Hereford Transport Strategy Phasing Study

Modelling Issues Report

Report

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JMP Consultants Limited
Rotterdam House
116 Quayside
Newcastle Upon Tyne
NE1 3DY

T 0191 206 4085
F 0191 206 4001
E newcastle@jmp.co.uk

www.jmp.co.uk

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Prepared by Paul Gray

Verified by Amy Sykes

Approved by Lee White

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Contents

Tables and Figures

1 Introduction

Context and purpose of this report

1.1 This report serves as a technical note of the issues identified in reviewing the model prior to undertaking the phasing study modelling work.

1.2 The following chapter presents the issues together with suggestions for changes to enable the model to be used in a WebTAG compliant Outline Business Case (OBC). It should be noted that as this work was undertaken prior to 1/2/2014, this work is based on the definitive WebTAG guidance of October 2013.

1.3 Further chapters document changes made to the models after receipt of the final AMEY version of the model during December 2013. These changes principally relate to modifications to the input files for the demand model, the coding of do minimum measures (specifically the committed pinch point schemes) and the corrections made to the supplied forecasting spreadsheet to calculate intermediate years.

2 Issues Identified with the Model

2.1 Initial runs of the model identified a number of issues with the Hereford Multi Modal model as supplied by AMEY.

2.2 Many of these issues have been resolved as they related to either missing files or misunderstandings of the approach adopted by AMEY.

2.3 The remainder of this chapter provides an overview of issues that remain; together with those that may have implications at the Outline Business Case stage of work for the Hereford Western Relief Road. The issues are listed below by type:

Model Reports

- AMEY made a series of reports available to JMP at the commencement of this commission. These were:
  - Model Scoping Note;
  - Local Model Validation Report
  - Base Model Comparison Report (HCBaseMod1 - 26/02/2013)
- Thus, there is limited reporting of the following aspects of the model:
  - Demand Model Calibration and Validation;
  - Forecasting Model approach;
  - User Manual;
  - Base Year Matrix Building; and
  - Survey Reports
- Other reports may be necessary for an Outline Business Case but the list above represents the minimum required for understanding of the derivation of the supplied model;
- In addition to the reporting, worked examples are sometimes requested, particularly for key parameters such as the generalised cost equation and validation results;

Base Assignment Models

- Highways Model has speed flow curves on links within the buffer network. This is contrary to SATURN advice though the issue is concentrated near the border between the buffer and simulation areas;
- Public Transport time factors are coded but do not seem to be being used within the model;
- Given the level of knowledge available on proposed strategic development sites, it may be prudent if updating the model to include additional zones to represent future growth;

Demand Model

- The demand model is (currently) not set up to run to convergence rather the model runs for a fixed number of loops, set by the user. Convergence measures are reported but given concerns with the generalised cost formulation (see below) it is not clear whether these are reporting accurately;

- The order of the model is trip distribution, then mode choice. These should be reversed for a standard WebTAG model, unless evidence is given through the model development reports. In addition, the costs for the distribution model are solely the highways model journey costs;
- The distribution model is doubly constrained for each journey purpose. This is not convention for a journey purpose such as Home Based Shopping where changes in travel costs can result in destinations receiving more (or fewer) trips. While the overall trip generation is conventionally controlled by the trip production model, the trip attraction pattern can change in destination choice models;
- The peak spreading model and trip frequency models have not been run for this commission as it was not clear the derivation or methodology used to generate the model scaling parameters. In addition, it is not clear whether the other four highway assignment models used to generate costs for the peak spreading model have been calibrated;
- The lights and heavy goods vehicle matrices are subject to trip redistribution during the model based on the prevailing travel costs. The derivation of the parameters governing this process is not clear, nor are there any reporting of the implied elasticity of goods vehicles;
- The model operates as an incremental model with the difference between future and base applied to the modelled base year. It appears however, that the 12 hour trip ends within the reference case files do not match those of the 12 hour trip ends in the forecasting spreadsheet. In addition, the application of a difference approach can (and to a limited extent does) result in negative trips being saved in the trip matrices;
- Parking charges are applied as monetary costs to travel to zones and are coded through a separate file. The supplied file only has values coded for zones where a car park existing, but since the trip matrices contain origin to destination trips (as opposed to origin to car park trips) this can create gaps in the central area in particular. In future versions of the model it may be necessary to refine the approach to car parking;
- Smarter choices have been coded as an input file representing the percentage change in trip ends even though modes such as walking and cycling are embedded within the choice model;

Forecasting Approach

- The model takes as input trip ends by journey purpose for three separate time periods. Conventionally, demand models are usually 24 hour and segmented by car availability. The time period approach has meant that a factoring process has been incorporated into the model to enable the changes due to car availability to be incorporated. No documentation was provided on the factor, and the default setting was a value of one;
- In addition, the time period approach limits the ability to link outbound trips in the morning to (for example) inbound trips in the evening peak. This may not be necessary, but it would be desirable for a major scheme bid;

Model Operation

- The model script files are not extensively annotated and thus it is a time consuming exercise to interpret and check. There are instances within the model where demand model calculations are applied to a specific set of zones. While there is probably an explanation for the approach there is a lack of documentation to explain the rationale. We

have presumed these zones to be large development / large change zones based on the zone numbers and forecasting inputs;

- The only changes to the model made by JMP have been to the trip ends / highways and public transport inputs apart from updating the batch files so that selected stages of the model are run outputting to a vdu file rather than the screen. This has considerably reduced the run times per model loops.

3 Demand Model Changes

Choice Model

3.1 The following changes were made to the demand model:

- A car occupancy factor file was created for each modelled year;
- A no car available factor was calculated for each modelled year; and
- Values of Time / Operating Costs / Public Transport Values of Time files were created for each modelled year.

3.2 The car occupancy factors have been derived from guidance from WebTAG (Unit 3.5.6) and have been made consistent with those in the AMEY supplied generalised cost spreadsheet. Similarly, the vehicle operating costs, public transport and highways model values of time have been updated in accordance with WebTAG (Unit 3.5.6).

3.3 The no car available factor (NCA factor) has been calculated by outputting "Trip Ends by Car Availability" from TEMPRO using the relevant alternative planning scenario. This represents a 24 hour total level of trip making based on four car availability groupings.

3.4 These four groupings are then themselves grouped into No Car Available and Car Available for the purposes of calculating the NCA factor. The definitions are illustrated in the table below:

Table 3.1 Car Availability Definition

TEMPRO Definition	Hereford Model Definition
Households with 0 Cars	No Car Available
Households with 1 Adult and 1 Car	Car Available
Households with 2+ Adult and 1 Car	50% No Car Available / 50% Car Available
Households with 2+ Adult and 2+ Car	Car Available

JMP

3.5 TEMPRO output is grouped into Car Available / No Car Available groups for the base year and forecast year output to yield. In addition, the TEMPRO future year total is proportioned into a Car Available / No Car Available value based on the base year Car Available / No Car Available shares.

3.6 The ratio of the No Car Available total for the TEMPRO Future and "TEMPRO Future with Base Mode share" is then calculated and used as the NCA factor.

Forecasting Model

3.7 The forecasting within the Hereford multi modal model is based on a series of spreadsheets that were supplied by AMEY at the start of the commission.

3.8 A few cell linkage issues were identified, principally related to the goods vehicle growth which have been corrected in the final spreadsheet. Forecast growth rates for goods vehicles for 2017, 2022, 2027 using the same NTM method as supplied by AMEY have been calculated.

3.9 Housing and Employment control totals by local authority areas were calculated by pro-rata of the 2032 growth as supplied by AMEY. This was done through a duplication of both the land use and time period growth spreadsheet.

3.10 All spreadsheets have been supplied to Parsons Brinckerhoff.

4 Supply Side Model Changes

4.1 The base highway and public transport models have been calibrated and validated by AMEY in accordance with WebTAG standards. JMP had previously reviewed the base highways model on behalf of the Highways Agency and make recommendations as to the modelling of the A49.

4.2 Recommendations on changes to the models for the main identified issues have been noted in Chapter 1, the section below highlights the changes made to the highways network to reflect known issues in the forecast year do minimum and do something scenarios. The following section documents changes to the input files of the public transport model.

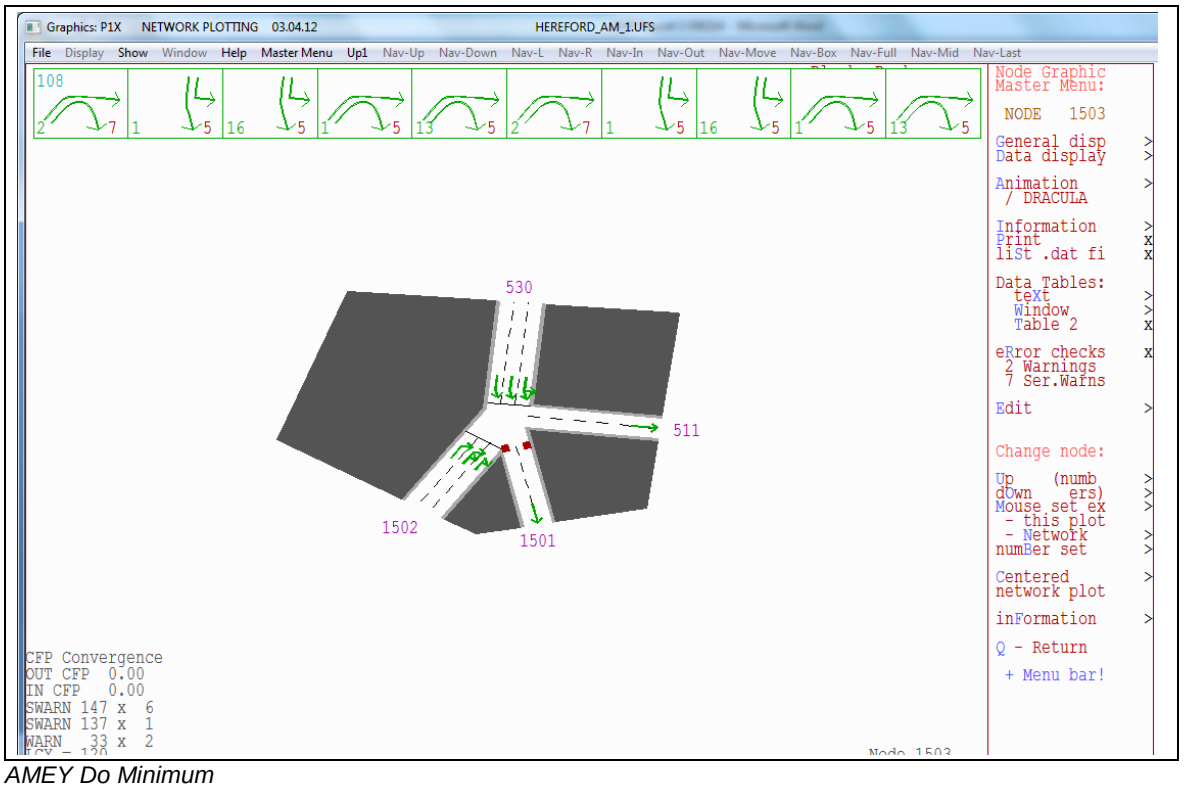
Highways Model Issues

4.3 Running the model revealed significant highways model convergence issues, in some cases the model failed to converge and at worst failed to operate after a number of iterations.

4.4 This was ultimately traced back to the coding of the signalised junctions between the A49 / A465 ASDA roundabout and the A49 Edgar Street roundabout with Newtown Road, coding that represented the two pinchpoint schemes.

4.5 An example of the supplied coding for the A49 Edgar Street / A438 Newmarket Street is given below.

Figure 4.1 SATURN Coding – Part of A49 Edgar Street / A438 Newmarket Street



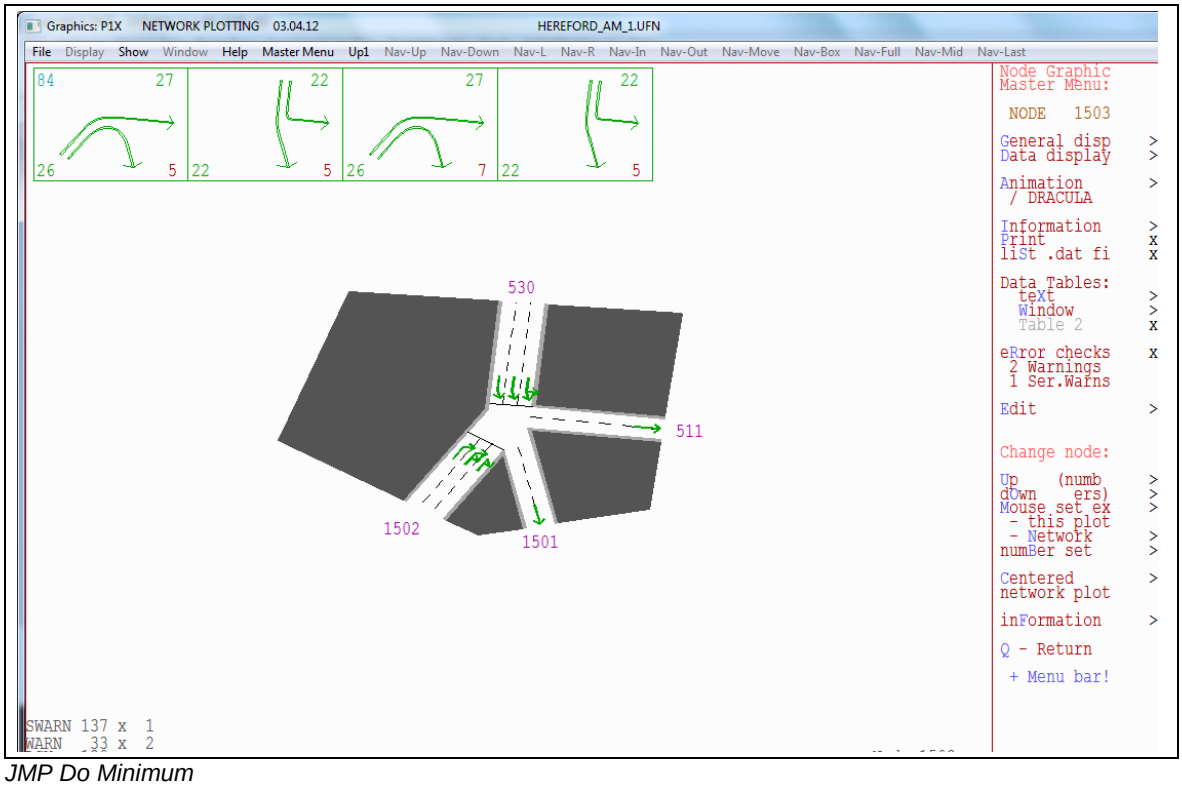
AMEY Do Minimum

4.6 As can be seen, the junction has been coded with 12 signal stages, with intergreen times between all stages. The result is a junction that has significantly less capacity than reality as the junction in effect shutdown 12 times in 2 minutes.

4.7 A similar style of coding was done for the A436 / A49 ASDA roundabout to the south of Greyfriars Bridge.

4.8 The two signalised junctions stage coding has been consolidated into fewer stages with the result being greater capacity as a consequence of a large reduction in the all-red time. The revision to the coding illustrated above is shown below.

Figure 4.2 SATURN Coding – Revised Part of A49 Edgar Street / A438 Newmarket Street



JMP Do Minimum

4.9 The Do Minimum network also had a series of signalised junctions coded to represent pedestrian crossings. There was no documentation for the source of the timings for these junctions so for future year networks these have been set to two minute cycles with 100 seconds green and 20 intergreen / pedestrian.

4.10 It was also noted that in later forecast years congestion was experience on the B4399 Rotherwas Link Road from the junction with The Straight Mile.

4.11 A further issue with the network in future years was with the loading points for zone 114. This zone contained the Hereford North West urban expansion and was in the base year connected to a single loading point off Three Elms Road.

4.12 In the supplied Do Something networks additional zone centroids had been coded direct onto the Hereford Western Relief Road. In the supplied Do Minimum Additional links were coded along the roads adjoining the Hereford Western Relief Road (Roman Road and King's Acre Road). The effect of coding in this manner was to make the Western Relief Road appear more attractive to new developments and so consequently, we modified the approach.

4.13 An additional connector to King's Acre Road was included in the Do Minimum / Do Something networks in 2027 and 2032 to reflect the later stages of the build out of the development. The choice of the southern access (King's Acre Road) was determined by analysis of SHLAA information which provided broad timescales for when sites were developable.

4.14 As a general point however, future modelling and especially any update of the demand model should take into account proposed strategic development locations within the specification of their zone plan to ensure that they can be separately identified and represented within the model.

4.15 It should also be noted that JMP have not performed an audit of the model, we have operated the model on an “as supplied basis” apart from where issues have presented concerns related to either the quality or stability of the outputs. We would recommend a full audit of the highways network is undertaken prior to any revisions to other aspects of the model suite.

4.16 The public transport networks have only been modified where required to allow for the consistent representation of the highways and public transport networks.

Public Transport Model Issues

4.17 Revisions were made to the public transport fares and value of time.

4.18 The values of time were calculated in accordance with WebTAG (Unit 3.5.6), and are consistent with the approach adopted for the highways model. Different values of time were coded for each of the four forecast years and appropriate FAC factor files were created.

4.19 The fares for the Do Minimum have assumed an increase in fares in line with retail prices over the plan period.