Greater Manchester's Outline Business Case to tackle Nitrogen Dioxide Exceedances at the Roadside

Local Plan Transport Modelling Tracking Table (T1)

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Version Status:	DRAFT FOR APPROVAL	**Prepared by:**	Transport for Greater Manchester on behalf of the 10 Local Authorities of Greater Manchester
Authorised by: **Date:**	Simon Warburton 28th February 2019		

Local Plan Transport Modelling Tracking Table (T1)

Ref	Requirement	LA Proposal Description	JAQU Review Comments
1	**Transport model specification : Model Selection**		
1.1	Present year validation if the model is more than 5 years old (e.g. ANPR, journey times etc.).	Existing model with appropriate user-class disaggregation for 2016 base year has been validated at county-wide level. The level of validation in and around specific JAQU-identified links has been reviewed.	Can you confirmation what year the calibration statistics are reported. Is it 2013 and then later factored to 2016? Can you confirm for all data presented?
		The model has been validated for a base year of 2016. The link flow comparisons presented in Section 4 of the T2 report compare modelled 2016 flows with observed counts. The traffic counts that have been used in the validation have been factored to a 2016 October average weekday using local count conversion factors. The journey time validation (described in Section 5 of the T2 report) compares modelled 2016 journey times with observed travel times estimated from Trafficmaster data collected during the period September 2013 to August 2014. We now have observed journey time data for 2016 for all of the routes described in the T2 report. The journey time validation results could therefore be updated using 2016 data, if necessary.	Counts are (mainly) from 2010 onwards with locally derived factors used to bring up to 2016. No breakdown provided by year of data (i.e. how many counts are 2014 etc.). Journey time data is 2013/14.
1.2	The coverage of the transport model should be robust enough to capture if any route choice will be impacted due to the proposed measures.	Highway modelling is being undertaken using TfGM's county-wide Saturn model, which covers all of Greater Manchester and the surrounding area. The model represents all motorways, A roads and B roads, plus all of the yellow coloured roads on the Ordnance surveys Landranger maps of the area.	Yes – good model coverage.

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1.3	Validation should be based on comparison between observed (i.e. from ANPR data) and modelled vehicle composition, flows (on links and across screenlines/cordons), traffic pattern and journey time within the study area (WebTAG Unit M3.115).	The model has been validated for a base year of 2016. The local fleet composition has been estimated from ANPR surveys undertaken in 2016. Link flows have been validated on cordons and screenlines at key locations within the study area for 2016, separately for car, LGV and HGV flows. Modelled 2016 journey times have been validated against TrafficMaster data collected during the period September 2013 to August 2014. We will consider updating the journey time validation results to make use of observed data for 2016, if possible. The age profile of the bus fleet has been obtained using local data collected during TfGM's (bus service) Punctuality and Reliability Monitoring Survey.	See above for clarity on model years. Either is within 5 years. So would be acceptable.
			Acceptable now model years confirmed.
1.4	For light and heavy goods vehicles, validation will need to be reported for short screenlines using grouped counts to ensure a larger sample size.	See above.	LGV and HGV reported.
1.5	The assignment convergence meets WebTAG convergence criteria (WebTAG unit M3.1, section 3.3, Convergence Measures and Acceptable Values).	Highway model convergence will be monitored using WebTAG convergence criteria and reported in modelling reports.	Yes, reported and meets criteria.

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1.6	Vehicle disaggregation: the transport model must split modes (e.g. HGV, LGV) to provide capability to distinguish the impact of measures that are targeting different vehicle types, such as freight logistic or different classes or charging Clean Air Zones.	Separate user classes are modelled for car, Light Goods Vehicle (LGV), Heavy Goods Vehicle (HGV) and Taxi trips, for compliant and non-compliant vehicles (where applicable). Buses are represented as fixed loads, separately by service/operator.	Good
1.7	If modelling does not fully meet above requirements in the key study area, please provide mitigation measures/implications.	Targeted matrix estimation from counts has been used to improve the link flow validation. Matrix estimation procedures have been applied separately for different vehicle types, and the impacts monitored.	It would be useful to understand a bit more about the matrix development: Can we have access to Trafford Park Calibration report? Reference 4. ME applied to Prior matrix. Can some information on changes to the prior matrix (as per WebTAG). Some information on what changes the TEMPRO factoring made to the base matrices.
		A copy of the Trafford Park highway model validation report has been supplied. Details of the changes brought about by the matrix estimation process have been included in Appendix A of the T2 report, including comparisons of matrix totals, trip end totals and trip length distributions for the prior and updated matrices. Details of the changes made by the TEMPRO factoring have been included in paragraph 3.6.8 of the T2 report. Comparisons of modelled versus NTEM Growth for car trips between 2016 and 2021 are included in Table 5.3 of the T3 report.	Trafford Park highway model validation report supplied which includes ME details as requested. ME: Zonal trip end changes meet WebTAG reqmts for car and total veh wrt slope and R2 but not intercept. LGV and OGV generally don't meet criteria. Significant TLD changes (well in excess of WebTAG recommendations) – generally increasing short distance trips.

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		Although the changes in the peak period car trip length distributions reported in Trafford Park model validation report were significant, the mean trip length for the post matrix estimation car matrices compared reasonably well with figures from the 2012 National Travel Survey, which indicated that the average trip length for car/van drivers in 2012 was around 8.5 miles (13.7 km), compared to 14.2 km and 14.0 km for the post ME AM peak and PM peak hour car matrices respectively.	Sector to sector changes also greater than recommended but this is more common.
2	**Overall model assessment**		
2.1	Base model fit.	Described in Model Validation Report (T2).	Cordon Count Calibration Generally good cordon calibration, although IP is weaker. Would be useful to see cordon split into screenlines too. AM cordon calibration is good. IP – weaker with only one out of 6 cordons passing WebTAG PM Peak is good. Individual Count Generally, seems good. Can you present a table summarising numbers of counts that pass GEH and WebTAG count criteria, by ME count, PCM count, etc.

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		The link flow validation results in the T2 report have been updated to breakdown the cordon results into shorter screenlines, as presented in Appendix B of the updated Report. A summary table reporting the number of counts passing the WebTAG link flow criteria for the cordon and PCM counts combined has been include in Table 4.10 of the revised T2 report. The modelled journey times in the peak hours tend to be too low when compared to observed journey times, with approximately 59% of the non-motorway routes meeting the WebTAG criteria for an acceptable journey time validation in the AM peak hour and 41% of the non-motorway routes satisfying the criteria in the PM peak hour. However, considering all of the routes together, the total modelled time for the non-motorway routes is within 4% of the observed time in the AM peak hour, which is reasonably good, although there is a difference of approximately 16% in the PM peak hour, which suggests that the model is too fast in the evening peak period in particular. The journey time validation for the non-motorway routes in the inter-peak hour is acceptable, with 84% of the routes meeting the WebTAG criteria that the modelled time should be within 15% of the observed time.	Journey Time Validation AM and PM journey time validation is weak. With the model tending to run quicker than observed. Further commentary/ clarification is needed. Further count details to be provided in revised T2 report. In terms of journey times, the AM model is balanced in the sense of an equal number of fast and slow (model to observed > +-15%) routes; the IP is generally good for non-motorway routes; and the PM unbalanced in terms of most routes being too fast. The model is too fast on motorway routes for the AM and PM peaks and too slow in the IP. The comparison of total model to total observed time is not a good indicator of performance. However, the work done using adjusted speeds and the ENIGMA model appears to show that the impacts of these journey time issues are not significant in the NOx estimation. This needs to be discussed further between the modelling and AQ teams.

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		We have investigated how errors in the journey time validation might impact on modelled road traffic emission totals for 2016 by applying adjustment factors to the modelled link speeds (at an aggregate level) to give a closer fit between the modelled and observed speeds across the County-as-a-whole, which were then run through the EMIGMA software. The results of these tests indicated that there was relatively little impact on the calculated emissions, with an increase of approximately 3% in total road traffic NOx emissions within the county. Discrepancies of this size are considered to be acceptable, especially taking into account the size and complexity of the modelled area. It should also be borne in mind that the errors associated with the journey time validation are just one extra source of uncertainty that are addressed by the application of adjustments to the modelled NO2 concentrations from the ADMS urban software to improve the fit between modelled and observed concentrations as part of the model verification process.	
2.2	Model calibration/ validation.	Described in Model Validation Report (T2).	No independent validation screenlines presented. This is not strictly WebTAG compliant, but can be acceptable given timescales. Some commentary required.
		Additional commentary has been included in paragraph 4.5.3 of the updated T2 report.	Detail to be provided
2.3	Present year validation (if relevant)	Described in Model Validation Report (T2).	Some clarity on 2013/ 2016 as described above.

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		Additional commentary has been included in the updated T2 report.	Detail to be provided
3	**Transport Model Methodology**		
3.1	Baseline forecast (demand growth assumption as per WebTAG guidance) including the review of committed schemes and local development plan.	Baseline forecast for 2021, described in Modelling Methodology Report (T3).	Growth based on Trafford Model, with adjustments made for committed developments to 2020. Adjustment made to growth to account for the latest version of TEMPRO (V7.2). Development assumptions based on Trafford work, have these assumptions been reviewed against latest development plans? Given that you state that the growth has been adjusted to NTEM V 7.2 can you explain why the output growth rates are different.
		We haven't been able to review individual development assumptions due to the study timescales and the size of the modelled area. There is a good agreement between NTEM 7.2 and output growths at the county level. There are modest differences at the district level due to spatial changes in the distribution of trips in the 2016 matrices brought about by the matrix estimation process, and the impacts of the variable demand modelling hat was carried out for the Trafford Park model, and the adjustments that were made to its reference case matrices as a result of changes to generalised cost between its base and forecast year.	Detail to be provided

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		Additional models have subsequently been built for 2023 and 2025, to assist in confirming the year of compliance for NO2 concentrations and to help with modelling the phased introduction of a GM-wide CAZ C. The development of the 2023 and 2025 models is described in the updated T3 Report.	
3.2	An uncertainty log providing a clear description of the planning status of local developments.	Attached as an Appendix to the T3 report.	As above – report is from 2014 so please confirm still relevant.
		See above for comments on local developments.	Still relevant for these forecasts.
3.3	Description of the future year transport supply assumptions (i.e. planned road networks examined for the baseline, core scenario and variant scenarios).	Described in uncertainty log/T3 report.	As above – report is from 2014 so please confirm still relevant.
		The future year transport supply assumptions are described in the T3 report, based on the Trafford Park model uncertainty log. We haven't made any changes to the uncertainty log, but have held meetings with district colleagues to review the development/transport assumptions. We will update the model to include any schemes that may have been omitted, if it is thought that they will have a material impact on the appraisal results. No fundamental concerns with regards to the modelling were raised at the meetings.	Still relevant for these forecasts. Will review schemes and update if required.
3.4	Description of the travel cost assumptions as per WebTAG guidance (e.g. fuel costs, PT fares, parking).	Provided in modelling methodology reports.	Methodology provided and looks correct.

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3.5	Description on how the options are modelled in transport models (e.g. timeframes, eligibility etc).	To be provided in modelling methodology reports.	OK
3.6	Description of forecasted vehicle composition assumptions, if deviating from EFT assumptions.	Based on local base year fleet mix (obtained from ANPR data), suitably adjusted to ensure that the age profile remains unchanged in the future, by vehicle type.	OK
3.7	What and how to interpret and implement behavioural responses to all measures replacing vehicle for compliance, avoiding zone, cancelling journeys, mode shift and other	Re-routing responses to CAZ charges are represented in the Saturn model by coding monetary charges (tolls) for non-compliant vehicles into the highway networks, which may differ by vehicle type (e.g. cars, LGVs, OGVs and Taxis). The tolls are defined as charges per cordon crossing link and have been divided equally between inbound and outbound sites. Note, however, that charges are not coded into the Saturn model for GM-wide Clean Air Zones, as it assumed that there will be no-re-routing responses for these measures (as motorists cannot change their routes to avoid paying the charge) and that drivers of non-compliant vehicles will either choose to pay the charge or make a different behavioural response, as described below.	Is the option sifting tool going to be adapted for the full forecasting?

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		An option sifting tool has been developed to assist in modelling the behavioural responses to the CAP measures based on guidance provided by JAQU concerning the proportions of drivers of affected vehicles who would pay the charge, cancel their journey, upgrade to a compliant vehicle etc. The output demand change matrices from the sifting tool are used to adjust the do-minimum demands in the Saturn model at a sector level to create do-something forecasts. The updated do-something matrices are then assigned to assess the demand changes on specific links in the Saturn model and the impact on emissions using EMIGMA. We did consider modelling the impacts of the CAP schemes on suppressed traffic using the elastic assignment procedures available in Saturn. Tests suggested, however, that this would not be necessary as the schemes that were being considered would not have a significant impact on congestion. Tests showed, for example, that the implementation of a CAZ D for the Regional Centre with a CAZ B for GM as-a-whole would result in an approximate 2% reduction in vehicle kilometres on roads within the County in 2021 and a 3% reduction in total PCU hours, which was not thought to be significant.	Clarified.
3.8	Outline of methodology for user behaviour research, if undertaken.	To be considered, but will be based on JAQU guidance initially	Useful to expand on how/ when this will be decided.

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		Initial modelling was based on data in JAQU's Evidence Package guidance, derived from the TfL ULEZ Stated Preference surveys, as local information for Greater Manchester was not available. In August 2018, the model was revised to take into account newly available data from Stated Preference surveys conducted in Bristol. Bristol was considered more similar to Greater Manchester than London. A re-weighting exercise was carried out to apply local travel patterns and demographics. Stated Preference research is not planned, due to time constraints and the type of vehicles in scope (commercial vehicles commonly without a driver-decider). Other Stated Intention research will be undertaken to validate the assumptions used in the modelling.	
3.9	Describe how the transport modelling implications are fed into the air quality modelling (e.g. speed, congestion etc.).	Air quality modelling is being undertaken using TfGM's EMIGMA (Emissions Inventory for Greater Manchester) software. Procedures combine information about traffic speeds and flows from the Saturn model with road traffic emission factors and fleet composition data from DEFRA's Emission Factor Toolkit (EFT) and the National Atmospheric Emissions Inventory (NAEI) to provide estimates of annual mass emissions for a range of pollutants including Oxides of Nitrogen (NOx), primary-NO2 Particulate Matter (PM10 and PM2.5) and CO2.	Please confirm whether you have considered other sources of data (e.g. Trafficmaster) for speed and on what basis you have opted for the modelled speeds in the Saturn model.

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		The Saturn model has been chosen as the primary source of information about vehicle speeds for input to the EMIGMA software as it was not considered practical to make use of other sources of information for estimating link speeds (such as traffic master or bluetooth data) due to the size and complexity of the modelled area, and also because of technical difficulties matching information from different data sources (which are coded to topologically different networks with different network structures and more/fewer links), which would be time consuming, complicated and subject to error.	Clarified.
4	**Overall forecasting methodology assessment**		
4.1	Forecasting assumptions.	Described in modelling methodology reports and the uncertainty log.	OK
4.2	Policy options and the implementation in the model.	To be described in modelling reports.	OK
4.3	Modelling vehicles behaviour change that are affected by measures	See above comments regarding the Option Sifting Tool. The results of the behavioural change and forecast modelling will be included in the T4 (Transport Model Forecasting) report.	OK
5	**Final Transport Forecasting Modelling**		
5.1	The detailed vehicle fleet composition for each policy scenario and the baseline (broken down by vehicle type and Euro standard) so that changes to the fleet are clear.	To be assessed and described in modelling reports.	OK

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5.2	Details of modelling methodology.	To be described in modelling reports.	OK
5.3	Forecast assumptions: demand growth, network changes and transport costs	Described in modelling reports and uncertainty log.	OK