Introduction

This document is a review of two documents which were not originally part of the published Birmingham Development Plan (BDP) Evidence base but which have become available during the progress of the Birmingham Development Plan Public Examination. These two documents are:

- Birmingham Development Plan, Transport Modelling Assessment: Hybrid Model Output, May, 2014 Birmingham City Council/Mott MacDonald (referred henceforth in this document as the “HMO\(^1\)”\(^1\)\(^\text{\textsuperscript{1}}\)). This document was provided by Birmingham City Council as a consequence of a Freedom of Information request to Birmingham City Council (ref FOI11592F); and

- PRIISM Forecasting Report, September 2014, Prism Management Group/Mott MacDonald (referred henceforth in this document as “PFR”). This document is referenced in the HMO and was provided by Birmingham City Council through the BDP Public Examination Programme Officer.

During the 20th November 2014 session of the BDP Public Examination, Birmingham City Council and their consultants confirmed that the HMO covered a key stage in the development traffic forecasts for the BDP, corresponding to “Stage 3a” as set out in Table 1.1 of the “Transport Evidence Base: Scoping and Methodology Report September 2012, Birmingham City Council/Mott MacDonald” (TA4).

\(^1\) At the time of writing, the two new documents have not been assigned an official reference code and so have been abbreviated for brevity. Reference to other documents include their relevant reference code e.g. TA6.
As a result this document therefore partly superseded the “Transport Modelling Assessment, Initial Output Report January 2014 Birmingham City Council (TA6), with the Hybrid Model Report forecasts replacing the traffic forecasts in TA6, but not affecting the base year forecasts.

The council also confirmed that the results of the “Green Belt Development Travel Demand Report, June 2014, Birmingham City Council/Phil Jones Associates” (TA29) fed into the HMO and that in turn the output from the HMO fed into the various junction assessments carried out for the BDP, namely:

- Minworth Roundabout – Option Development and Appraisal Report, June 2014, Birmingham City Council/Aecom (TA23);
- Tyburn Roundabout – Option Development and Appraisal Report, June 2014, Birmingham City Council/Aecom (TA24);
- Peddimore Access Modelling, June 2014, Birmingham City Council/Aecom (TA25);
- Peddimore Access Modelling – Access Option 2, June 2014, Birmingham City Council/Aecom (TA26);
- 2031 M42J9 Model Assessment, May 2014, JMP (TA28)

During the session of 20/11/14 I provided a verbal description of weaknesses that I had identified with the approach described in the HMO and how these weaknesses would affect the assessment of the proposed development of Peddimore and Langley. The purpose of this report is to set down these points formally in writing to ensure a full understanding of the matters raised.
It should be noted that the HMO was received on 10\(^{th}\) November 2014 and the PFR was received on 19\(^{th}\) November 2014 and hence only a limited review and cross checking of these documents (particularly the latter) was possible.

**Partial carry-over of traffic demands**

The HMO details how the PRISM model has been adapted to provide future year forecasts based upon calculations detailed in the “Green Belt Development Travel Demand Report, June 2014, Birmingham City Council/Phil Jones Associates” [TA29].

Table 4-17 of TA29 provides the summary of the 2031 forecast Arrivals and Departures calculated based upon the proposed land use. The corresponding table in the HMO is Table 2.3.

![Table 4-17: Summary Trip Generation for the Green Belt Development](image)

Source: Green Belt Development Travel Demand Report, June 2014, Birmingham City Council/Phil Jones Associates [TA29, page 33]

![Table 2.3: Total peak hour person-trips to/from the GBD from the PJA TDM](image)

Source: Transport Modelling Assessment: Hybrid Model Output May 2014 Birmingham City Council/Mott MacDonald, page 7

As can be seen the figures reproduced above, for Peddimore there is a match between the two documents (e.g. 2,018 arrivals in the AM peak in both cases). However, there is a mismatch between
the two documents for Langley, as only the figures for “Residential” trips from Langley have been carried forward from TA29 to the HMO (e.g. 1,280 arrivals in the AM peak).

For ease of reference the two figures are compared below in a common format. As can be seen there is a significant decrease in the total trips, especially in the AM peak. No explanation is given for the difference between the two sets of figures.

<table>
<thead>
<tr>
<th>Data from TA29</th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>AM</td>
<td>PM</td>
<td>AM</td>
<td>PM</td>
</tr>
<tr>
<td></td>
<td>Arr</td>
<td>Dep</td>
<td>Arr</td>
<td>Dep</td>
</tr>
<tr>
<td>Peddimore Employment</td>
<td>2,018</td>
<td>458</td>
<td>297</td>
<td>1,739</td>
</tr>
<tr>
<td>Langley Residential</td>
<td>1,280</td>
<td>4,373</td>
<td>3,397</td>
<td>2,242</td>
</tr>
<tr>
<td>Langley Education</td>
<td>3,701</td>
<td>525</td>
<td>77</td>
<td>179</td>
</tr>
<tr>
<td>Langley Retail</td>
<td>29</td>
<td>21</td>
<td>54</td>
<td>55</td>
</tr>
<tr>
<td>Langley Other</td>
<td>572</td>
<td>459</td>
<td>786</td>
<td>720</td>
</tr>
<tr>
<td>Total One-way</td>
<td>7,600</td>
<td>5,836</td>
<td>4,611</td>
<td>4,935</td>
</tr>
<tr>
<td>Total Two-way</td>
<td>13,436</td>
<td>9,546</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Data from HMO</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
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<tr>
<td></td>
<td>AM</td>
<td>PM</td>
<td>AM</td>
<td>PM</td>
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<tr>
<td></td>
<td>Arr</td>
<td>Dep</td>
<td>Arr</td>
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<td>297</td>
<td>1,739</td>
</tr>
<tr>
<td>Langley</td>
<td>1,280</td>
<td>4,373</td>
<td>3,397</td>
<td>2,242</td>
</tr>
<tr>
<td>Total One-way</td>
<td>3,298</td>
<td>4,831</td>
<td>3,694</td>
<td>3,983</td>
</tr>
<tr>
<td>Total Two-way</td>
<td>8,129</td>
<td>7,677</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HMO traffic as proportion of TA29 (One-way)</td>
<td>43%</td>
<td>83%</td>
<td>80%</td>
<td>81%</td>
</tr>
<tr>
<td>HMO traffic as proportion of TA29 (Two-way)</td>
<td>61%</td>
<td></td>
<td>80%</td>
<td></td>
</tr>
</tbody>
</table>

Some explanation of this difference might be gained from how TA29 dealt with the distribution of the forecast trips. Table 5-9 of TA29 set out the distribution of trips according to various areas (of varying size), and included purely internal trips as a separate category (“Internal to site”).

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2 In TA29 the process by which these figures are derived initially refer to these “Residential trips” as “Journey to work” trips.
As can be seen from this table, TA29 assumed that all Education trips would be confined within the Langley area. Hence it might be argued that these trips should have been excluded from the HMO. However, the simplistic idea that just because primary and secondary schools are to be built within the Langley area these will capture all Education trips in Langley is incorrect. For example this ignores the likelihood of the following:

- that some secondary pupils will be traveling from Langley to the local selective schools, Bishop Vesey and Sutton Coldfield Grammar School for Girls, or to King Edward’s schools in Birmingham;
- that some pupils will be traveling from Langley to the most popular Sixth Form location in Sutton Coldfield, Arthur Terry School in Four Oaks or other Sixth form choices;
- that some pupils will be traveling from Langley to denominational schools, for example the Abbey Primary School in Erdington the Bishop Walsh school in Wylde Green;
- that some pupils will be traveling from Langley to any of the different secondary schools in and around Sutton Coldfield due to the varied specialisations available; or
that some pupils will be travelling in from outside Langley, as schools in Sutton Coldfield are generally well thought of.

Hence the Educational trips should have been considered in more detail and some proportion of these included in the trips that travel in to and out of the Langley area. School trips are a notorious source of congestion, traffic levels in school holiday periods are markedly different from “normal” traffic levels and so their total exclusion form the model is a major flaw.

Whereas TA29 assumed no Education trips would extend outside the confines of the Langley area, it did assume the other types of trips would do. Table 5-9 of TA29 shows that it was assumed that 55% of retail trips would travel outside the Langley area. Yet none of these trips have been carried forward to the Hybrid model.

Also of note is that Table 5-9 TA29 does not appear to discriminate between the direction of trips, for example whether it is a trip starting at a house in Langley going to a shop in Wylde Green, or a trip starting at a house in Wylde Green going to a shop in Langley. These distributions are hardly going to be the same (and there would have been value in the HMO reviewing this in the light of available evidence from the Prism model). It may well be that the Langley development would benefit from a good retail centre to improve its sustainable credentials but if it is good enough to attract the local residents (against strong competition such as the Asda next to Minworth roundabout as well as other local shopping areas) then it would be good enough to attract external shoppers.

Table 5-9 of TA29 gives no distribution for “Langley – Other” trips but presumably a significant proportion of these would travel in from or out to the area outside the Langley area.

So overall it can be seen that a very large number of trips have simply disappeared from the assessment. Rather than being a sustainable development this seems more like a ghetto, with the inhabitants barred from leaving the area coupled with restrictions to keep other people out. Certainly it would be hardly be likely that promotional material for new homes would advertise the fact that new residents are expected to confine their travel so much to within the Langley site.

In addition the traffic distribution used in TA29 does not appear to have considered the difference between trips heading “inbound” and those heading “outbound”. Whilst this is effectively
superseded by the HMO it would have been valuable for the HMO to have produced more information on the resultant distribution of trips, much as TA29 did, in order to properly inform the BDP (and ensure the process is realistic).

**Peak hour/Peak period**

Having taken forward only part of the total number of trips originally calculated in TA29, these were then converted from peak hours values into peak periods for compatibility with the PRISM model. These conversion factors are shown in section 2.6 of the HMO and are significant, particularly for the AM peak where the hourly flow for the peak period is only 70% of the hourly flow in the peak hour.

![Table 2.6: Trip Rates](resource)

Source: Transport Modelling Assessment: Hybrid Model Output May 2014 Birmingham City Council/Mott MacDonald, page 7

The use in the PRISM model of the average flow over the whole peak period rather than the average over the peak hour is important, not because there any intrinsic error, but as this would need to have been taken into account when PRISM flows were used for detailed junction analysis (or any other use). Yet when the flows have been used such as in the assessment of the Peddimore Access no detailed explanation has been given to confirm that the data has been properly processed, merely a statement that, as in “Peddimore Access Modelling, June 2014, Birmingham City Council/Aecom” (TA25) for example, “PJA have provided 2031 flows in vehicles”.


In section 4.2 of TA24, Aecom refer to having received flows in “average hour models” which is ambiguous. There is some circumstantial evidence though. The report identified (the fourth paragraph of section 4.2) that the 2031 forecast flows were in some cases lower than the observed 2009 flows and notably this is for the AM peak when there is a 30% difference between the two potential flows, and so this mismatch between peak hour and peak period flows could be the reason for this (the effect is most marked in the AM peak, and it is for this peak that the problem has been identified. Also in this analysis it is stated that the percentage of HGVs had to be assumed, showing that insufficient information was passed to Aecom, suggestive of a poor level of communication between the different parties working for the council.
This therefore compounds any concerns about the output from the Prism model (Hybrid or not) when used in any of the detailed junction assessments. This particular problem would be easier to detect (and avoid) if forecast figures were available for key links which could be cross checked against flows used in individual junction assessments.

**Conversion from person trips to vehicle trips**

The next step described in the HMO is to convert from person trips into Highway trips. This is done by applying the mode split proportion for Car drivers to the total person trips. The factors are set out in Table 2.5 of the HMO.

<table>
<thead>
<tr>
<th>Mode / Purpose</th>
<th>AM Departures</th>
<th>AM Arrivals</th>
<th>PM Departures</th>
<th>PM Arrivals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Car Driver / Business</td>
<td>5.0%</td>
<td>5.1%</td>
<td>3.4%</td>
<td>5.6%</td>
</tr>
<tr>
<td>Car Driver / Other</td>
<td>53.0%</td>
<td>60.8%</td>
<td>54.8%</td>
<td>56.2%</td>
</tr>
<tr>
<td>Car Driver Total</td>
<td>58.0%</td>
<td>74.9%</td>
<td>58.2%</td>
<td>61.8%</td>
</tr>
</tbody>
</table>

Source: Transport Modelling Assessment: Hybrid Model Output May 2014 Birmingham City Council/Mott MacDonald, page 8

Section 2.7 HMO states that the factors were derived from the “Transport Modelling Assessment Initial Output Report, January 2014, Birmingham City Council/Mott MacDonald” (TA6). Table 4.2 of TA6 sets out the assumptions that were included in the PRISM model including extensive public transport infrastructure (the proposed “SPRINT” service) including the addition of bus gate and bus lanes to derive the “Development Case” mode split.

**2.7 Purpose, Mode, and Time Period Proportions**

The PRISM travel demand model has been chosen as the appropriate source to distribute the trip totals in Table 2.4. The model runs used to support the Initial Output Report have been selected because many of the improvements since then have been to the network models rather than to the demand model. The following table presents the percentage of total person arrivals or departures in each time period to the GBD zone that are made by car drivers for the purposes of business and other purposes (including commuting):

Source: Transport Modelling Assessment: Hybrid Model Output May 2014 Birmingham City Council/Mott MacDonald. page 7
However the HMO gives no indication that the “with Development case” forecasts had any network changes applied to the Reference case network (in effect the only difference between the two modelled scenarios is in the demand matrix). The forecasts therefore have assumed the benefits of additional public transport improvements which reduce the amount of traffic generated, but at the same time have not included the reduction in road capacity for other road users implicit in these public transport improvements (e.g. bus gates, bus lanes). The resultant forecasts are therefore unrealistic and based on a scenario that is not simply unrealistic but actually impossible to achieve.

As a cross-check TA29 Figures 6-29 & 6-30 give the values of 56% and 63% as aspirational targets for the proportion of car trips (i.e. the upper limit), assuming significant public transport measures were put in place. These aspirational figures are consistent with the model split assumed in the HMO, confirming that this report has assumed that such infrastructure would be in place. (If this was not the case then this indicates that the reference forecasts were over-optimistic about low car use to begin with, which would be a problem in itself.)

As a further cross-check, Table 6-3 of TA29 shows that actual car use is Walmley in actually much higher, with Car Drivers representing 74% of all trips for journeys to work (which is should be representative of what we might expect for Langley). It should also be noted that 1% of trips apparently travel by Rail, despite there being no rail service in Walmley. Such trips might be “Park and Ride” trips (a category not included in the analysis of TA29), as the Cross City line has a number of such sites in Sutton Coldfield which would still generate car trips in the local area.
Tables 6-29 and 6-30 of TA29 do not show any Park and Ride share. These trips might be hidden in the “Public Transport” category implying an even higher number of cars should have been forecast. Further details of Park and Ride forecast usage would help clarify the picture.

Source: Green Belt Development Travel Demand Report, June 2014, Birmingham City Council/Phil Jones Associates [TA29, page 116]
Importance of modelling adverse impacts

Section 3.1 of the “Green Belt Development Movement Infrastructure Plan, January 2014, Birmingham City Council/Phil Jones Associates” (TA7) makes it clear that it is not merely sufficient for a Sustainable Development, as the Langley site is claimed to be, to have good connections but that it should not adversely impact on existing travel. This is important not just as a matter of principle but as critical issue with regards the protection of Green belt.

Table 6-3: Walsley: Journey to Work Mode Split

<table>
<thead>
<tr>
<th>Mode</th>
<th>Split</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rail/Underground</td>
<td>1%</td>
</tr>
<tr>
<td>Bus/Coach</td>
<td>11%</td>
</tr>
<tr>
<td>Car Driver</td>
<td>74%</td>
</tr>
<tr>
<td>Car Passenger</td>
<td>6%</td>
</tr>
<tr>
<td>Cycle</td>
<td>1%</td>
</tr>
<tr>
<td>Walk</td>
<td>5%</td>
</tr>
</tbody>
</table>

Source: Green Belt Development Travel Demand Report, June 2014, Birmingham City Council/Phil Jones Associates [TA29, page 72]

Section 14 of the National Planning Policy Framework, March 2012, Department for Communities and Local Government identifies that there is a presumption in favour of sustainable development. However it is easy to misread this as a presumption in favour of development because it can be
presumed that a development is sustainable. Instead it should be seen as a presumption in favour of a development if, and only if, it can be proved to be sustainable (which would require rigorously derived proof).

14. At the heart of the National Planning Policy Framework is a presumption in favour of sustainable development, which should be seen as a golden thread running through both plan-making and decision-taking.


Despite TA7 identifying the need for a development to be considered sustainable only if it does not significantly affect existing travel movements, this concern does not appear to have been taken into account in the assessment of the traffic impacts of either Langley or Peddimore (it should be noted that although only Langley has been labelled explicitly as “Sustainable”, the Peddimore site would equally need to prove its sustainable credentials in order to claim a presumption in favour of development on Green Belt). Perhaps the only indication of this is the way the traffic figures in the HMO seem to have been processed in order to reduce the likely impact (e.g. the absence of all but residential trips travelling outside Langley) having made an automatic presumption of sustainability rather than actually assessing the matter in an objective manner.

As has been discussed above, in producing the “with development” forecasts the HMO has applied the development trips as an additional demand on to the Reference case network. As a consequence the forecast only show the negative impacts of the additional traffic (which is bad enough) but does not show the adverse impacts of the Public Transport measures such as bus gates and bus lanes which would adversely impact on the highway network. Although well intentioned, the negative impact of these measures should still be taken into account (regardless of how far away from the site this occurs) if any claim is to be made on sustainability. The council may believe that the traffic benefits of these improvements would offset the negative impact (for example by reducing the traffic flow by moving people onto buses) but this needs to be proved not merely assumed.

Additional adverse impacts
Figures 3.9 and 3.10 of the HMO presents plots of the differences in traffic flows between the Reference and Development cases, with red lines indicating where traffic is forecast to increase and green lines where it forecast to decrease (and the width of each line being in proportion to the scale of the change).
These plots confirm the fact that the model does not show any reduction in traffic along the line of the proposed “Sprint” bus service (which would be expected with the associated loss in capacity and increased delays for cars on this route). In addition these plots show important links near the Langley site where there is forecast to be a significant decrease in flows.

In the AM peak it can be seen that Thimble End Road is forecast to have a significant decrease in traffic, as does the section of Walmley Ash Road between Webster Way and the A38 Minworth Roundabout. In each case, both ends of the road is intersected by a significant increase in flow associated with the Langley development. In the PM peak the same problem is found on Walmley Road north of Fox Hollies Road, and also on the A38 north of Minworth Roundabout. This indicates that the increased flow due to the development is forcing pre-existing traffic movements away from these roads. The development is therefore having a significant adverse impact on the existing road network and travel movements.

Similarly Figures 3.13 and 3.14 of the HMO, which show changes in speed with the development, also show widespread adverse impacts. These would require not just the odd junction improvement but significant increases in road capacity (or more simply, more roads).

Although a long list of schemes has been produced in Appendix E of the “Birmingham Development Plan Transport and Infrastructure Evidence Base and Strategy, June 2014, Birmingham City Council” only four schemes have been tested (albeit with forecast traffic data that is likely to be an underestimation, as detailed above). Again it seems to be a case of presumptions being made, namely that an “off the shelf “ solution (each scheme has an associated cost but comparison of these shows the same values repeated showing these are just generic costs without any adjustment for individual conditions) will be enough to deal with any problems without actually doing any relevant analysis. This is hardly a valid approach.

Whilst it can be seen that the task of carrying out a full assessment of all the roads and junctions identified as requiring improvement would be significant and costly, and for which the council may be unwilling to undertake, this task is inherent in the decision that the council has taken in deciding to place significant development on the Green Belt and is the necessary price it must pay. If the council does not want to undertake this work they have merely to downgrade the scale of the development to something that is more manageable.
Source: Transport Modelling Assessment: Hybrid Model Output May 2014 Birmingham City Council/Mott MacDonald, page 21
Source: Transport Modelling Assessment: Hybrid Model Output May 2014 Birmingham City Council/Mott MacDonald, page 22
Source: Transport Modelling Assessment: Hybrid Model Output May 2014 Birmingham City Council/Mott MacDonald, page 25
Source: Transport Modelling Assessment: Hybrid Model Output May 2014 Birmingham City Council/Mott MacDonald, page 26
Weaknesses in PRISM Forecasting

At the very end of the PFR, comments have been made on key assumptions that may influence its forecasts. Of the four, the last is likely to have significance to the use of the Prism model in the context of the BDP and the HMO, namely that “Crowding is not represented in the PTAM” (presumably referring to the Public Transport Assignment Model).

5.2 Assumptions

The following are the key assumptions that may influence results:

- Zonal targets still based on 2001 uplifted to 2011/21/31 and no allowance for ageing population
- A potential improvement to the model would be to use 2011 Census data
- Real increase in fares are not represented in the PTAM
- Crowding is not represented in the PTAM

Source: PRIISM Forecasting Report, September 2014, Prism Management Group/Mott MacDonald

The inclusion of Crowding in a public transport model is important to reflect the capacity of such services and the decreasing attractiveness as a service fills up (for example someone is more likely to make use of a bus that is practically empty with lots of free seats compared to one that is almost full with limited standing room available) and this acts as an important balancing factor on public transport use (much in the same way that as roads fill up with more and more traffic, the speeds decrease making them less attractive). The absence of the Crowding function is therefore a potential major weakness in the model, likely to lead to over optimistic public transport forecasts. Attempts to produce a major modal shift to public transport may produce higher public transport shares because the critical restraint has been left out (unlike cars which slow down as the road gets more congested, PT services would be assumed to run at fixed speeds regardless of their use.

It is recognised that the caveat in the PFR would appear to refer specifically to the PT assignment model rather than the demand model. It is just possible that Crowding is applied in the Demand Model and therefore the calculation of the mode split, although this seems highly unlikely as this would presumably require the levels of Crowding to be determined by the PT Assignment Model. No other reference is made to Crowding in the PFR so the point is left in doubt. Even so, even if the correct mode share was determined the routing would be likely to be affected, with passengers using routes that are over-capacity when they ought to be on an alternative route, which in turn ought to be affecting the level of Crowding on that route and so on. At the very least this would make the reliability of PT forecasts on parallel routes very uncertain although, as discussed above,
the likelihood is that there is a great problem of too many trips forecast to be on Public Transport and hence the highway network would have a lower level of forecast traffic than it ought to have.

In addition to the absence of Crowing in the PTAM, it is also stated that “Real increase in fares are not represented in the PTAM”. In this instance reference is made in 2.1.4 to the use of a Real Fare Increase in the Demand Model. Hence this should not affect the share that public transport should get (which it would if it was absent from the Demand Model process). Given fares across all PT options increase at the same rate then presumably this error may well balance out amongst different options, so no clear systematic error seems evident. Even so, the city council should provide more information on why the absence of a realistic modelling of fares should not affect the reliability of the model in the context of the BDP.

2.1.4 Real Fare Increases

Public transport fares are an input to the PRISM Demand Model in the form of origin-destination matrices extracted from the PTAM. Since the fares extracted are still in 2011 prices, a factor is applied to reflect the real increase in fares between 2011 and the future year.

Source: PRIISM Forecasting Report, September 2014, Prism Management Group/Mott MacDonald

Paul Hoad 21/11/14