environmental impact and carbon reduction benefits are lower. This is reflected in the modelling outputs due to the inability of the CAZ Benchmark to achieve compliance in the modelled years and the narrowing gap between the CAZ Benchmark vehicle upgrades and natural upgrades in later years (beyond 2025).
- The Present Value of Costs (PVC) is higher for the CAZ Benchmark compared to the Investment-led Plan, consistent with the *Financial Models*, and reflects the higher vehicle upgrade costs and infrastructure costs. Whilst the CAZ revenues offset some of the CAZ Benchmark costs, the CAZ Benchmark PVC remains higher than the Investment-led Plan.
- The Net Present Value (NPV) for the Investment-led Plan is higher relative to the CAZ Benchmark albeit both reflect a negative value. The CAZ Benchmark PVC outweighs the broadly even monetised benefits between the Investment-led Plan and CAZ Benchmark.
- The BCRs for the Investment-led Plan and the CAZ Benchmark are broadly consistent, both between 0 and 1 and equates to a “poor” VfM. based on the Department for Transport’s Value for Money Framework categories.
- It is noted however, that the Do Minimum scenario does not meet the Direction requirement for compliance with legal limits for nitrogen dioxide meaning that action must be taken, which should be considered with respect to the interpretation of the VfM of the tested scenarios.

5.2 Sensitivity Testing

5.2.1 In-line with discussions with JAQU on the main sensitivity testing, as reported in the *Sensitivity Testing Report*, a review has been conducted based on the economic sensitivity tests which were produced as part of the Stage 1 initial economic assessment for the Previous GM CAP to understand the likelihood of the sensitivity tests resulting in a different impact between the Investment-led Plan and the CAZ Benchmark. These sensitivity tests are as follows:

5.2.2 The list of sensitivity tests reviewed as part of the Previous GM CAP is shown below:

- Depreciation rates changed from locally derived values to JAQU generic values;
- Transaction costs changed from locally derived values to JAQU generic values;

- Air quality benefits equivalent to the JAQU 'Low' value category;
- Air quality benefits equivalent to the JAQU 'High' value category;
- OPEX optimism bias of 13%;
- 0% CAPEX optimism bias;
- 50% additional CAPEX optimism bias; and
- Extended appraisal period.

5.2.3 Similar to the approach taken on the core economic assessment, consideration has been given to the relative differential impact of these sensitivity tests on the Investment-led Plan and the CAZ Benchmark.

5.2.4 Given the nature of these sensitivity tests, it is not considered that they would result in a materially differential impact between the Investment-led and CAZ Benchmark and therefore would be unlikely to alter the relative difference between the Investment-led Plan and the CAZ Benchmark. Therefore, in line with the approach outlined above, these sensitivity tests have not been conducted.

5.2.5 GM has identified three VfM sensitivity tests following discussions with JAQU. They are:

1. Adjustment to implementation costs to reflect higher and lower costs (10% test). This test has been conducted in lieu of adjusting optimism bias which is derived from the factoring approach.
2. Removal of bus-based emissions benefits in relation to the Investment-led Plan to account for potential overestimation of benefits relative to the Do Minimum due to the benefit of future bus resource deployment not being captured in the Do Minimum; and
3. A 10% reduction in the number of vehicles upgrading in the CAZ Benchmark and Investment-led Plan.

5.2.6 **Table 3** shows the sensitivity test results for key economic outputs namely the PVB, PVC, NPV and BCR. Based on the three identified tests above, the results show an expected positive and negative change to the NPV and BCR based on the changes to benefits and costs. Across the three sensitivity tests, the BCRs remain between 0 to 1, providing added robustness to the core assessment undertaken for the Investment-led Plan and the CAZ Benchmark.

Table 3 VfM Sensitivity Test – Results Summary

Sensitivity Tests	Core		Test 1 – Higher & Lower Implementation Costs				Test 2 – No Investment-led Plan bus emissions benefits		Test 3 – Lower vehicle upgrades	
			ST1a – 10% higher costs		ST1b – 10% lower costs		ST2		ST3	
£m	CAZ B.	ILP	CAZ B.	ILP	CAZ B.	ILP	CAZ B.	ILP	CAZ B.	ILP
PVB	68	65	68	65	68	65	68	58	60	59
PVC	151	116	163	124	140	107	151	116	140	107
NPV	-83	-50	-94	-59	-72	-42	-83	-57	-80	-48
BCR	**0.45**	**0.56**	**0.42**	**0.53**	**0.49**	**0.61**	**0.45**	**0.50**	**0.43**	**0.55**

Note: BCR cells shaded green denotes a positive (+) change compared to the core results. Red shaded cells denote a negative (-) change compared to the core results.

5.3 Optimism Bias

5.3.1 Optimism bias has been applied as part of the Stage 1 initial economic assessment based on the Stage 1 initial economic assessment position. This derived a Stage 3 level of optimism bias based on the TAG guidance as of July 2021.

5.3.2 Based on a weighted average of the component elements, this was estimated to be at a value of approximately 38%, higher than the typical value for a road scheme (20%) given the atypical nature of the scheme.

5.3.3 If the optimism bias was reduced to 20%, it would not alter the VfM categorisation for either current scenario and would not materially change the relative comparison between the Investment-led Plan and the CAZ Benchmark.

5.4 Analysis Limitations & Risks

5.4.1 The lists of identified risks for the Investment-led Plan and CAZ Benchmark are reported in the *Appraisal Report*. Associated with the analysis of the Investment-led Plan and the CAZ Benchmark there will be an inherent level of uncertainty which has been reported within the *Analytical Assurance Statement*. To avoid duplication, this section reviews areas which contribute to the highest economic benefits and costs to assess the risks associated with these values and therefore the likely most significant impact to the VfM assessment outputs.

5.4.2 The most significant economic benefit from the Investment-led Plan and the CAZ Benchmark in the VfM assessment is from the financial subsidy provided to vehicle owners to upgrade their vehicles. The Investment-led Plan provides financial support to buses and taxis only whereas the CAZ Benchmark provides mitigation to vehicle types covered under a CAZ Category C excluding bus (HGV, LGV, taxis, coach and minibus).

5.4.3 In terms of uncertainty around the pragmatic approach adopted to the benefits identified for the Investment-led Plan and the CAZ Benchmark, this is likely to be primarily around the cost to upgrade. Relative to the Stage 1 initial economic assessment, the gap between the assumed Do Minimum and Do Something vehicle upgrade / scrappage years will have narrowed because of the later scheme start year, which would likely have reduced the upgrade cost per vehicle, suggesting the end PVBs may be somewhat underestimated in this respect. Conversely though, the fuel consumption benefits would also become smaller in magnitude.

5.4.4 The most significant cost from the Investment-led Plan and the CAZ Benchmark is associated with the vehicle funds. The Investment-led Plan costs comprise of provision of grants to taxis, funding for ZEBs and OEM Euro VIs, bus depot electrification costs, CAZ decommissioning costs and local highway measures. Whilst there is a high degree of confidence in relation to the provision of funding for bus and taxis, further work is required with Manchester and Salford City Councils to agree the final costs of the package of local highway measures.

5.4.5 The implementation costs associated with the CAZ Benchmark are associated with the provision of grants to eligible vehicles (under a CAZ C) and infrastructure-related costs. Whilst the grant values are considered fixed and therefore there is a high degree of confidence on this cost item, the costs for the CAZ have not been developed following a procurement exercise albeit they have been informed from the contract costs associated with the Previous GM CAP.

5.5 Statement on Analytical Assurance

5.5.1 This section aims to provide a succinct summary on the reasonableness, robustness and uncertainty associated with this pragmatic and proportionate approach to the economic assessment undertaken for the Investment-led Plan and CAZ Benchmark as shown in **Table 4**. The programme level assurance and assurance on analysis which informs the tested scenarios' ability to meet the determining Critical Success Factor (achieving compliance in the shortest possible time and by 2026 at the latest) is considered separately in the *Analytical Assurance Statement*.

Table 4: Analytical Assurance – Value for Money

	1. Reasonableness of the Analysis / Scope for Challenge	
a)	Have we been constrained by time or cost, meaning further proportionate analysis has not been undertaken?	The economic assessment approach to generate BCR values for the Investment-led Plan and CAZ Benchmark has been developed specifically to support the Greater Manchester Clean Air Plan. The Direction on the 10 GM Authorities has influenced the bespoke approach used to calculate the quantified economic assessment, and to achieve compliance in the shortest possible time, and by 2026 at the latest, the level of economic assessment undertaken is considered proportionate.
b)	Is there further analysis that could be done which would lead to different conclusions?	It is not considered that further analysis would change the VfM conclusions. Both, the Investment-led Plan and CAZ Benchmark are shown to represent a "poor" VfM, but only the Investment-led Plan achieves compliance with the Direction. The assessment also shows that GM are able to deliver the Investment-led Plan at a lower cost compared to the CAZ Benchmark.
c)	Does the analysis rely on appropriate sources of evidence?	This economic assessment draws upon a range of sources. It draws upon previous GM CAP information through the Stage 1 initial economic assessment economic assessment using a factoring approach, monetisation of air quality benefits through DEFRA's Air Quality Damage Cost toolkit whilst utilising in-house appraisal tools such as the PEAT in relation to the Local Traffic Measures. It is considered that the tools used are appropriate and proportionate having regard to the requirements of the Direction and broadly reflect those used through the development of the GM CAP.
d)	How reliable are the underpinning assumptions?	This economic assessment draws upon information which has been developed, assured and reported elsewhere in the CAP suite of documentation. The vehicle fleet information and air quality outputs are assured via the core modelling process and considered in the *Analytical Assurance Statement*. The costs for the Investment-led Plan and CAZ Benchmark, used in this economic assessment, are set out in *the Financial Models* and reported in the *Appraisal Report*.
	2. Risk of Error / Robustness of the Analysis	
a)	Has there been sufficient time and space for proportionate levels of quality assurance to be undertaken?	GM considers this assessment to be suitably robust based on a pragmatic and proportionate approach that has evolved through discussions with JAQU to understand the relative difference between the Investment-led Plan and the CAZ Benchmark. The precision of this assessment is lower compared to a typical economic appraisal undertaken as part of a business case submission. This is based on the use of multiple assumptions, factoring based on the Stage 1 initial economic assessment values and the combination of the different toolkits and sources used to derive monetised costs and benefits for the Investment-led Plan and the CAZ Benchmark. Notwithstanding this lower level of precision, the outputs from this economic assessment are considered sufficient to understand the relative differences between the Investment-led Plan and CAZ Benchmark.
b)	How complicated is the analysis?	This economic assessment uses a simplified approach to derive a BCR calculation following feedback received by JAQU on the December 2023 evidence submission. This assessment uses output values for costs, number of vehicle upgrades and emissions which are developed and assessment separately to this economic assessment. However, this assessment does use a combination of different toolkits and sources to derive a BCR for the Investment-led Plan and the CAZ Benchmark.

c)	How innovative is the approach?	The approach adopted is based on a simplified version of standard tools and metrics in accordance with standard TAG process and is considered proportionate for the reasons outlined above. The Investment-led Plan and CAZ Benchmark uses a factoring approach against the Stage 1 initial economic assessment Previous GM CAP scheme which had developed a full economic assessment.
d)	Have sufficiently skilled staff been responsible for producing the analysis?	TfGM and the consultant team have expertise in economic appraisals that have been used on a range of different projects. The consultant team were chosen following a competitive tendering process where the experience and skills of individuals being put forward was a key factor in their selection.
	3. Uncertainty	
a)	What is the level of inherent uncertainty (i.e. the level of uncertainty at the beginning of the analysis) in the analysis?	There is a level of uncertainty associated with forecasting the economic benefits and costs of the Investment-led Plan and CAZ Benchmark. As stated previously, this economic assessment uses a combination of different toolkits and sources however it is considered proportionate to understand the relative difference between the Investment-led Plan and the CAZ Benchmark. The approach to generate an appropriate, proportionate assessment using a factoring approach from the Stage 1 initial economic assessment has been checked and reviewed by JAQU as part of the Previous GM CAP. Following discussions, JAQU and GM acknowledge that the assessment generated is less precise compared to a full economic assessment, typically conducted as part of a business case submission. However, GM considers it is proportionate for carrying out a relative assessment between the Investment-led Plan and the CAZ Benchmark. VfM is a secondary Critical Success Factor with the CAZ Benchmark failing to meet the Determining Critical Success Factor to achieve compliance in the shortest possible time and by 2026 at the latest. Therefore, the VfM outcomes are less material compared to a traditional VfM assessment and the level of uncertainty considered acceptable should be considered on this basis. The uncertainty associated with the Investment-led Plan and the CAZ Benchmark measures is considered in the *Analytical Assurance Statement*. Following discussions with JAQU on the economic calculations spreadsheet in January 2024 and subsequent feedback, GM has identified three VfM sensitivity tests. They were: 1. To run a lower optimism bias test on the implementation costs to reflect the higher degree of certainty on the Investment-led Plan and CAZ Benchmark. 2. To remove bus-based emissions benefits in relation to the Investment-led Plan to account for potential overestimation of benefits relative to the Do Minimum due to the benefit future bus resource deployment not being captured in the Do Minimum; and 3. A 10% reduction in the number of vehicles upgrading in the CAZ Benchmark and Investment-led Plan.
b)	Has the analysis reduced the level of uncertainty? What is the level of residual uncertainty (the level of uncertainty	The economic assessment has utilised, where available, information and guidance to support the assessment of the GM CAP. Sensitivity testing has been undertaken as part of the Stage 1 initial economic assessment. As stated in Section 5.2, consideration has been given to the relative differential impact of sensitivity tests on the Investment-led Plan and the CAZ Benchmark. The previously identified tests were not considered to result in a differential impact between the Investment-led

remaining at the end of the analysis)?	Plan and CAZ Benchmark and would be unlikely to alter the relative difference between the Investment-led Plan and the CAZ Benchmark. Therefore, these sensitivity tests have not been conducted as part of this proportionate assessment approach. However, three sensitivity tests were carried out as stated above. The results demonstrate that the Investment-led Plan and the CAZ Benchmark are less sensitive to changes to costs or the number of vehicle upgrades as these metrics are represented as a benefit, providing financial subsidies and air quality benefits as an example, and as a cost. It is considered that Sensitivity Test 2 and 3 have been undertaken representing hypothetical scenarios as the EMIGMA model has estimated the bus-related benefit associated with the procurement of cleaner buses and there are control mechanisms associated with bus (through bus franchising) and taxi (through vehicle licensing emission standards) to provide certainty on the number of vehicle upgrades. The sensitivity test results show that the BCR values for the Investment-led Plan and the CAZ Benchmark remain between 0 and 1. This provides robustness that the core assessment provides an accurate representation for VfM with both the Investment-led Plan and the CAZ Benchmark likely to result in a “poor” VfM.

6 Summary & Conclusions

6.1.1 A proportionate and pragmatic approach has been adopted to derive BCRs for the Investment-led Plan and the CAZ Benchmark to understand the magnitude of the relative differences between the Investment-led Plan and the CAZ Benchmark VfM.

6.1.2 The Investment-led Plan and the CAZ Benchmark return a similar VfM, classed as a “Poor” VfM with a reasonable level of confidence that the Investment-led Plan and the CAZ Benchmark fall within a similar magnitude of VfM in economic terms based on the proportionate and pragmatic assessment undertaken.

6.1.3 However, the VfM economic outcome does not factor in that the CAZ Benchmark fails to meet the Determining Critical Success Factor and the requirement of the Direction to achieve compliance in the shortest possible time and by 2026 at the latest, based on modelled outputs as reported in the Appraisal Report.