Birmingham Development Plan2031

Examination Hearings

Further Written Statement by

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Matter I: Transport & digital communications (BDP policies TP37-45)

Main issue: Are the Plan's policies towards transport and digital communications justified and effective?

Question 1 - Should policy TP37 refer to the reallocation of road space to more sustainable transport modes?

Public transport schemes by their very nature can only serve limited travel movements and the use of car as a travel mode is often inevitable as there is no alternative service. It would be much simpler if all employment were to be concentrated in the city centre, meaning that transport systems need only funnel people from the outskirts into the centre, but in reality employment is scattered throughout the city. Therefore it is not possible to switch a road (or part of a road) from serving car users to public transport users and assume that there will be a simply switch in mode of travel.

When a bus lane was imposed on the A38 (associated with improvements to some of the bus services along it) the result was a large increase in congestion on the road. The expected transfer to bus use did not happen and in the end the scheme was removed because it did not improve matters.

Any proposal to convert road lanes to "more sustainable transport modes" should therefore include a full and proper investigation of the impact. This should include detailed examination of the road users before and after the intervention (not just the numbers on the links but on an origin-destination basis).

From this information it would then be possible to identify how well the new configuration would capture the original users or how much they have been inconvenienced, for example how many people are forecast to make the same trip but on bus not car and how many trip movements have been changed via elsewhere or even to make a completely different trip. This might sound complicated but provided the scheme is a net benefit then there would be no difficulties in this simple assessment. It would only be when the scheme is a disadvantage to travellers that the assessment would produce complicated answers.

Whilst it may not be acceptable that no-one is inconvenienced by such a scheme, it is important that planners and the public are equally and fully aware of who benefits and who is inconvenienced so that a properly informed decision is made. Simply having a policy of imposing bus lanes is clearly incorrect and will lead to bad schemes being created around the city. Such a "one solution solves everything" approach is plainly contrary to good planning practice.

Question 13 - Are these policies effectively drafted to achieve their intended purpose and do they provide a clear indication of how a decision-maker should react to a development proposal?

The transport assessment of the Plan is flawed and, if accepted, will establish a policy of poor transport planning for the future.

The transport analysis has been based on a fundamental misuse of a Variable Demand Transport Model (PRISM) which modifies forecast transport movements in accordance with forecast travel congestion, delays etc.. Such a model is designed primarily to assess the impact of new transport infrastructure where population, employment etc. are fixed. Only when used in an extremely careful and controlled manner is it a valid tool. Used incorrectly it merely confuses matters and hides adverse impacts from view.

By using the PRISM model to assess the impact of a major population and employment increase in the same manner as an improvement in transport infrastructure would, the council has established a de facto policy which will inevitably lead to greater congestion and a decrease in accessibility throughout the city. Although this error is most apparent with the assessment of new developments on the current Green Belt, this approach will adversely affect all of Birmingham.

The key to this is the manner in which the PRISM is a “Variable Demand Model”, which modifies its forecast travel movements according to the forecast cost of travel (not just the financial cost but also time for example). The need for such models was identified by SACTRA (the DfT’s Standing Advisory Committee on Trunk Road Assessment) in 1994 to take account of the effect of induced traffic (i.e. additional traffic generated due to improved travel conditions). The common example of induced traffic is from when the M25 was first opened and instead of providing free-flow traffic conditions it suffered from severe congestion due to the extra traffic that appeared. (In simple terms, the amount of traffic increased until it was back to the previous level of congestion.)

However the problem with Variable Demand Models is that as well as increasing traffic levels in response to increase road capacity, they will also reduce travel demands in response to decreased capacity and this is a necessary part of their functionality. (In simple terms, the amount of traffic will be reduced until the original same level of congestion is reached.) Adding new travel demands to the model from new housing and employment will of course increase congestion. The inevitable model response will therefore to be to reduce the level of traffic to bring the level of congestion back to roughly its original level. Reducing car trips may appear a good thing but this is merely a symptom of reduced economic performance and hence something to be avoided.

The result of using a Variable Demand Model in this manner will therefore be to provide a forecast road network that superficially looks similar to the forecasts without the additional population and employment but in fact is a result of a major change in travel movements that would be forced upon people due to increased levels of congestion. In real terms this would mean that existing residents and businesses are expected to change how and where they travel, for example moving house or place of work so they can have a feasible commute instead of being stuck in traffic. Areas are liable to become economic backwaters due to poor accessibility, but this will be hidden by the model.

This process is outlined in Appendix A of this document from which two important aspects need to be taken.

Firstly, the process is an iterative one, producing a future year matrix of trips (i.e. how many trips are made between each possible combination of origin and destination) which is based upon the future costs of travel. This is shown by the dotted black line on the bottom right of the diagram, which feeds the future year cost back into the development of the future year matrices. (NB There is a slight error in the location of this arrow which is explained further in Appendix A.) As a result, the pattern of any trip making after a change will not necessarily follow the pattern before the change.

The second aspect is the changes that the model can make to the pattern of trip making, which are set out in the bullet points that precede the diagram, namely:

- change in trip making/trip frequency
- change in mode
- change in destination/trip distribution
- change in time of travel

So, for example if the road congestion is forecast to be very bad, trip making from A to B may be reduced, with trips instead going from A to C (where this avoids the congestion or travels for a shorter distance through it) or just less trips made or perhaps some trips change to public transport (to the same or different destination). It is a common misconception that congestion will simply move trips from road onto public transport, while retaining the same origin and destination, but in fact general experience is that car users are most likely to change the origin or destination of their trip.

Taking a hypothetical case, in our base year we might have twenty car trips going from A to B as commuters. In the future year with natural growth in traffic due to normal population rise we may still have perhaps eighteen car trips still going between A and B, decreasing due to higher future congestion levels. If new infrastructure were added that improved the future connectivity between A and B, we would expect this number to increase significantly. However if the utilisation of the land between A and B were to be increased adding significantly more population for instance, this would increase the congestion locally. The model could therefore respond by reducing the trip making between A and B from eighteen down to ten, with eight trips changing to travel elsewhere (moving house or changing jobs in order to avoid the congestion). Such a change would not be immediately apparent from the model. Traffic flows on roads may be very similar expect in the immediate vicinity of the new population. Only detailed examination of the trip matrices would show how people have been adversely affected – information that has not been presented as part of the BDP.

Such an approach goes against the established procedures when dealing with new developments, specifically that additional trip making from a new development should not have a detrimental impact on existing travellers. Where such a development does have an impact, then the developer would be responsible for providing mitigation measures (e.g. paying for junction improvements on the main highway). Although the assessment of the BDP has included some changes to the road network there is no evidence to show that this would be adequate to deal with the additional traffic. Going back to the above example, we might find that instead of reducing the trip making between A and B from eighteen to ten it

instead only reduces to twelve. So whilst it does have a positive impact there is still a net detrimental effect.

Far from telling us that the additional infrastructure will be adequate to avoid any new congestion being caused, what the model is telling us is that the congestion will not be a problem only after the congestion has first happened and then people have been forced to adapt to the new problems. For the model there is no problem with this, but in real life terms expecting people to move house or change jobs due to an adverse impact (rather than to take the opportunity of improved conditions) is clearly wrong.

The PRISM model should have been used in a careful and planned manner. Firstly it should have been used to provide the future year baseline traffic levels. Once this future baseline was established the next stage would be to add the new development traffic into the model. These trips would then be distributed according to the existing travel patterns, which could be copied from the PRISM model. (It should be noted that although this does make use of the PRISM model this is entirely different to simply running the PRISM demand model with the new development included which will scramble the data together preventing any viable analysis being carried out.)

Having established both “without” and “with” development models in this manner, it would be possible to identify where the new development traffic has significantly increased travel costs and hence where mitigation action needs to be taken. Measures could then be identified to allow for these problems to be mitigated. This would therefore ensure the planned transport infrastructure would be able to sustain the travel patterns which would exist without the development, together with the new travel patterns for the new development.

To demonstrate the importance of this approach, take the following hypothetical example. An existing junction arm has capacity of 1,000 vehicles per hour (vph). In the future design year (but without the new development) it is forecast to have 900 vph travelling on it. When adding the additional new development traffic 500 vph are expected to enter the junction on this arm, giving a total of 1,400 vph. Therefore it is reasonable to conclude we would need to add more capacity to this junction (to something above 1,400 vph).

But by rerunning the variable demand model after adding the development planning data into the model, the road capacity will act as a constraint upon the new matrix of trips. So we might well expect to come back to roughly the same traffic levels as before, say 950 vph. Of this total we may have roughly 500 vph of development traffic but the other trips (i.e. “existing travellers”) would have been reduced. This is not due to traffic changing their route (e.g. changing from going from A to B via C, to going from A to B via D) but changing their travel pattern (e.g. changing from going from A to B to going from A to E). In effect the model would have assumed that people get fed up with the congestion and so move house/workplace.

A variation of this hypothetical example would be where after adding the development and running the variable demand suppresses some but not all of the excess traffic, to give a total of 1,050 vph. This of course would identify that the junction needs to be improved but when it came to redesigning the new junction it would be based on this much reduced total of 1,050 vph not the 1,400 vph as established above (i.e. being designed on the assumption that

some of the existing trips can be ignored by forcing them to change their origin or destination).

In using a Variable Demand Model in the manner it has done, the Council has no idea if the transport measures that it has proposed are adequate to deal with the additional demands due to increased population and employment. Instead the process is one of assuming that existing road users will have to change their behaviour to accommodate new traffic. This is a significant departure from existing current practice where new developments should demonstrate that there will be no adverse impact on existing users.

Although this strategy utilised the in BDP is not explicitly stated, it is implicit in the manner the PRISM model has been used and therefore it effectively establishes a new policy for the Council. If the BDP is approved in its current form, future developers will be able to use this as a precedent to avoid having to provide any transport improvements should there appear to be any apparent negative impacts. For example, if a new development was thought to lead to congestion at a junction, the developer would be justified in claiming that it would be up to the existing road users to change their travel patterns, as this is precisely what the BDP is based upon.

It is therefore easy to see that in the future the council will find it very difficult to obtain funding for transport improvements from developers with the BDP in place. The council's ability to fund improvements will be significantly undermined and the whole of Birmingham will face increased congestion as a result.

As a result of the incorrect use of the PRISM model the council has no real idea of the underlying transport needs for the city. Instead the council is merely following a de facto policy of forcing people to adapt their travel behaviour to an increasingly congested transport network, even if this requires people to move house or location of employment. This is clearly detrimental to the future development of the city.

The council has responded to comments on the validity of PRISM's use in this study by stating that the model has been approved for use by the Department for Transport. This response is misleading. The DfT may have given some form of approval to the PRISM model in the past but would not have given the council carte blanche to use the model in any way the council chooses. Any use of the model would need to be explained and justified in its own right and would need to subject to proper scrutiny. Even if the DfT had approved the use of the model for assessing a new road scheme in the past, this has no relevance to its use in the BDP to assess a major population increase. No reference has been made in the evidence base to an approval by the DfT specific to the BDP and so it can be concluded that no such approval exists.

Being a transport modeller myself (including working with a number of Variable Demand Traffic models over the last twenty years) I can understand how easy it would have been to follow the wrong approach. Having made regular use of the PRISM model for new infrastructure assessment, the Council will have easily fallen into the trap of thinking that the BDP required just another set of model runs as before. However it is not just enough that the PRISM model be used, it needs to be used in the correct manner. However it is also possible that the approach used has been taken deliberately as it provides a more optimistic view of the impact of new development. It is therefore critical that this issue be examined in

full to determine whether the council understands fully the implications of the approach taken.

If this is not examined in detail, with further elaboration from the Council, it will not be certain if the BDP has been drafted to achieve its intended purpose and there will not be a clear indication of how a decision-maker should react to a development proposal.

Appendix A: PRISM Model Forecasting Methodology

Excerpt from "Birmingham Development Plan, Transport Modelling Assessment Initial Output Report", Birmingham City Council January 2014

2.5 Variable Demand Model

The demand model forecasts future travel demand by estimating growth based on changes in synthetic trips between the base and the forecast years (see 'Pivoting' Process in Figure 2.1). This growth is then applied to a validated base year matrix. The demand model produces forecasts for 2021 and 2031.

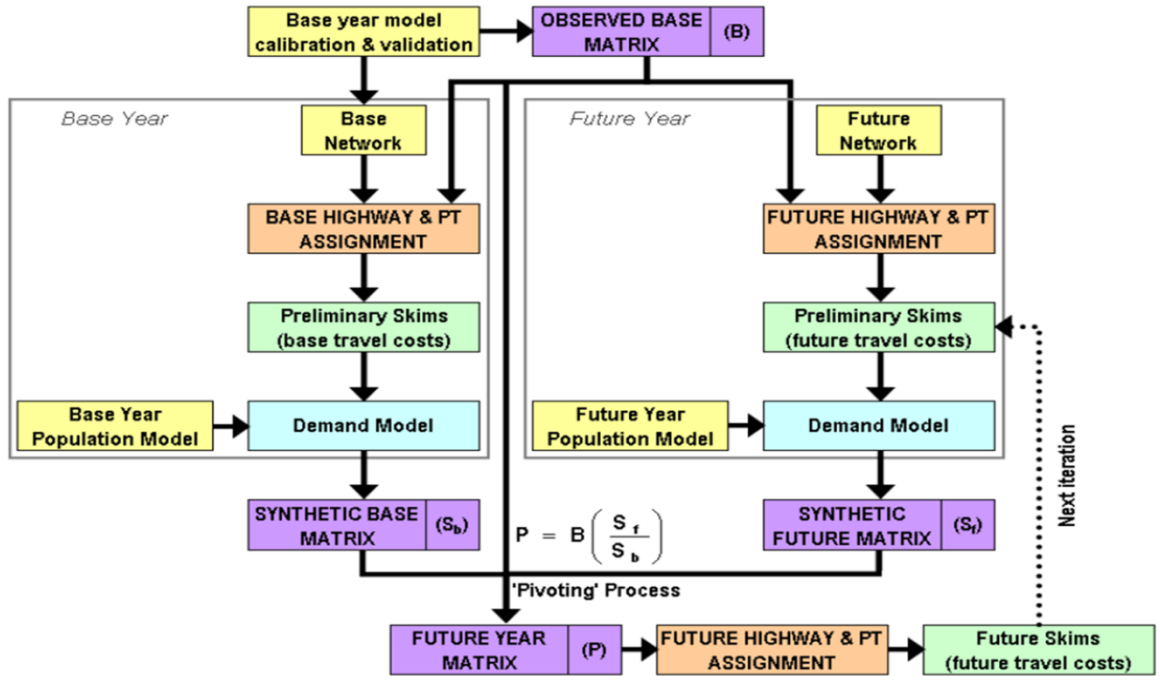
The synthetic demand is a mathematical estimation of the travel movement in the area, based on observations of the travel behaviour of the West Midlands population, spatial information and generalised travel costs for each origin-destination (OD) pair in each modelled year. The demand model contains a bespoke population forecasting module which estimates a future pseudo-household interview based on future zonal targets such as population, workers and household income. The estimation of the synthetic trips (demand) takes into account the following demand responses:

- change in trip making/trip frequency
- change in mode
- change of destination/trip distribution
- change in time of travel

The forecast matrices are assigned to the future networks to obtain an accurate representation of the generalised costs for synthetic matrix re-estimation. This process is done in an iterative process until reaching a satisfactory convergence level.

The above process is undertaken by several modules that are integrated within the demand model and controlled by a VBA program. The whole forecasting process is summarised by the flowchart in Figure 2.1.

Figure 2.1: PRISM Forecasting Process



It should be noted that the figure above contains an error – the dotted line labelled "Next Iteration" should in fact link to the light blue box labelled "Demand Model" below the light green box labelled "Preliminary Skims (future travel costs)" which it incorrectly links to. The future skimmed travel costs replace the preliminary skims and are fed into the demand model. A flow chart showing the correct positioning of the iterative loop is shown below.

PRISM Forecasting Process, as corrected by the author