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Dear Ben

Peel Hall Vissim Model – Base Model Review

Atkins has been commissioned by Highways England to audit a base VISSIM model and supporting Local Model Validation Report (LMVR) which has been produced by the Modelling Group on behalf of Highgate Transportation (HT) who have been commissioned by Satnam Millennium Ltd (Satnam) in support of the proposed development of land at Peel Hall in Warrington.

It should be noted at the outset that this review focuses on the parts of the network that are of interest to Highways England. As such, it cannot be said that Highways England agrees or disagrees with any part of the work that does not fall under that heading.

Basic Model Coding

The model has been built in Version 11.00.12 of the Vissim software. Although it is stated in the LMVR that this is the latest version of the software, The statement reads "…update the network to the **latest fully stable and tested version** of the software…" PTV released Vissim Version 2020 in the Autumn of 2019 and it is recommended that the model is updated to this version of the software As the work was started before this point it would not be good practice to swap versions. Our standard practice is always that we do not immediately start using the latest version of VISSIM until we have completed rigorous in-house testing has been completed, as past early release versions have almost always been found to contain a lot of 'bugs' and other issues. An update to another version of the software would create unacceptable delays to the assessment programme, for no discernible benefit.

When the model is opened it produces eight warnings with regards to discontinued vehicles. This is a function of the model being updated from Version 8 to Version 11 of the Vissim software. It is suggested that the 3D model distribution is updated so that all of the selected vehicle models are from the current database. This has now been updated.

The model has been coded in a geographical location such that the background mapping is slightly mis-aligned to the model. This makes the detail of the network coding hard to audit and should therefore be amended. The model is in the geographical location which AECOM coded it in. This exercise has not been to build the model, but to cordon what previously used and agreed. Google mapping can be used for reference in this case.

The model has been set to a simulation resolution of 5 which is acceptable.

Use of Modifications

The model uses 12 separate modifications to reflect just the Morning and Evening Base scenarios. This is not recommended best practice and makes the model significantly more difficult to audit as well as making the scenarios longer to load. The model only takes seconds to open – perhaps Atkins need to explain this point further. It is recommended that all of the modifications associated with the Morning Peak scenario are read into the base model and then removed from the list. Further, the modifications related to the Evening Peak scenario should be rationalised into a single modification which changes the appropriate settings from morning to evening such as the start time and flows. Although the recommendations are noted, there are no central UK standards that dictate the way that modification files 'should' be used. Our way of working ensures that different elements and settings can easily be used and interchanged between multiple different scenarios, rather than having to potentially repeat elements of work creating the chance for changes and errors to creep in.

For the avoidance of doubt, it would not be expected that the modelled network would be physically different between the Morning and Evening Peak scenarios without very strong justification. We would agree. It is quite a quick and relatively simple process to see that the modifications used do not create separate physical changes between peaks, but rather track minor input, routing and signal changes between peaks, in order to achieve calibration. This allows an auditor to see exactly what has been done to the original model, rather than if the modifications were all just read into the base which has the potential to obscure/ provide less transparency, regarding the process taken.

Method of Assignment

The model is based on the original AECOM model which was coded using Dynamic Assignment. Although the model has been switched to a Static Assignment model, the coding associated with the original Dynamic Assignment including matrix files, parking lots, and nodes have been retained in the model making it unnecessarily complex. This coding should be removed. There is no complexity, once the model is a static model, all dynamic assignment elements are ignored. Nodes are used for evaluation purposes, so cannot be removed, parking lots and matrices are turned off/ ignored.

It is unclear as to why the model has been converted from Dynamic to Static assignment This is a process which was clearly laid out in the provided methodology document in November 2019., but it is clear from a review of the vehicle inputs and associated Static Vehicle Routes that the process has resulted in a significant drop in the number of OD pairs with flow assigned to them. It is unclear at this stage as to whether or not that will negatively impact on the model being fit-for-purpose. As stated in the LMVR "During the process to convert the original model from dynamic assignment to static assignment, an option to remove any routes with less than 0.02 relative volume and/or less than 2 absolute minimum volume was selected in an attempt to minimise the subsequent total amount of static routes to work with. Otherwise though, all routes are as per the original models." The 'significant drop' is due to the fact that the original models contained large volumes of routes with total volumes which were often less than 1. This is an unnecessary level of detail, and would also considerably extend the processing time of the data for no discernible benefit.
As for the comment as to whether this could "…negatively impact on the model being fit-for-purpose", this is the whole point of the comparison tables provided right at the front of the LMVR (Tables 2.1 – 2.4) which show that there is almost exactly the same level of turning vehicles and a similar level of journey time performance, as was found in the original model.

Temporal Scope

The temporal scope of the model is as below:

- Morning Peak – 07:00 to 09:30
- Evening Peak – 16:00 to 18:30

A review of typical delays in Google Maps suggests that the M62 eastbound is already congested by 07:00 and that the Winnick Link suffers from some delay. In the evening, Google Maps suggests that the Winnick Link suffers from some delay. Overall, it is felt that the temporal scope is probably sufficiently robust subject to validation and calibration of the model.

Network Layout Coding

It has not been possible to check the network coding in detail due to the misalignment of the model against the background mapping. In saying that, there are areas of the model that are coded differently to the approach that Atkins would take including the bus stop laybys and the use of 'dummy' connectors at junctions. However, these differences in approach are not necessarily wrong and would not necessarily preclude the model from being fit-for-purpose noting, in particular, that buses are not the focus of this model. This is the previously agreed model, and although it is not a method we would have used if building the model in-house, the point is whether it achieves a reasonable representation of real-world performance.

We would welcome the opportunity to review the network coding in detail once the model is correctly aligned to the background. As already set out above, this is a previous model and the background can be checked against an external source such as Google mapping

Driving Behaviour Parameters

The majority of the network is coded as Urban Motorised as would be expected. The motorway is coded using a range of behaviour types include bespoke behaviours for the westbound carriageway and links coded to best accommodate weaving where appropriate. In general, this approach is regarded as being robust so long as the model can be validated and calibrated in these areas.

It is noted that at M62 J9, the western slip roads are coded with a link behaviour type of '203:Slip Roads' whilst the eastern slip roads are coded as '4. Mway 2'. This appears to be inconsistent and should be reviewed or justified.

It would be expected that a gradient is coded onto the off-slips at M62 J9 in order to accurately reflect the uphill gradient on the approach to the roundabout. No changes were made to the provided, previously approved model driving/ link behaviour setup.

Traffic Flows

Notwithstanding previous comments on the assignment of the traffic, a review of the model running suggests that traffic flows around the model in a way that suggests the model is reasonably well coded. In saying that, lookback distances at the key roundabouts in the network may need reviewing in order to minimise the number of vehicles changing lane very close to the junction or within the junction itself. Whilst it is agreed that some elements such as lookback distances are not all entirely 'default', this is likely to be resultant of localised observations during the original model development.

It appears that the acceleration rate of some of the HGV's in the model is quite low. As such, it is recommended that the coding of the characteristics that feed into the acceleration such as 'Power' and 'Weight' as well as the 'Maximum Acceleration' and 'Maximum Deceleration' functions are reviewed against current best practice as would be default in Vissim Version 2020. Whilst it is agreed that some elements such as HGV acceleration/ power/ weight are not all entirely 'default', this, again, is likely to be resultant of localised observations during the original model development. Also, we are not working in VISSIM version 2020, so this point is not relevant.

It appears that one of the 'Car' vehicle inputs, on link 227, may be coded into the model twice causing too much traffic to be loaded into the model. This was an error which had been missed – thank you, it has now been corrected.

Signals

A review of the signals in the model has focused on the area of main interest to Highways England, M62 J9 and the immediate junctions to the north and south. Signals on M62 J9 run using two controllers. However, they are coded in one controller in the model. Whilst not necessarily best practice, this should not negatively impact on the model's fitness for purpose.

It is noted that no operational timings were able to be acquired for M62 J9. As such, particular focus would be expected on the journey time validation through this junction in order to illustrate the appropriateness of the signal timings used.

Speed Distributions and Speed Decisions

Desired speed distributions generally appear to be fine as do the reduced speed areas. It is noted however that the Sandy Lane W free flow left turn appears to have a desired speed distribution of 30 mph whereas the posted speed limit is 20 mph. As the speed is set to the posted 20mph as soon as traffic goes around the corner onto Sandy Lane West, it was assumed that there must have been a good reason for this very short section (44m exiting the roundabout, 22m approaching the roundabout) to do with calibration of the original model, most likely as a result of site observations in 2015.

Public Transport

Bus routes and their departure times have been defined in the model. Although bus timetables have not been checked against published schedules, it is noted that the departure times in both the Morning and Evening Peak models are the same. A review of the departure times is therefore recommended. This is as per the provided AECOM model

Calibration to Counts

For the Morning Peak, the LMVR reports the model flows for 08:00-09:00 matching only 57.1% to a GEH of less than 3. Whilst 85.7% match to a GEH of less than 5, it is noted that the model has no route choice and therefore a high match rate would be expected. This doesn't consider the hybrid nature of using a previously developed model, multiple sources of updated flow data, and a separate historical journey time data collection averaged over all relevant days in the month of the majority of the updated flow data. As always this is a balancing act to get the best out of the turning comparison vs the journey time data. Huge amounts of time have already been spent making smaller and smaller manual tweaks – eventually a point is reached the returns for time spent dwindle to almost nothing. This is not a point which is arrived at lightly, but it is genuinely felt that there is not value in spending further time going back and forth trying to tweak the AM model considering the combined calibration levels already achieved (which are above nationally stipulated values in any event).

For the Evening Peak, the LMVR reports that the model flows match to a much better level.

It is suggested that the Morning Peak traffic inputs and routeing is reviewed.

Validation to Journey Times

For both peaks, the LMRV reports northbound and southbound journey times for eight sections that make up a route through the network along the A48. It would be preferable for the comfort of Highways England if additional routes through M62 J9 were also reviewed.

With regard to the Morning Peak, the overall journey times in the model when compared to the observed are -1% for the Northbound and +2% for the Southbound. These are considered acceptable. It is noted that the journey times for the section that reflects M62 J9 are +2% for the Northbound and -13% for the Southbound. The latter of this is somewhat concerning.

With regard to the Evening Peak, the overall journey times in the model when compared to the observed are 0% for the Northbound and -3% for the Southbound. These are considered acceptable. It is noted that the journey times for the section that reflects M62 J9 are +3% for the Northbound and +71% for the Southbound. The latter of this is very concerning. This section is 232m long – the 'very concerning' 71% which has been highlighted here represents 21 seconds. This draws attention to the fact that these standards were never designed for very small sections (the original criteria for journey time validation was meant for routes of at least 3km).

In summary, whilst the overall journey times suggest the model is generally robust, the journey times for M62 J9 are of concern and it is recommended that the model is reviewed. In addition, it is recommended that additional routes are added to the model to reflect other movements at M62 J9.

Observation of Model Simulation Runs

Given the issues identified in the previous sections of this review, it is not felt productive to dwell on operational observations as the model will be updated to an extent. Notwithstanding this, it is noted that there is significant queuing on Northway in the Morning Peak model which exceeds the link length and is felt to be particularly unrepresentative. It is suggested that the priority rules and modelling of the flared approach to A50/A49 junction on the eastern arm is reviewed. This is entirely resultant of the double counting which your auditing highlighted, and which has now been corrected.

Summary

Atkins has been commissioned by Highways England to audit a base VISSIM model and supporting Local Model Validation Report (LMVR) which has been produced by the Modelling Group on behalf of Highgate Transportation (HT) who have been commissioned by Satnam Millennium Ltd (Satnam) in support of the proposed development of land at Peel Hall in Warrington.

The model looks to be overall of a reasonable standard. However, a number of issues have been noted through this review which should be addressed so that the model can be reviewed and agreed as being fit-for-purpose.

There are some understandable points, but overall it is felt that this audit is unnecessarily petty and alarmist in the issues it raises. It feels that the specifics of this project have not been considered, in that using an older model, developed by a different consultant, using different practices, is never the easiest or most ideal start point. However, it is felt that when all of this history/ background is considered, along with the hybrid nature of available data used, along with the fact that all flows (and most likely signal timings) will be altered during future year testing, that actually this is a pretty decent start point for testing. Spending further time on minute details feels counter-productive and time-wasting.

Yours faithfully

Gavin Coupe