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

Note 1: Data, Evidence and Modelling Post-OBC approach

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Version Status:	DRAFT FOR APPROVAL	**Prepared by:**	Clare Sheffield 9th July 2019
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1 Introduction

1.1 This note describes the process being undertaken to deliver the Data, Evidence and Modelling requirements in support of the GM CAP Full Business Case (FBC). It also describes the evidence that will be supplied to JAQU on the 12th July 2019 and in the following week; highlighted in green throughout and set out in Appendices 1 and 2.

1.2 The goal of the Data, Evidence and Modelling (DEM) workstream is to ensure that the GM CAP FBC is underpinned by robust and reliable evidence. It involves:

- Developing models and tools to facilitate analysis and using those models and tools to assess the impacts of the proposals;
- Collecting data and carrying out analysis of that data to support case making and impacts assessment; and
- Carrying out research to inform case making and impacts assessment.

1.3 Fundamentally, this evidence and modelling-based approach will ensure that the proposals contained in the GM CAP meet the objective of achieving compliance with NO2 legal limits in the shortest possible time.

2 Feedback from JAQU, the TIRP and DIRP

2.1 GM has received formal feedback from JAQU, the TIRP and DIRP. A fuller response to this feedback is presented in Appendices 2 (JAQU), 3 (TIRP) and 4 (DIRP). Key issues included the need to:

- Provide evidence of the impact of each implementation fund measure on compliance, and to provide supporting evidence for any CAF measures in line with the JAQU guidance;
- Assess the potential for additional measures at local exceedance sites to bring forward compliance;
- Update the behavioural response assumptions, grounded in a robust evidence base and better describe the methodology and test uncertainty;
- Collect evidence and develop assumptions for responses to the Funds/Loans (including new surveys) and other proposed measures (EV infrastructure, sustainable journeys, LA fleet);
- Carry out further sensitivity testing of the transport, air quality and economic impacts of the proposals;
- Better understand potential distributional impacts of the proposals; and

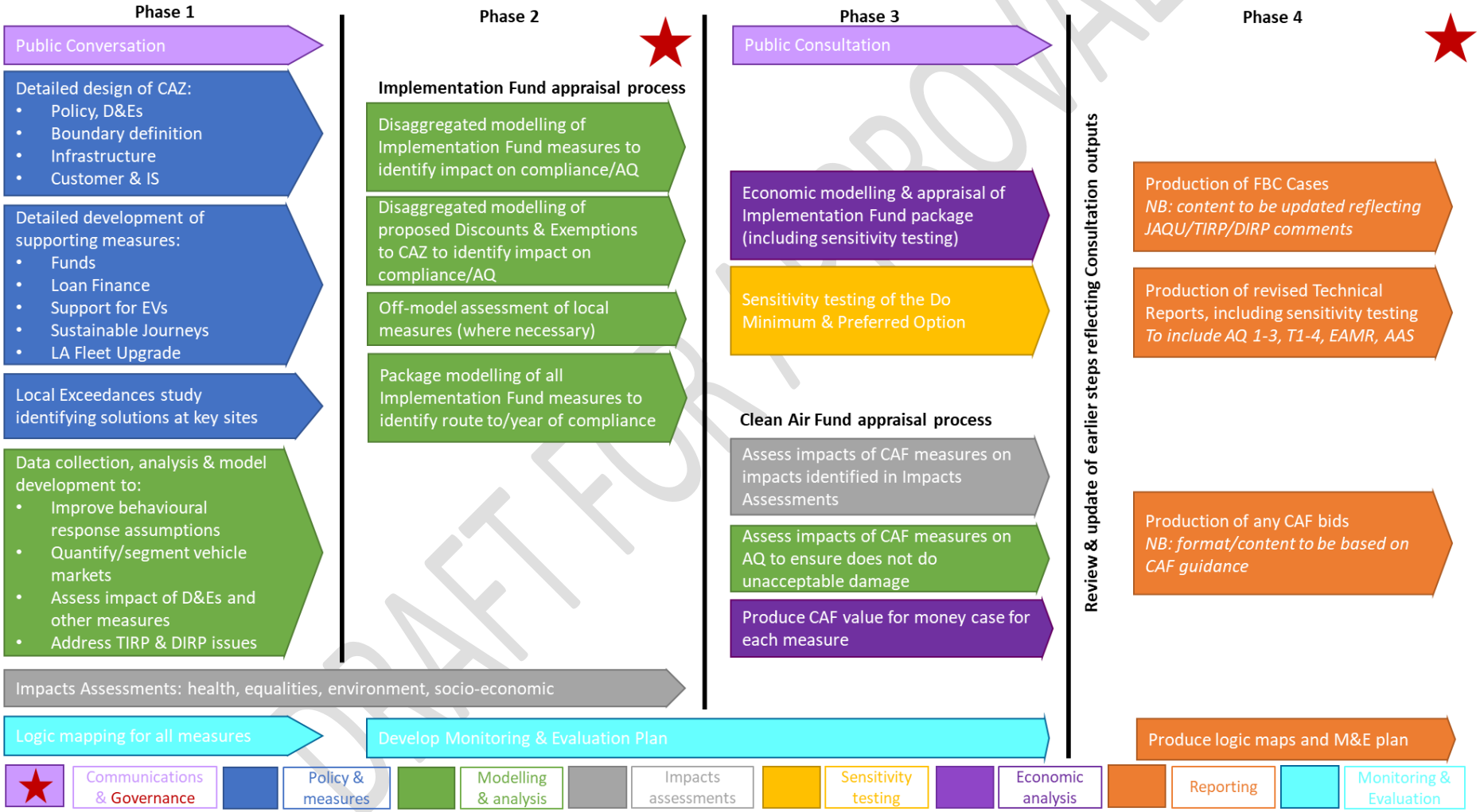
- Make the case for why a GM-wide CAZ D does not bring forward compliance, and why bringing forward the implementation of a GM-wide CAZ C to 2021 does not bring forward compliance.

3 Approach to delivering an improved evidence base for FBC

3.1 The process for delivering the proposals, evidence and policy for the FBC is shown overleaf. The Data, Evidence and Modelling workstream is feeding into all aspects of this work, but tasks owned by that workstream are Modelling and Analysis (shown in green), Economic analysis (shown in purple), Sensitivity testing (shown in yellow), and some reporting (shown in orange).

3.2 More detail about the proposed approach to each of these activities is supplied below in Figure 3-1.

Figure 3-1: Diagram of the process for delivering the GM CAP proposals, evidence and policy materials for the FBC



4 FBC Phase One: Improving the evidence base and supporting scheme design (Underway)

4.1 Improving our knowledge of the vehicle markets affected by the GM CAP

4.1.1 GM has carried out a data gathering exercise for each of the vehicle markets affected by the GM CAP, including buses, coaches, HGVs, LGVs, minibuses, and taxis (Hackney cabs and private hire vehicles (PHVs)). Notes describing the number of vehicles operating in GM, the compliance status of those vehicles, and the business and usage patterns of those vehicles are under production for each vehicle type – those for coach, HGV and LGV are available now; and analysis of bus, minibus, and taxi is underway. In particular, GM has improved our understanding of the complexity of freight activity and vehicle types; of the coach and minibus markets about which little was previously known; about the nature of vehicles in the bus fleet; and about the full taxi fleet including the substantial numbers of PHVs seemingly operating in GM but licensed elsewhere.

4.1.2 This evidence is being used to inform scheme design and to support the development of analytical tools and modelling assumptions.

4.1.3 **Papers to be supplied to JAQU on 12th July 2019:**

- **Note 3 GM CAP Analysis of the Freight Market**
- **Note 4 GM CAP Coach Vehicle Research**

4.2 Carrying out new primary data collection

4.2.1 GM has carried out new deliberative research with freight, taxi and coach operators to explore potential responses to and impacts of the proposals; these have informed the design of the Conversation, measures development and will be used to sense check the conclusions of the analytical work. The Conversation outputs will also feed into the evidence base and be used to identify any issues or risks with the analytical assumptions.

4.2.2 Surveys are under development to gather better information about freight activity in GM, and to better understand how key groups may respond to the CAZ and other proposals, using Stated Intention techniques. These surveys will be undertaken in July 2019 and used to validate the behavioural response assumptions, and to support the development of tools assessing the impact of the Funds and Loan Finance proposals.

4.2.3 An ANPR survey was conducted across a single week in January 2019 at 42 sites across GM. The survey was designed to provide a representative profile of the vehicle fleet operating in Greater Manchester in terms of vehicle type (including fuel used) and age profile. The new survey results are intended to update the previous data used in the OBC and collected in 2016 on a more ad hoc basis using ANPR data collected from pre-existing sites, which did not necessarily represent a robust coverage across Greater Manchester. The new ANPR dataset is more comprehensive and robust than the one used in the OBC and covers key areas where emissions had previously been estimated to be above legal levels. The results show that there are not major differences between observed levels of compliance in the overall GM fleet between the 2016 and 2019 surveys. This data set is now being used widely as part of the ongoing work to refine the proposals as part of the FBC development for the CAP.

4.2.4 **Papers to be supplied to JAQU on 12th July 2019:**

- **Note 5 GM CAP ANPR Surveys: Summary of Initial Findings**

4.3 Gathering and analyzing new secondary data and research

4.3.1 GM has identified a number of sources of data offering insight into the vehicle markets in question and how they might respond to the range of measures proposed in the GM CAP. These include Stated Preference surveys that have been carried out by other CAP authorities (Sheffield and Bradford) and shared with GM.

4.3.2 **Papers to be supplied to JAQU on 12th July 2019:**

- **Note 6 GM CAP: Behavioural response assumptions and available sources of data**

4.4 Improve behavioural response assumptions for a CAZ

4.4.1 GM recognises the need to improve the robustness of the behavioural assumptions underpinning the suite of strategic modelling tools. This was a key requirement of the TIRP and DIRP. The behavioural responses assumed for each of the vehicle types have been considered and reassessed, based on new evidence, and including the development of new analytical tools. As a result:

- HGV responses were previously based on a response curve derived from two evidence points. It is proposed that this method is replaced at FBC by responses derived from an operational cost model, segmented by vehicle type and size, and allowing responses to upgrade, stay and pay or change mode to a smaller vehicle subject to a lower charge (LGV).

- LGV responses were previously derived from stated preference research carried out in Bristol. GM has investigated two alternative methodologies: utilising behavioural responses derived from stated preference research carried out in Sheffield, which offered a better sample of LGV drivers; or using an operational cost model similar to that used for HGVs. Both methods have been tested, and deliver similar responses, with the operational cost model appearing more credible and also allowing greater flexibility to be adapted for assessing measures beyond the CAZ. The operational cost model allows responses to upgrade, stay and pay or change mode to an out-of-scope vehicle (car).

- PHV responses were previously derived from stated preference research carried out in Bristol and adapted to be more suitable to GM. Analysis has been undertaken deriving behavioural responses from stated preference research carried out in Sheffield, which offered a better sample of PHV drivers. Provisional analysis suggests that these appear to perform better than the Bristol-derived assumptions but GM is also planning to test an operational cost model approach for PHVs as an alternative

4.4.2 In particular, the OBC assumed a 100% upgrade response for bus and Hackney cab, in the absence of alternative information. This was highlighted in the feedback from JAQU, the TIRP and DIRP as a particular source of concern and GM were asked to carry out sensitivity tests on the implications of this assumption. As a result:

- Hackney cabs were previously assumed to upgrade in full, in the absence of alternative information about likely responses. GM has undertaken analysis deriving behavioural responses from stated preference research carried out in Sheffield, which included a sample of Hackney cab drivers. These perform well when adapted to GM conditions, however GM is also planning to test an operational cost model approach for Hackney cabs as an alternative. Either approach will mean that the 100% upgrade assumption made at OBC will not be carried through to FBC. Because GM is no longer proceeding with the 100% upgrade assumption, it was not considered a good use of limited resources to carry out sensitivity tests on this aspect.

- Buses were previously assumed to upgrade in full, in the absence of alternative information about likely responses. The responses available to bus operators in a deregulated bus market are uniquely complex and carry wider public interest concerns. Therefore, the approach taken for bus has been to commence a logic mapping exercise to better illustrate the complexity of the challenge and the risks posed by a CAZ to the sustainable travel offer and to accessibility. GM has also developed an analytical method to act as a sensitivity test for bus, testing which routes must upgrade to achieve compliance, and which routes are less influential. It is not clear the extent to which this analytical division could be realised in practice and work is underway to better understand the policy and delivery implications of the findings. In summary this analysis found that around three quarters of routes pass a point at risk of

exceedance, and that for the larger operators with some opportunity to restructure their fleet, such routes accounted for just under half of their fleet. In comparison, for the same group just under one in ten buses are currently compliant.

4.4.3 GM has carried out a sensitivity test of the impacts of a CAZ C (without any supporting measures) in 2023, applying revised behavioural responses for HGV, LGV, PHV and Hackney Cab. The bus upgrade has been assumed as 100% for the purposes of this test as no alternative assumptions have been identified as yet. The results of this test will be available by the 12th July.

4.4.4 **Papers to be supplied to JAQU on 12th July 2019:**

- **Note 8 GM CAP: Updating behavioural responses for HGVs**
- **Note 9 GM CAP: Updating behavioural responses for LGVs**
- **Note 10 GM CAP: Updating behavioural responses for Taxis**
- **Note 11 Analysis of Bus Upgrade Options to Deliver Air Quality Compliance**

4.4.5 **'Note 16 GM CAP: Sensitivity testing of a CAZ C in 2023 with revised behavioural response assumptions' will be supplied in the week of 15th July 2019.**

4.5 Supporting the scheme design of the CAZ

4.5.1 Analysis has been carried out to support scheme design of the CAZ including:

- Modelling of boundary impacts of diverting traffic and advice on boundary selection issues (complete);
- Assessment of the impacts of potential discounts and exemptions, including the blue light fleet, community minibuses, and a range of scenarios for taxis linked with the implementation of Minimum Licensing Standards (underway), recognising the requirement to provide evidence of both the necessity of any discounts and exemptions and of any impact on the achievement of compliance; and
- Assessment of the costs and benefits of delaying CAZ C implementation until 2023 – this work is ongoing but an interim update is available.

4.5.2 **Papers to be supplied to JAQU on 12th July 2019:**

- **Note 12 Evidence of the impact of 2021 implementation of a CAZ C (without exemptions)**
- **Note 13 GM CAP Study: Traffic Impact on Neighbouring Authorities**

4.6 Supporting the scheme design of other non-CAZ measures

4.6.1 Analysis and research is underway, as outlined above, to support the development of the measures other than the CAZ. In particular:

- Supporting policy development in terms of who should be in scope for the Funds and Loan Finance schemes; how such schemes might operate and what the impacts would be, including providing advice on case-making from both an implementation and CAF perspective. Assessing these proposals will require evidence from local surveys (underway) and may require the development of new tools, potentially as extensions to the operational cost models;

- Gathering evidence to support the case for investment in EV infrastructure, promotional activity and help to upgrade to an EV in terms of how this investment would deliver increased uptake of EVs and the resulting air quality benefits;

- Developing a methodology for quantifying the air quality benefits of investing in measures to promote sustainable travel; and

- Gathering data from local authorities to inform the design of measures to upgrade the LA fleet and consider adaptations to local parking policy.

4.6.2 This work is underway. GM recognises the need to quantify the independent air quality and compliance impact of any Implementation Fund measures, and to demonstrate what impacts are mitigated by any CAF measures, the value for money of this investment, and the impact on air quality.

4.7 <u>Supporting the identification and assessment of key sites where local measures could bring forward compliance</u>

4.7.1 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.

4.7.2 GM is taking the following approach to assessing these sites:

- Analysis of traffic flows, speeds and composition and assessment of modelled outputs compared to real-world conditions (complete);

- Analysis of NOX source apportionment and any local conditions affecting concentrations, such as canyons, including checking how accurate the representation of such conditions is in the model itself (complete);

- Site visits and meetings with districts to review of the locality in terms of trip attractors etc and identify any planned development, changes to the road network etc (complete);

- Review by experts at TfGM, the relevant districts and the Lead Advisor team to identify a long list of possible solutions (complete);

- Shortlisting of possible solutions based on GM's Multi Criteria Assessment

Framework (underway);

- Initial scoping/development of those solutions including high level analysis of possible impacts on AQ – seeking a recommendation to proceed (to follow);

- If a decision is made to proceed, full development of any identified measures, including local modelling where appropriate.

4.7.3 **Papers to be supplied to JAQU on 12th July 2019:**

- **Note 14 GM CAP Local Exceedances: Update**

4.8 Investigating the implications of the revised EFT

4.8.1 GM's methodology for calculating traffic emissions applies emissions factors derived from DEFRA's Emission Factor Toolkit (EFT) version 8.0, which was originally released in November 2017. Subsequently, DEFRA released EFT v9.0 aligning the fleet figures in the EFT with those in the most recent PCM base year projections (2017). At the end of May 2019, JAQU issued an update to the toolkit, EFT version 9.1a. This is a non-standard EFT update, which has has been produced for local authorities (LAs) developing Clean Air Plans plans only (and thus is only available on Huddle). This version of EFT contains fleet figures which have resulted from a recent Department for Transport (DfT) project to develop new passenger car fleet projections in light of emerging evidence regarding changes in consumer purchasing behaviour.

4.8.2 The EFT release has implications for the emissions factors and fleet projections used in GM's emissions models, and incorporates revisions to background emissions maps and as well as for background emissions maps and the the NOx to NO_2 calculator. GM is carrying out work to better understand the implications of these updates and has carried out an initial sensitivity test looking at the impacts of the revised emissions factors and fleet projections, reported in the paper below.

4.8.3 **Papers to be supplied to JAQU on 12th July 2019:**

- **Note 15 Implications of the EFT update for GM CAP**

4.9 Supporting associated workstreams

4.9.1 Data, Evidence and Modelling are working closely with the teams carrying out the environmental, equalities, health and socio-economic Impacts Assessments and the Monitoring and Evaluation team to share evidence.

4.10 Providing further evidence for the case against a Greater Manchester-wide CAZ D

4.10.1 A Greater Manchester-wide CAZ D was developed initially as a theoretical 'maximum case', primarily to understand whether compliance could be achieved under any scenario by 2021, as Option 6 in the sifting stage of the GM CAP development. Importantly, the modelled scenario did not take account of the feasibility of delivering such a scheme or include the full package of supporting measures that would be required. A GM-wide CAZ D was ruled out on the basis that it would not deliver compliance in the shortest possible time, and would perform even more poorly in terms of reducing human exposure as there would be a long period without action on the ground; during which time considerable progress towards compliance would be expected with other options.

4.10.2 JAQU have asked GM to provide further evidence supporting that decision. This analysis is underway, and an update will be submitted by 19th July.

4.10.3 **Papers to be supplied to JAQU in the week of 15th July 2019:**

- **Note 17 Evidence supporting the decision not to progress with a GM-wide CAZ D**

5 FBC Phase Two: Modelling the impact of Implementation Fund proposals (To Follow)

5.1 Disaggregated modelling of Implementation Fund measures to identify impact on compliance/AQ

5.1.1 GM recognises the need - as set out by JAQU and the TIRP/DIRP - to provide evidence of the contribution of each of the proposed Implementation Fund measures separately and is intending to supply this at FBC, subject to any technical limitations. The methodology for assessing and modelling each measure is being designed in such a way to facilitate this disaggregated analysis as much as possible. Revised behavioural assumptions will be applied to the modelling of CAZ impacts as set out above.

5.2 Disaggregated modelling of proposed Discounts & Exemptions to CAZ to identify impact on compliance/AQ

5.2.1 Similarly, GM recognises the need - as set out by JAQU and the TIRP/DIRP - to provide evidence of both the justification for any discount or exemption, in terms of the impact being mitigated, and also of the impact on the achievement of compliance. GM understands that, where analysis can demonstrate that impacts are likely to be minimal, modelling is not required, but recognises that modelling will be required for any large-scale exemptions including the delayed implementation of the CAZ C until 2023. Analysis is underway of all discounts and exemptions currently being considered, recognising that further issues may emerge from the Conversation.

5.3 Off-model assessment of local measures (where necessary)

5.3.1 As discussed with JAQU technical staff, there is a concern that targeting the last exceedances risks targeting issues that aren't as likely to be apparent in the real world and we have been advised that JAQU would rather see something put forward that is likely to work in the real world but is difficult to represent in the modelling than vice versa. GM's modelling suite is at a strategic scale and it would be difficult to properly represent the benefits of very localised measures. It may be necessary to carry out off-model analysis based on supporting evidence to demonstrate the efficacy of local solutions, depending on the measures identified.

5.4 Package modelling of all Implementation Fund measures to identify route to/year of compliance

5.4.1 GM will re-model the revised full package of measures for the Preferred Option, using the updated tools and assumptions, to supply transport, air quality and compliance outputs as per the OBC.

5.5 It is intended that the package modelling and as much disaggregated modelling as possible will be available prior to public consultation.

6 FBC Phase Three: Economic appraisal, assessing the impact of CAF measures and sensitivity testing (To Follow)

6.1 It is currently intended to carry out this phase of work during the public consultation period.

6.2 Economic modelling & appraisal of Implementation Fund package (including sensitivity testing)

6.2.1 GM is carrying out a review of the economic appraisal methodology and applying improvements where appropriate. An economic appraisal will be carried out of the package of Implementation Measures, based on this updated methodology. Only basic sensitivity testing was conducted at OBC, and a more thorough programme of sensitivity testing will be carried out at FBC, supported by a clear explanatory narrative.

6.3 Sensitivity testing of the Do Minimum & Preferred Option

6.3.1 Sensitivity testing will be carried out of the Do Minimum and Preferred Options, considering key sources of uncertainty. This will involve replicating some tests conducted at OBC, applied to the updated measures and modelling tools/assumptions, and is likely to involve the addition of further tests, subject to time.

6.4 Appraisal of Clean Air Fund measures

6.4.1 If GM decides to apply for CAF funding, an appraisal will be conducted of all CAF measures based upon the JAQU guidance, demonstrating what impacts are mitigated by the measures, the value for money of this investment, and the impact on air quality. GM is currently developing a methodology to allow the assessment of any CAF measures based on the written JAQU guidance and advice provided by officers; this will ensure that the tools are in place to assess measures as they come forward.

7 FBC Phase Four: FBC production and reporting (To Follow)

7.1 Note that, prior to this phase, it may be necessary to re-run parts of the preceding work in response to outcomes of the Public Consultation.

7.2 Data, Evidence and Modelling will feed into the production of the FBC (particularly the Strategic and Economic cases) and will provide the following supporting updated Technical Reports:

- T1, T2, T3 and T4 including the results of sensitivity testing
- AQ1, AQ2, AQ3 including the results of sensitivity testing
- EAMR, including the results of sensitivity testing
- Analytical Assurance Statement
- Full response to TIRP and DIRP feedback

8 Next steps

8.1 GM proposes that a workshop to run through the materials supplied, discuss outstanding questions and agree next steps would be valuable.

APPENDIX ONE: PAPERS TO BE SUPPLIED TO JAQU ON 12TH JULY 2019

1. GM CAP Data, Evidence and Modelling: post-OBC approach
2. GM CAP: Next steps for data collection and the development of analytical tools
3. Analysis of the freight market
4. Analysis of the coach market
5. GM CAP ANPR Surveys: Summary of Initial Findings
6. GM CAP: Behavioural response assumptions and available data sources
7. LGV and HGV Operational Cost Models
8. GM CAP: HGV Behavioural Responses Note
9. GM CAP: LGV Behavioural Responses Note
10. GM CAP: Taxi Behavioural Responses Note
11. Analysis of Bus Upgrade Options to Deliver Air Quality Compliance
12. Evidence of the impact of 2021 implementation of a CAZ C (without exemptions)
13. GM CAP Study: Traffic Impact on Neighbouring Authorities
14. GM CAP Local exceedances: Update
15. Implications of the EFT update for GM

TO FOLLOW IN THE WEEK OF 15TH JULY:

16. GM CAP: Sensitivity testing of a CAZ C in 2023 with revised behavioural response assumptions
17. Evidence supporting the decision not to progress with a GM-wide CAZ D

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

Issues raised in letter of 23rd May	GM response	Evidence supplied?
Confirmation of which measures have been modelled as being needed for compliance	The OBC assumes all measures are required for compliance. The modelling includes a representation of the following measures: • CAZ B in 2021, CAZ C in 2023; • Funds to support the upgrade of all buses, and some freight vehicles and taxis; and • Investment in EV charging points. Measures to promote sustainable journeys have not been modelled. 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.	No
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 12th July.	Yes
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	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 12th July. 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 12th July.	Yes
Justifying the contribution to compliance of individual measures, such as electric vehicle upgrade, sustainable transport and local authority fleet upgrade	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. If measures are proposed under the CAF, evidence will be supplied in accordance with the relevant guidance.	No
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 15th July.	Yes

Issues raised in letter of 23rd May	GM response	Evidence supplied?
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 12th July.	Yes
For all [Clean Air Fund] schemes, justifying the cost, the assumptions used about uptake, and further information on how these have been are 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
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 12th July.	Yes
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 12th July.	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 12th 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 15th July.	Yes

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

Summary of requirements/feedback	Source & rating	Initial GM response
Model validation – review implications of poor validation	TIRP	Underway at key sites via the local exceedances work – see interim report for initial findings.
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.
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.
Behavioural responses – better description of methodology and sources for assumptions, discussion of uncertainty, issues of lack of destination choice	TIRP	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. 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. 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.
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.
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.
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.
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.
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.

Summary of requirements/feedback	Source & rating	Initial GM response
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.
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.
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.
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.

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

Summary of requirements/feedback	Source & rating	Initial GM response
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.
Uncertainty - Not detailed in the economic metholodogy 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.
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 CAF and will supply supporting evidence reflecting the relevant guidance.