TECHNICAL NOTE 1
HCA LAND EAST OF HARDINGSTONE, NORTHAMPTON
Response on NBC Traffic Modelling

17TH APRIL 2015
PROJECT: 3513738C-PTE/ 1.1

Prepared By: Alex Woo Principal Transport Planner
Checked By: Hannah Shrimpton Regional Associate
Approved By: Hannah Shrimpton Regional Associate
Peer Review Jon Tricker Director, Phil Jones Associates

1 INTRODUCTION

1.1 WSP | Parsons Brinckerhoff has been commissioned by the Homes and Communities Agency (HCA) to promote the mixed use development at Land East of Hardingstone, Northampton. The proposed development includes junction improvements with the A45, at Brackmills Interchange and Queen Eleanor Interchange.

1.2 This Technical Note seeks to address questions and issues raised by Northampton Borough Council and their consultants Glanvilles in a letter to the Appellant’s agent dated 11/2/15 and a subsequent letter dated 10th April 2015. The letter relates to highway evidence submitted as part of the planning application for residential development at Land South of Brackmills, Hardingstone. In particular these issues relate to modelling and design proposals for the Brackmills and Queen Eleanor Interchanges on the A45.

1.3 The sections below discuss the specific topics raised in correspondence with Northampton Borough Council and Glanvilles. Each section will discuss the modelling parameters employed in the LinSig Models, with responses to key questions referenced. Many issues are cross-related and the reader may find it useful to read this note as a whole to understand the overall approach taken to the modelling of these junctions.

2 ASSESSMENT SCOPING AND STUDY AREA

2.1 This section addresses queries 2, 3, 4, 6 and 7 as referenced within letter dated 10th April 2015.

2.2 The scope of the Transport Assessment and study area was agreed with Northamptonshire Highways, initially in early 2012 with a wider study area agreed in autumn 2013. A meeting was held with NCC & the Highways Agency in January 2012 with further meetings held in October 2013 resulting in an agreed TA in January 2014. Initial scoping responses and a Technical Note received from Northamptonshire Highways (NH) are appended to this note.

2.3 As noted within the Technical Note issued by NH dated 19/7/13, an expansion of the study area to include ‘Brackmills junctions’ and Queen Eleanor Interchange. A meeting was held with NH to confirm the junctions to be included in an updated TA and these were agreed as:
• Caswell Road/Gowerton Road;
• Caswell Road/Rhosili Road;
• Caswell Road/A45 (Brackmills Interchange); and
• Queen Eleanor Interchange.

2.4 Regarding the additional junctions specified within the April 10th response, none of these junctions were requested for assessment by Northamptonshire Highways.

• A45 Southbound On-slip/Pavilion Drive – this is a small exit from the southern section of Brackmills Industrial Estate on the A45 southbound on-slip. The slip road is part of the Highways Agency network and as such was not requested for assessment. It was not considered that the Hardingstone development would generate significant additional traffic at this junction.

• A45/A428 Barnes Meadow Interchange. As noted in comments provided by Rob Sim-Jones, NH to Glanvilles dated 9th April 2015, an existing major improvement scheme has recently been undertaken at the junction. This was designed to provide additional capacity to accommodate all traffic generated by allocated sites, including Hardingstone SUE.

• A428/Lilliput Road. As noted in comments provided by NH to Glanvilles dated 9th April 2015, the junction was not considered an attractive route for traffic generated by the Hardingstone SUE due to the convoluted route through the middle of Brackmills Industrial Estate.

2.5 As part of the scoping discussions, it was agreed that TEMPRO growth rates would be applied to baseline traffic data. The following TEMPRO rates were applied:

<table>
<thead>
<tr>
<th>2012-2016</th>
<th>AM</th>
<th>Inter-Peak</th>
<th>PM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weekday</td>
<td>1.2524</td>
<td>1.3</td>
<td>1.2557</td>
</tr>
</tbody>
</table>

2.6 The growth rates are based on Planning dataset 62 and NTM dataset AF09 adjusted to Rural Minor v 6.2. The factors include the following assumed increase in jobs and residential units:

<table>
<thead>
<tr>
<th>Base HH</th>
<th>Base Jobs</th>
<th>Future HH</th>
<th>Future Jobs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wotton/Hardingstone Area (34UF2)</td>
<td>3357</td>
<td>15114</td>
<td>4153</td>
</tr>
</tbody>
</table>

2.7 No additional specific sites were requested by NH to be included within our assessments due to there being no specific local approved developments considered to not be included within the forecast growth within TEMPRO.

2.8 Traffic was distributed across the network based on 2001 census data, as discussed within the Transport Assessment (Section 6.5).

2.9 All LinSig models were issued for approval to NH. As stated in correspondence received from Rob Sim-Jones on 9th April 2015, all models were approved by Lou Mason-Walsh in December 2013.
3  CLASSIFIED TRAFFIC COUNT

3.1  This section addresses query 5 as referenced within letter dated 10th April 2015 along with query 7 referenced within letter dated 11th February 2015.

3.2  LinSig traffic flow group demand is expressed in PCU. The base year turning movement matrices were derived from Classified Turning Counts. Traffic counts at Brackmills was undertaken in Sep 2013 by JES and Queen Eleanor was observed in Nov 2012 by NDC. A PCU factor of 2 has been applied to the Heavy Vehicles group (OGV1, OGV2 and Bus & Coaches).

4  CALIBRATION/VALIDATION

4.1  This section addresses query 8 as referenced within letter dated 10th April 2015 along with query 9 referenced within letter dated 11th February 2015.

4.2  The base models were prepared with relatively limited information however it was endeavoured to prepare a model suitable to represent the existing conditions on the ground, based on observed flows and signal control information. The base model has not been calibrated/validated using independent data, with Saturation Flows adjusted based on the baseline model performance. This is discussed further in Section 6 below. The main objective of preparing the base model is to understand how the junction will operate with future traffic flows and derive suitable but reasonable mitigation in order to achieve ‘nil detriment’.

4.3  As advised by Rob Sim-Jones, the adopted policies relating to development management require all TAs to be prepared in accordance with the DfT Guidance on Transport assessment, and therefore provide for ‘nil detriment' mitigation. This is therefore the position that was taken with regard to the modelling of the local highway network.

5  CONTROLLER SPECIFICATIONS

5.1  This section addresses query 9 as referenced within letter dated 10th April 2015 along with query 1 referenced within letter dated 11th February 2015.

5.2  The existing controller specification would certainly provide the basic signal plan, stage time, intergreen times and the co-ordination of signals. This information would be correct when the signal regime was last reviewed. However, it is expected that the junctions may well be operating with some form of urban traffic control using SCOOT or MOVA detections to manage traffic whilst maintaining the safety of the A45; which varies the signal timings to accommodate the traffic demand throughout the day.

5.3  As a result, the fixed time plan from existing controller specification would provide a “fall-back” position of the junction operation. Fixed plans are deployed when the controllers suffer malfunctions, such as power lost and communication drop. They are the fail safe protocols to ensure the junction would maintain some order until the controllers’ faults are rectified.

5.4  It is acknowledged that the fixed plans would provide some “as existing” conditions more concisely for the base year, providing the signal plans were reviewed to reflect the base year traffic demand. However, it is often found that the fixed plan specification is not up-to-date due to the plan has been amended remotely. The fixed plan may not be most suitable to accommodate the traffic demand in future scenario even the junction is not improved.

6  OPTIMISATION

6.1  This section addresses query 10 as referenced within letter dated 10th April 2015 along with query 14 referenced within letter dated 11th February 2015.
6.2 The optimisation process of a traditional grid LinSig network would normally involve perhaps 2-3 iterations between traffic assignment and signal optimisation. The process is completed when the signal timing is converged. The process becomes harder to follow in a signalised roundabout setting. It is imperative that the circulatory carriageway of the roundabout is managed, so that queuing is not causing a lock-up situation. This means optimising the signal timing is more intuitive than autonomous. In addition, the queuing of the A45 off-slip roads is monitored. It is equally important to manage the queuing of the slip road so that it is not affecting the operation of the A45 mainline. Also, it is preferable to maintain some form of "platoon progression" so that traffic is moving through the roundabout in a reasonable fashion.

6.3 The combination of these requirements often results in deliberately reducing the green time of the county road entries (to manage queuing on circulatory and A45 off-slip roads). This is followed by adjusting the offsets to achieve some platoon progression.

6.4 It is acknowledged that the optimisation for Queen Eleanor Interchange is particularly difficult. Many circulatory carriageway links are experiencing congestion. The scale of queuing cannot simply be judged by the Mean Maximum Queue indicator. The other queuing outputs are also used to achieve a tolerable solution.

7 SATURATION FLOWS

7.1 This section addresses queries 11 and 12 as referenced within letter dated 10th April 2015 along with queries 2 and 3 referenced within letter dated 11th February 2015.

7.2 Saturation flow uses a mixture of RR67 calculation, typical value of 1800 pcu/hr/lane and some use the uplifted 2100 pcu/hr/lane. The existing model was first prepared using a typical saturation flow of 1800 pcu/hr/lane. However, the preliminary base year results with the lower value reports over-capacity; suggesting the saturation flows may be too low and traffic is most likely to be more bunched up than normal. Therefore, the lane saturation flow is uplifted to present value in an attempt to calibrate, so that the junction operates at capacity; hovering at or just exceeding the 90% Degree of Saturation threshold.

7.3 It is acknowledged that saturation flow should ideally be observed to reflect the existing conditions. However, observation also comes with their uncertainties. For example:
- No guarantee that the junction is operating "typically" on the day of observation
- Observation can only take place during the peak periods
- Traffic struggle to exit roundabout downstream will affect the observations
- Traffic demand fluctuate would reduce the number of valid observation
- Time and resources

7.4 Saturation flow for the “with mitigation” models adopts the same values as existing. It is assumed that proposed improvement would not alter the traffic behaviour. Vehicles using the junction in peak periods, commuters, remain in close formation with similar driving behaviour.

8 GIVE WAY MODEL

8.1 This section addresses query 13 as referenced within letter dated 10th April 2015 along with query 5 referenced within letter dated 11th February 2015.

8.2 The partially signalised interchanges have arms that operate as traditional roundabout. These arms are modelled as give way in LinSig. The geometric parameters of these give way arms have been measured and entered into the roundabout capacity formula set out in TRL LR942, which calculates the slope and intercept values.
9 CRUISE TIME / SPEED

9.1 This section addresses query 14 as referenced within letter dated 10\textsuperscript{th} April 2015 along with query 6 referenced within letter dated 11\textsuperscript{th} February 2015.

9.2 Cruise speed of the interchange at peak periods was assumed to be 36kph (22 mph), which equates to 10m/s. It is considered that the interchange would not be able to achieve absolute free flow condition in peak times.

10 LANE DESIGNATIONS & FLARE MODEL

10.1 This section addresses queries 15 and 16 as referenced within letter dated 10\textsuperscript{th} April 2015 along with queries 4, 12 and 13 referenced within letter dated 11\textsuperscript{th} February 2015

10.2 Regarding the lane designations for the Brackmills LinSig model, Brackmills Arm 1 Lane 2 is for ahead and right turn. Technically, it is the offside lane for the ahead movement. It is equally correct to consider this as a nearside lane for the right-turn movement with no real alteration in performance.

10.3 Regarding Brackmills Arm 2 Lane 3, the observation is correct that this should be designated as nearside in Saturation Flow calculation. As a result the Degree of Saturation in various scenarios may increase slightly. However, it is not envisaged that this particular lane will exhibit a capacity issue under these modelling conditions.

10.4 Lane Length, in PCU, is only specified for Short Lanes (flares). This is in order to set up the flare model.

10.5 The short lanes are described by number of passenger car unit (PCU). The current version of LinSig will always attempt to make full use of the Short Lane subject to blocking by other adjacent lanes. It is considered that there is no need to manually intervene the short lane occupancy in the flare model.

11 EXIT BLOCKING & QUEUING

11.1 This section addresses queries 17, 18, 19 and 20 as referenced within letter dated 10\textsuperscript{th} April 2015 along with query 15 referenced within letter dated 11\textsuperscript{th} February 2015.

11.2 Exit blocking has not been modelled within the LinSig Modelling as the junctions have all been modelled independently. Although the Caswell Road/Rhosili Road junction could be linked to the Brackmills model as a series of Give-way arms, the mitigation proposals for this junction include a left-turn slip lane which is considered to address any significant queuing on this arm of the roundabout. Such a junction arrangement is considered more appropriately modelled in ARCADY, as has been undertaken. Based on the development traffic being residential, it is not considered that the increase in traffic will affect the circulatory traffic on the roundabout causing additional delay to the western Caswell Road arm of the roundabout. It should also be noted that the two junctions are approximately 250 metres apart, a significant length for queuing to avoid exit blocking.

11.3 Queuing and blocking is managed in a pragmatic fashion through the optimisation process as discussed above.

11.4 It is agreed that the Queen Eleanor exit lanes should be ‘unconstrained” however it is not considered that such a change will affect the results.

11.5 Lane flow diagrams have not been prepared separately. A route list has been used.
12 WIDER NETWORK CAPACITY ISSUES

12.1 The existing junction models utilise information from the observed traffic counts. The traffic counts record the number of vehicles cross the stopline/give way. If exit blocking and congestions beyond the interchanges are reducing the throughput, they would be reflected in the observed turning movements.

12.2 The existing junction performances in base year are consistent with the junction operating at/close to capacity, with Practical Reserve Capacity near 0% and Degree of Saturation around 90%. This means the junction models in base year are only just accommodating the volume of existing traffic that has been observed through the stopline; but not suggesting the existing junctions are operating with spare capacity. It is considered that the existing models are representing the existing conditions reasonably well.

12.3 On the other hand, the highway authority may consider 100% degree of saturation as acceptable. In that case, there is a reason to revert the uplift of Saturation Flows, but accept the PRC would be well into negative. It is possible to revalidate the existing models using a new set of observed turning movements, supplemented by queuing survey and saturation flows measurements. However, it would be highly recommended that signal timing information is recorded and observed accurately at the same time.

13 DESIGN RELATED QUERIES

13.1 This section partially addresses queries 21, 22, 23 and 24 as referenced within letter dated 10th April 2015. A further more detailed Technical Note related to design standards, Road Safety Audits and Technical Approval will be issued separately.

13.2 Much of the mitigation proposals are for widening of entries and lanes, alterations to lane marking and destination marking. The geometric characteristics of the junctions have not been altered as they are fixed by the existing junction layouts. The existing junctions were constructed as traditional roundabouts and subsequently converted into a partial signalised arrangement.

13.3 The design standards themselves have been revised on more than one occasion since the 1980s, and since construction of these junctions. Applying the latest design standards to the existing layouts will almost certainly find some form of departure. The highway authority must appreciate a ‘retro-fit’ mitigation will be able to fully satisfy the latest design standards, and the preliminary mitigation designs have been approved by NH on this basis.

13.4 Since submission of the planning application, and in preparation for the Planning Inquiry, additional work has been carried out on the design proposals for the two A45 interchanges. This includes commissioning Stage One Road Safety Audits for all junction proposals, undertaking on site measurements to verify designs and undertaking a full design review.
14 SUMMARY

14.1 At the time of submission, the main objective of the Transport Assessment was to determine whether the proposed improvement would satisfy the “nil detriment” requirement, as agreed with Northamptonshire Highways. This position was achieved and agreed with NH. However, the term “nil detriment” has not been used since the introduction of the National Planning Policy Framework, which now describes a less onerous ‘severity test’ as indicated in Para 32. This policy shift means that our ‘nil detriment’ approach is considered very robust when compared to more recent advice in NPPF.

14.2 The junction parameters inputted into LinSig are considered best reflecting the existing condition. The base year junction performances are consistent with the perception that these junctions are at/close to capacity. Therefore, it is considered that the existing junction models are “fit for purpose” to support the Transport Assessment.

14.3 The proposed improvements are not drastically changing the method of control. The interchanges are remaining as partially signal controlled, therefore not considered necessary to adjust the main parameters.