

**Note 1: Data, Evidence and Modelling Post-OBC approach  
Update to Appendices for JAQU workshop 24<sup>th</sup> October 2019**

**COVID-19 Pandemic Statement**

This work has not considered the impact of the COVID-19 pandemic. Whilst we are continuing, where possible, to develop the Greater Manchester Clean Air Plan, the pandemic has already had an impact on our ability to keep to the timescales previously indicated and there may be further impacts on timescales as the impact of the pandemic becomes clearer.

We are also mindful of the significant changes that could result from these exceptional times. We know that the transport sector has already been impacted by the pandemic, and government policies to stem its spread. The sector's ability to recover from revenue loss, whilst also being expected to respond to pre-pandemic clean air policy priorities by upgrading to a cleaner fleet, will clearly require further thought and consideration.

The groups most affected by our Clean Air Plan may require different levels of financial assistance than we had anticipated at the time of writing our previous submission to Government.

More broadly, we anticipate that there may be wider traffic and economic impacts that could significantly change the assumptions that sit behind our plans. We have begun to consider the impacts, and have committed to updating the government as the picture becomes clearer over time.

We remain committed to cleaning up Greater Manchester's air. However, given the extraordinary circumstances that will remain for some time, this piece of work remains unfinished until the impact of the COVID-19 pandemic has been fully considered by the Greater Manchester Authorities.

**\*UPDATE\* APPENDIX TWO: DATA, EVIDENCE AND MODELLING RESPONSE TO LETTER FROM ANDREW JACKSON, 23RD MAY 2019**

Issues raised in letter of 23 <sup>rd</sup> May	Response as at 12 <sup>th</sup> July 2019		Response as at 24 <sup>th</sup> October 2019	
	GM response	Evidence supplied?	GM response	Evidence supplied?
Confirmation of which measures have been modelled as being needed for compliance	<p>The OBC assumes all measures are required for compliance. The modelling includes a representation of the following measures:</p> <ul style="list-style-type: none"> <li>• CAZ B in 2021, CAZ C in 2023;</li> <li>• Funds to support the upgrade of all buses, and some freight vehicles and taxis; and</li> <li>• Investment in EV charging points.</li> </ul> <p>Measures to promote sustainable journeys have not been modelled.</p> <p>At FBC, GM intends to provide disaggregated modelling to demonstrate the impact of each implementation measure on compliance (subject to any technical limitations). This will be carried out once the measures are fully defined.</p>	No	<p>Revised package modelling has been conducted to support the Consultation. The following measures have been included in the core strategic modelling:</p> <ul style="list-style-type: none"> <li>• GM-wide CAZ C</li> <li>• Clean Bus, Taxi and Commercial Vehicle Funds</li> <li>• Sustainable Journeys measures</li> </ul> <p>The following measures are included within GM's funding ask but are not required for compliance and have not been included in the modelling:</p> <ul style="list-style-type: none"> <li>• Vehicle Finance</li> <li>• Charging infrastructure for electric vehicles</li> </ul> <p>Additional modelling has been carried out separately investigating the impact of the City Centre Transport Strategy proposals on emissions. Initial modelling of traffic management measures at local exceedance sites has also been conducted.</p> <p>Initial modelling has been carried out to test the effectiveness of different scheme design options and to identify the impact of each measure – this was carried out in an interim version of the modelling suite.</p> <p>Further modelling using the fully updated modelling suite will be carried out in November 2019 to provide a disaggregated view of the impact of each Implementation Fund measure, plus any CAF fund measures that also contribute to compliance.</p>	<p>Revised package modelling supplied</p> <p>Initial modelling of individual measures to be supplied shortly</p> <p>Further disaggregated modelling to be supplied by end 2019</p>

Issues raised in letter of 23 <sup>rd</sup> May	Response as at 12 <sup>th</sup> July 2019		Response as at 24 <sup>th</sup> October 2019	
	GM response	Evidence supplied?	GM response	Evidence supplied?
Assessing whether additional measures targeted at the longest outstanding exceedances can bring forward compliance.	GM has identified 12 sites that are the last remaining exceedance locations in 2023/4 to explore whether local measures could mean that compliance could be brought forward or early benefits realised. This study is underway and an interim report will be provided to JAQU on the 12 <sup>th</sup> July.	Yes	<p>Initial reports of the local exceedances exploratory study were supplied on 12<sup>th</sup> July and 2<sup>nd</sup> August.</p> <p>The local exceedances study within the city centre has been subsumed into the work to develop the City Centre Transport Strategy (CCTS) proposals. The CCTS proposals have been modelled in GM's city centre Paramics model and an assessment has been made of their possible impact on emissions and exceedances in addition to the core CAP package. It should be noted that the CCTS tests are based on a draft set of proposals, and currently do not have a formal status.</p> <p>Traffic management and sustainable journeys proposals have been identified at three sites, representing the final points of exceedance outside the city centre. These measures cannot be effectively represented in the strategic modelling at present.</p> <p>It has been agreed with JAQU that it is not sensible to proceed with the development of any proposals at the A57 Regent Road in Salford given that the major junction re-modelling scheme has only just re-opened. Monitoring will be undertaken to assess real-world conditions post-opening.</p>	Yes

Issues raised in letter of 23 <sup>rd</sup> May	Response as at 12 <sup>th</sup> July 2019		Response as at 24 <sup>th</sup> October 2019	
	GM response	Evidence supplied?	GM response	Evidence supplied?
<p>Reviewing with you the vehicle upgrade assumptions used, particularly for buses and taxis/private hire and whether these have an impact on the option chosen</p>	<p>GM is undertaking a review of all vehicle upgrade and behavioural response assumptions and is developing a revised approach for HGV, LGV, PHV and Hackney Cab responses. This means that the 100% upgrade assumption applied to Hackney Cabs will be replaced at FBC with an evidence-based behavioural response. These are described in a series of papers to be provided on the 12<sup>th</sup> July.</p> <p>GM has discussed the complexity of assessing and modelling possible bus upgrade responses and has developed a sensitivity testing methodology to assess what proportion of buses must be upgraded to achieve compliance. To be supplied in a paper on the 12<sup>th</sup> July.</p>	Yes	<p>GM has carried out a review of all vehicle upgrade and behavioural response assumptions and has developed a revised approach for HGV, LGV, PHV and Hackney Cab responses. This means that the 100% upgrade assumption applied to Hackney Cabs at OBC has been replaced with an evidence-based behavioural response in the Consultation package.</p> <p>Initial updates on the revised methodology for each vehicle type were supplied to JAQU on 12<sup>th</sup> July. Updated notes will be supplied by 1<sup>st</sup> November 2019 to inform JAQU and the TIRP, alongside a table outlining how these notes relate to/replace the contents of the strategic modelling Technical Reports.</p> <p>A full update of the strategic modelling Technical Reports (T1-4, AQ1-3, AAS) is planned for end December 2019, to be published alongside the Consultation. The series of technical notes supplied to date will also be published, subject to limitations in terms of commercially sensitive or personal data.</p> <p>GM has undertaken sensitivity testing, using an off-model analysis method, testing the minimum bus upgrade required to achieve compliance, supplied 12<sup>th</sup> July as 'Note 11: Analysis of Bus Upgrade for compliance'. A further sensitivity test of the impact of a fully electric GM bus fleet was supplied as 'Note 21: GM CAP Sensitivity test of full electric bus fleet'.</p>	Yes
<p>Justifying the contribution to compliance of individual measures, such as electric vehicle upgrade, sustainable transport and local authority fleet upgrade</p>	<p>GM is gathering further evidence on the efficacy of investment in EV infrastructure and sustainable transport to deliver AQ improvements. Modelling or analysis will be provided to justify the contribution of any measures proposed for implementation funding to compliance.</p> <p>If measures are proposed under the CAF, evidence will be supplied in accordance with the relevant guidance.</p>	No	<p>A review of evidence with regards to the impact of investment in EV charging infrastructure was undertaken and following consultation with JAQU, the decision was taken to remove any assumed additional EV uptake for passenger cars and LGVs from the Consultation package modelling.</p> <p>GM has evidence that investment in sustainable journeys interventions can be effective in achieving mode shift. A sensitivity test was carried out to establish whether such investment could have an impact on compliance. The proposals were found to have a minor beneficial impact and thus have been incorporated in the Consultation package modelling as an assumed Implementation Fund measure.</p> <p>GM is no longer planning to include a funding bid for LA Fleet upgrade in the CAP as modelling showed the impact to be insignificant.</p>	Yes

Issues raised in letter of 23 <sup>rd</sup> May	Response as at 12 <sup>th</sup> July 2019		Response as at 24 <sup>th</sup> October 2019	
	GM response	Evidence supplied?	GM response	Evidence supplied?
Demonstrating that a GM CAZ D cannot bring forward compliance, including outlining the delivery challenges discussed for a GM wide CAZ	Work is underway to further demonstrate that a GM CAZ D cannot bring forward compliance and an interim update will be supplied week of 15 <sup>th</sup> July.  *UPDATE* Note that in fact the provision of this Note was delayed.	Yes No	'Note 17: Evidence supporting the decision not to progress with a GM-wide CAZ D' has been supplied to JAQU in October 2019.	Yes
Further justifying your case that bringing forward the CAZ C exemption cannot bring forward compliance	Work is underway to further justify the case that bringing forward the CAZ C exemption cannot bring forward compliance and an interim update will be supplied on the 12 <sup>th</sup> July.	Yes	'Note 12: Evidence of the impact of a 2021 CAZ C' was supplied to JAQU on 12 <sup>th</sup> July and further discussions and evidence sharing have taken place since then. Revised estimates of the number of LGVs expected to upgrade to new and secondhand vehicles have been supplied to JAQU on 22 <sup>nd</sup> October 2019.	Yes
For all [Clean Air Fund] schemes, justifying the cost, the assumptions used about uptake, and further information on how these have been arrived. Further detail on how the schemes are intended to operate and how they are they targeted at those most affected.	Work is underway to develop detailed case-making and scheme designs for each of the measures. If a decision is made to progress with any measures under the Clean Air Fund, a bid will be developed in line with JAQU's guidance.  Health, environment, equalities and socio-economic impacts assessments are underway to inform the assessment of any CAF measures.	No	Work has been carried out to develop detailed case-making and scheme designs for each of the measures – initial information on how funding offers and uptake have been estimated will be supplied on 24 <sup>th</sup> October and in Technical Notes to follow that meeting.  Initial drafts of the health and socio-economic impacts assessments have been received and reviewed by the project teams. An equality impact assessment is underway to inform the assessment of any CAF measures.  Full CAF bids are being developed in line with JAQU guidance.	Yes, further information to follow
Immediate priority 1: Exploring whether measures targeted at the last remaining exceedance locations following implementation of a CAZ in 2021 would achieve compliance quicker	As described above, GM is undertaking a study of key local exceedance locations and will supply an interim report on the 12 <sup>th</sup> July.	Yes	Initial modelling suggests that the CCTS proposals could be effective in delivering emissions reductions in the regional centre. Incompatibility between the CAP strategic modelling suite and the Paramics model make it difficult to assess whether compliance would be brought forward. The CCTS is only at pre-consultation stage and so has yet to be adopted and therefore has no agreed timetable for delivery.  Initial modelling suggests that traffic management and sustainable journeys measures at three sites could reduce emissions, but again it is unclear whether this would bring forward compliance at these sites.	Yes

Issues raised in letter of 23 <sup>rd</sup> May	Response as at 12 <sup>th</sup> July 2019		Response as at 24 <sup>th</sup> October 2019	
	GM response	Evidence supplied?	GM response	Evidence supplied?
Immediate priority 2: Updating the behavioural assumptions used to model the impact of a CAZ, following the TIRP's suggestions	As described above, GM is updating the behavioural assumptions used to model the impact of the CAZ, using new data and tools and informed by the TIRP's suggestions, and will supply a series of papers describing the process and findings on the 12 <sup>th</sup> July.	Yes	As described above, GM has updated the behavioural assumptions used to model the impact of the CAZ, using new data and tools and informed by the TIRP's suggestions, and will supply an updated series of papers describing the process and findings on the 1 <sup>st</sup> November, following the submission of draft notes on the 12 <sup>th</sup> July and 2 <sup>nd</sup> August and discussions at fortnightly Technical Review sessions with JAQU technical experts.	Yes
Immediate priority 3: Providing further sensitivity testing on your vehicle upgrade assumptions	GM has undertaken sensitivity testing, using an off-model analysis method, testing the minimum bus upgrade required to achieve compliance, supplied 12 <sup>th</sup> July. GM has undertaken a sensitivity test of the impact of a CAZ C in 2023 (without supporting measures) applying updated behavioural response assumptions, to be supplied week of 15 <sup>th</sup> July.	Yes	<p>GM has undertaken sensitivity testing, using an off-model analysis method, testing the minimum bus upgrade required to achieve compliance, supplied 12<sup>th</sup> July as 'Note 11: Analysis of Bus Upgrade for compliance'.</p> <p>A further sensitivity test of the impact of a fully electric GM bus fleet was supplied as 'Note 21: GM CAP Sensitivity test of full electric bus fleet' on 5<sup>th</sup> August 2019.</p> <p>GM supplied on 16<sup>th</sup> July 2019 a sensitivity test of the impact of a CAZ C in 2023 (without supporting measures) applying updated interim behavioural response assumptions as 'Note 16: GM CAP GM-wide CAZ C with revised behavioural responses'.</p> <p>As part of the development process for the scheme design, GM has carried out a number of sensitivity tests of the impact of different charge levels, funding offers and terms, and EV uptake assumptions. These informed the conclusions presented in the workshop on the 24<sup>th</sup> October and will be supplied as Notes subsequently in mid-November.</p>	Yes

**\*UPDATE\* APPENDIX THREE: INITIAL DATA, EVIDENCE AND MODELLING RESPONSE TO TIRP FEEDBACK**

Summary of requirements/feedback	Source & rating	Initial GM response	GM response as at 24 <sup>th</sup> October 2019
Model validation – review implications of poor validation	TIRP	Underway at key sites via the local exceedances work – see interim report for initial findings.	<p>Analysis has been undertaken at all sites identified as part of the local exceedances study. It was identified that the local exceedance site in Oldham was modelled with too narrow road widths and this has been corrected, removing it from consideration as one of the last points of exceedance.</p> <p>Further off-model analysis is underway to investigate the validity of low speeds at the A6 site.</p>
Model validation – validation by vehicle class	TIRP	This can be reported although caution is required around less well represented classes. Will be supplied at FBC as a revision to T2.	No change.
Demand sifting tool assumptions need to be better explained and justified	TIRP	GM has carried out a full audit of the Demand Sifting Tool and is producing a manual. GM recognises the need to provide a thorough description of the methodology and this will be supplied as a revision to T4 at FBC.	<p>GM has carried out a full audit of the Demand Sifting Tool and is producing a manual, to be supplied to JAQU for the TIRP by 1<sup>st</sup> November 2019, alongside updated notes setting out the behavioural response assumptions and methodological base sitting behind the Demand Sifting Tool.</p> <p>A thorough description of the methodology and this will be supplied as a revision to T4 by end December 2019.</p>
Behavioural responses – better description of methodology and sources for assumptions, discussion of uncertainty, issues of lack of destination choice	TIRP	<p>A thorough review of the behavioural response assumptions is underway and it is intended that the responses applied at FBC will be grounded in more robust evidence. Papers have been described providing updates on this work and an initial sensitivity test of the impacts.</p> <p>This process, the sources and methodology will be supplied at FBC as a revision to T4. Further sensitivity testing will be conducted on the revised tools and updated preferred option, and these will be supplied alongside a discussion of uncertainty as an update to the AAS at FBC.</p> <p>An appropriate variable demand model was not available and so it will not be possible to resolve the lack of representation of destination choice. This is considered less significant given the regional scale of the scheme.</p>	<p>GM has carried out a review of all vehicle upgrade and behavioural response assumptions and has developed a revised approach for HGV, LGV, PHV and Hackney Cab responses.</p> <p>Initial updates on the revised methodology for each vehicle type were supplied to JAQU on 12<sup>th</sup> July. Updated notes will be supplied by 1<sup>st</sup> November 2019 to inform JAQU and the TIRP, alongside a table outlining how these notes relate to/replace the contents of the strategic modelling Technical Reports.</p> <p>A full update of the strategic modelling Technical Reports (T1-4, AQ1-3, AAS) is planned for end December 2019, to be published alongside the Consultation. The series of technical notes supplied to date will also be published, subject to limitations in terms of commercially sensitive or personal data.</p> <p>Variable demand model – no change.</p>
Behavioural responses – segmentation of vans by user type	TIRP	A segmentation of vans by user type has been applied in the revised methodology for deriving LGV behavioural responses.	No change – see ‘Note 7: LGV and HGV Operational Cost Model’ for details.

Summary of requirements/feedback	Source & rating	Initial GM response	GM response as at 24 <sup>th</sup> October 2019
Behavioural responses – incorporate car to van response	TIRP	A van to car response is being applied in the revised methodology for deriving LGV behavioural responses.	No change – see ‘Note 7: LGV and HGV Operational Cost Model’ for details.
Behavioural responses – identifying ‘point of failure’ for scheme	TIRP	This is complex to assess but sensitivity testing will be carried out to inform our understanding at FBC. Some relevant analysis is underway as part of the local exceedances project – see interim report.	<p>GM has undertaken sensitivity testing, using an off-model analysis method, testing the minimum bus upgrade required to achieve compliance, supplied 12<sup>th</sup> July as ‘Note 11: Analysis of Bus Upgrade for compliance’.</p> <p>A further sensitivity test of the impact of a fully electric GM bus fleet was supplied as ‘Note 21: GM CAP Sensitivity test of full electric bus fleet’.</p> <p>GM supplied a sensitivity test of the impact of a CAZ C in 2023 (without supporting measures) applying updated interim behavioural response assumptions as ‘Note 16: GM CAP GM-wide CAZ C with revised behavioural responses’.</p> <p>As part of the development process for the scheme design, GM has carried out a number of sensitivity tests of the impact of different charge levels, funding offers and terms, and EV uptake assumptions. These will be described in the workshop on the 24<sup>th</sup> October and supplied as Notes subsequently.</p> <p>Further sensitivity testing will be carried out over the coming months.</p>
Behavioural responses – reconsider and justify use of Bristol SP data	TIRP	GM has developed a revised methodology for assessing behavioural responses and is no longer dependent on the Bristol SP data for assessing the preferred option.	No change. See ‘Note 6: GM CAP: Behavioural response assumptions and available data sources’ for a discussion of available data sources.
Behavioural responses – need to improve responses to grant/loan schemes via new surveys	TIRP	GM is carrying out data collection and analysis to inform the assessment of responses to grant/loan schemes, including surveys. New tools will be developed. The results and methodology will be supplied as an update to T4 at FBC.	<p>GM has carried out data collection and analysis to inform the assessment of responses to grant/loan schemes including:</p> <ul style="list-style-type: none"> <li>• Data gathering and market analysis as reported in Notes 3, 4, 18 and 19 describing the freight, coach, minibus and taxi and private hire fleets respectively;</li> <li>• New surveys including ANPR surveys (Note 5), specialised goods vehicle counts (Note 20), and fieldwork with van drivers, Hackney cab and private hire drivers (results to follow in November 2019); and</li> <li>• Data gathering on credit worthiness and other aspects related to vehicle finance (underway).</li> </ul> <p>The Operational Cost Models have been developed to allow the testing of grant funding options (described in Note 7 and forthcoming notes on the OCM tools for taxi, coach and minibus), and an analytical tool has been developed to assess loan finance scheme design options and impact on uptake.</p>

Summary of requirements/feedback	Source & rating	Initial GM response	GM response as at 24 <sup>th</sup> October 2019
Behavioural responses – need to consider changes to second hand market resulting from scheme	TIRP	Analysis is underway to better understand the potential for changes to the second hand market resulting from the scheme, but it is not yet clear if it will be possible to take this into account in the quantification of impacts.	Some analysis of possible impacts has been undertaken, but it is considered that this depends on many factors beyond the control and remit of the GM CAP, including CAP interventions elsewhere in the UK. It is not possible for GM to undertake this analysis on our own and hence would be purely speculative for GM to take this into account in the quantification of impacts.
Sensitivity testing – further testing focussed on specific policies and uncertainties	TIRP	Some early sensitivity testing has been carried out, as described above. A full programme of sensitivity testing will be conducted to inform the FBC, following scheme design and package modelling.	See above notes on sensitivity testing carried out to date. Further sensitivity testing is planned.
Overlapping policies – provide more detail on supporting schemes as part of the package	TIRP	Modelling or analysis will be provided to justify the individual contribution of any measures proposed for implementation funding to compliance. This will be presented in the main body of the FBC and as an update to AQ3.	Modelling or analysis will be carried out to justify the individual contribution of any measures proposed for implementation funding to compliance and will be provided to JAQU by end December 2019 and published alongside the consultation.
Calibration – analysis and sensitivity testing of AQ model calibration	TIRP	Further model runs to test model parameterisation can be undertaken at FBC, to be supplied as an update to AQ3.	No change.

**\*UPDATE\* APPENDIX FOUR: INITIAL DATA, EVIDENCE AND MODELLING RESPONSE TO DIRP FEEDBACK**

Summary of requirements/feedback	Source & rating	Initial GM response	GM response as at 24 <sup>th</sup> October 2019
Cost/benefit analysis - Although the guidance has been followed correctly the analysis relies heavily on the LGV/HGV upgrade response which is uncertain (similar issues for taxis/PHVs).	DIRP	Improvements to the methodology for deriving behavioural responses should resolve this issue. It would also be possible to carry out sensitivity testing of for the preferred option looking at the impact of uncertainty in transport modelling on the economic appraisal, to be supplied as at update to the EAMR at FBC.	No change.
Uncertainty - Not detailed in the economic methodology report or economic case. Will be particularly important given the comments given for Q2 and the additional information forthcoming from a number of ongoing stakeholder consultations as noted in the OBC.	DIRP	GM will provide further narrative on the sensitivity testing of the OBC economic appraisal and will ensure that further tests are supplied with a full explanatory narrative, as an update to the EAMR at FBC.	No change.
Distributional analysis / mitigation - More consideration is needed with regard to potential regional distributional impacts given the size of the study area, the nature of the preferred option and the differences in characteristics between the LAs/areas involved.  Currently the business case does not specify which measures should be funded from the CAF.	DIRP	Health, Environment, Equalities and Socio-economic Impacts Assessments are underway and will inform a consideration of potential regional distributional impacts, to be supplied as an additional appendix to the FBC and considered in the Economic Case.  The OBC assumes that all measures will be funded via the Implementation Fund. The FBC will specify whether measures are proposed as Implementation or	Initial drafts of the health and socio-economic impacts assessments have been received and reviewed by the project teams. An equality impact assessment is underway. An environmental impacts assessment is no longer planned.  Whilst GM remains clear that all measures are required in order to meet the objectives and needs of

Summary of requirements/feedback	Source & rating	Initial GM response	GM response as at 24 <sup>th</sup> October 2019
		CAF and will supply supporting evidence reflecting the relevant guidance.	the region, the Consultation Package contains a clear differentiation between Implementation Fund and CAF measures and we anticipate that this will be specified in all future materials.

APPROVED