Project:	**Highways England Spatial Planning Arrangement**	Job No: **60600479 DM014.014**
Subject:	**South Caldecotte, Audit of revised forecast VISSIM model**	
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Executive Summary

This Technical Note describes the modelling audit of the South Caldecotte forecast Vissim models of the A5/A4146 Kelly's Kitchen Roundabout, provided by BWB to support the planning application of the proposed South Caldecotte development in Milton Keynes. The audit was carried out based on WebTAG guidance and best practice recommended in Transport for London (TfL) Traffic Modelling Guidance.

This Technical Note follows on a series of reviews of the base and forecast Vissim models, as well as mitigation proposal designs and the proposed development's Transport Assessment. The latest reviews of the forecast models were documented in Technical Note 10 ('South Caldecotte Revised Forecast VISSIM Review_V2) and Technical Note 11 (TN11 - 'South Caldecotte Revised Forecast VISSIM Review_V9'). The latest review of the mitigation proposal was documented in Technical Note 12 ('TN12 Kelly's Kitchen Proposed Junction Review (DMRB) v7').

The forecast Vissim models were already approved in the previous reviews (TN11), where the mitigation proposal (TN12) was considered to effectively mitigate the traffic impact of the proposed development.

Recent updates on the delivery of nearby development Aylesbury Vale (Eaton Leys), whereby it is now not going ahead, meant that the proposed mitigation linked to Aylesbury Vale development will not be implemented, changing the configuration of the junction included in the previous models.

Subsequently, BWB identified a scheme at Kelly's Kitchen roundabout, built upon the existing layout, and updated the forecast Vissim models of the junction accordingly to test the impact of the new mitigation proposal in the new junction configuration.

The review of the latest mitigation proposal can be found in Technical Note 13, which should be read alongside this technical note.

This note focuses on the audit of the updated models and summary of results' note submitted by BWB on 30th of June 2020.

This note draws attention to the following elements:

- Changes to the model from the previous submission;
- Modelling results;
- Coding of the mitigation proposal;
- Outstanding comments from the previous review; and
- Analysis and interpretation of modelling results.

Issues/Errors that were found in the models have been classified into three levels:

- **MINOR –** The issues found are likely to produce minimal changes in the results.
- **MEDIUM –** The issues found could have a medium impact on the results.
- **SIGNIFICANT –** The issues are considered as an error and are likely to have a large/ significant impact on the results.

Table 1 summarises the status of the issues identified during the previous audits:

Table 1. Summary of outstanding issues with the models from previous audits.

Issue Identified in Previous Audit	Level of Issue	Resolved?	Comments
Incomplete definition of scenarios	Minor	Yes	The summary of Vissim model results note contains a description of the modelled scenarios.
Use of both priority rules and conflict areas	Minor	Yes	The model does not contain Priority Rules and Conflict Areas controlling the same conflict points.

No other modelling issues were found in the models that require further attention.

The modelling results indicate that the proposed mitigations offset the main increase in journey times caused by the development on the approaches to the junction. All Journey Times across the modelled area remain similar or are reduced by the mitigation compared to the Reference Case.

Overall network performance results show that, with mitigation, average delay across the network is reduced in the Do Something scenario, compared to the Reference Case. Delays at the junction remain at similar levels to the Reference Case in the PM peak hour, and are significantly reduced in the AM peak hour.

The model shows that the junction, with the proposed mitigation in place and an optimal signal configuration, can effectively mitigate the impacts caused by the development flows.

1 Introduction

This Technical Note (TN14) provides a summary of the audit of the revised forecast Vissim models (dated 30th June 2020) developed for the A5 Kelly's Kitchen Roundabout by BWB. The Vissim models have been prepared to support the planning application of an employment development at South Caldecotte in Milton Keynes.

AECOM has previously undertaken three reviews of the base models:

- 'TN03 South Caldecotte VISSIM Model Review_v10' – dated 2nd November 2018;
- 'TN04 Revised South Caldecotte VISSIM Review_v8' – dated 26th April 2019; and
- 'TN05 South Caldecotte Revised VISSIM Review_v7' – dated 1st August 2019.

In the last review of the base models (TN05), these were approved (subject to minor amendments) and agreed to be taken forward for forecast modelling. Subsequently, AECOM carried out four reviews of the forecast models:

- 'TN07 South Caldecotte Revised Forecast VISSIM Review_v13' – dated 24th January 2020
- 'TN09 South Caldecotte Revised Forecast VISSIM Review_v14' – dated 20th March 2020;
- 'TN10 South Caldecotte Revised Forecast VISSIM Review_V2.12' – dated 24th April 2020; and
- 'TN11 South Caldecotte Revised Forecast VISSIM Review_V9' – dated 3rd July 2020.

The audit of the previous forecast model (Technical Note 11 – 3rd July 2020) concluded that the model provided a reliable basis for the assessment of the development's traffic impacts and proposed mitigation, and that the development's impact on the junction was effectively mitigated on all approaches.

However, a change in the Aylesbury Vale (Eaton Leys) development and the proposed mitigation linked to this development at Kelly's Kitchen roundabout, meant that the junction layout in the opening year of South Caldecotte development would change, from the previously assumed 'hamburger' configuration, to the existing layout.

Consequently, BWB identified a series of mitigations for Kelly's Kitchen roundabout, built upon the existing layout, and provided updated drawings and models for its assessment. The models/information received by AECOM for this audit include:

- The forecast VISSIM models;
- Summary of VISSIM model results; and
- Mitigation drawing (*SCD-BWB-GEN-01-SK-TR-SK02_Kelly's Kitchen Roundabout_P3* dated 8th July 2020).

2 Forecast model review – changes from previous model submission

2.1 Modelling approach

A summary of the modelled scenarios is provided below in Table 2. It should be noted that the scenario labelled 'Do Minimum' includes the proposed development traffic, but without any network mitigation. To evaluate the impact of the proposed development trips and mitigation on the network, a comparison should be made against the 'Reference Case' and 'Do Minimum - with development' and the 'Do Something – with development + mitigation'.

The only change in modelling assumptions compared to the previously reviewed models is that the layout of Kelly's Kitchen junction in the South Caldecotte development's opening year is now as existing, rather than the previously assumed 'hamburger' layout.

The development at Aylesbury Vale, with which the 'hamburger' scheme was linked, is now less certain and is not included in the models; however, the trips generated by this development were not included in the models explicitly, but were included as background growth extracted from TEMPro. The updated models therefore contain the same demand as the previously reviewed models, which is considered appropriate and a robust modelling approach.

The models submitted only comprise the development's opening year (2023), and do not include the 2031 forecast year assessment as in previous reviews; it is recommended that the assessment includes the opening year and at least one additional forecast year (WebTAG Unit M1 §5.2.1) to fully understand the operation of the junction after the full delivery of the associated development. This issue is considered **MINOR**.

Table 2. Composition of modelled scenarios.

	Flows	Schemes
Reference Case 2023	Base + Committed Developments (without Levante Gate)	Existing layout
Do Min 2023	Base + Committed developments (without Levante Gate) + Proposed development	Existing layout
Do Something 2023	Base + Committed developments (without Levante Gate) + Proposed development	Existing layout + mitigation

2.2 Demand checks

The modelled demand is consistent with the modelling assumptions described in §2.1. The modelled demand is consistent with the previous submission (refer to TN11 - §2.2), which is considered appropriate.

2.3 Network Changes

2.3.1 Link and connectors

The proposed mitigation has been coded upon the existing junction layout, as described in §2.1.

The changes to the link and connector structure of the model accurately represent the proposed mitigation, as specified on the mitigation drawing (SCD-BWB-GEN-01-SK-TR-SK02_Kelly's Kitchen Roundabout_P3).

It should be noted that the road markings on the A5 northbound approach to Kelly's Kitchen roundabout indicate 'A5 BEDS' in the mitigation drawing, whilst the Vissim model only allows the right turn onto Brickhill Street from the offside lane and the straight ahead movement onto the A5 northbound from the two middle lanes. However, as the exit onto the A5 northbound only has two lanes, this is assumed to be an error in the mitigation drawing, and has therefore not been highlighted as an issue in the model.

There are no additional changes to links and connectors other than those necessary to replicate the proposed mitigation.

2.3.2 Other changes

There are other changes to reduced speed areas, signal heads, and vehicle routing decisions to account for the different link and connector structure associated with the proposed mitigation. These are considered appropriate.

2.4 Changes to signal controllers

The previously assumed 'hamburger' layout required the definition of new signal controllers at the junction in the forecast scenarios. However, with the updated layout, the base signal controllers have been retained in all forecast scenarios. This is considered an appropriate and robust approach that allows a like for like assessment of the development's traffic impact and proposed mitigation.

2.5 Modelling results

2.5.1 Replication of modelling results

The model results contained in the '*Summary of VISSIM model results*' note have been successfully replicated by AECOM for all scenarios.

2.5.2 Analysis of modelling results

Figure 1 shows the location of the journey time sections defined across the model area.

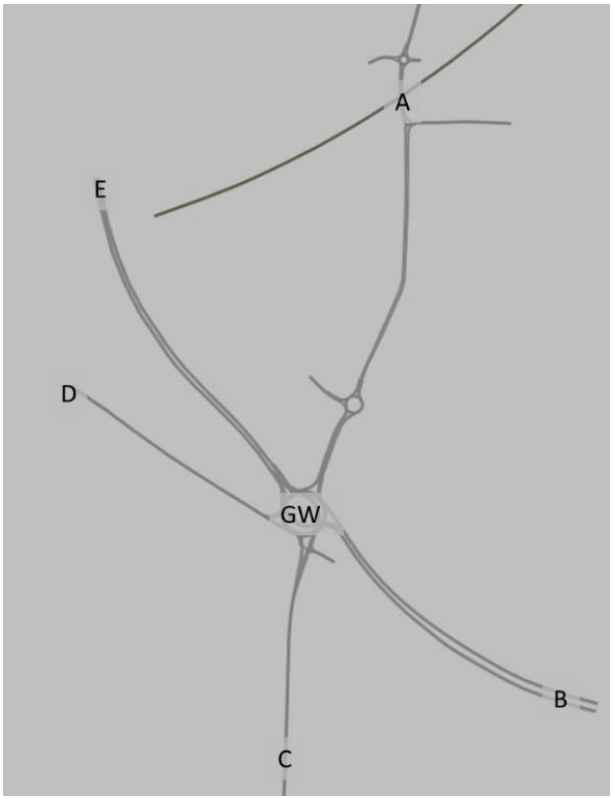

Figure 1. Journey time sections though the model.

Figure 2 shows the journey time results for the AM and PM peak hours on all the approaches to the Kelly's Kitchen junction produced by the model submitted by BWB.

The journey time results for the AM peak hour show that:

- The proposed mitigation in the Do Something scenario offsets the increase in journey times seen from the Reference Case to Do Minimum (due to the additional development trips) on most approaches to the junction (B-GW, C-GW, D-GW and E-GW);
- There is a marginal increase of 9 seconds from the Reference Case scenario to the Do Something scenario on Brickhill Street southbound (A-GW);
- The implementation of the proposed mitigation results in significant reductions in journey times on Brickhill Street northbound (GW(B)-B, GW(C)-B and GW(D)-B) and on the A5 northbound (B-GW), so that the resulting journey times are lower than that of the Reference Case;

The journey time results for the PM peak hour show that:

- The additional northbound traffic on Brickhill Street (inbound trips into the development) in the Do Minimum scenario results in more green time being assigned to that movement across the junction, which benefits the southbound approach to the junction (A-GW), causing a significant increase in the journey time on the A5 southbound (E-GW);
- The implementation of the proposed mitigations in the Do Something scenario offsets the main increase in journey time caused by the development trips in the Do Minimum, i.e. the increase in journey times on the A5 southbound (E-GW) is effectively mitigated; and
- Journey times on all routes through the junction are generally either reduced or remain similar in the Do Something Scenario compared to the Reference Case, with only marginal increases seen on some movements.

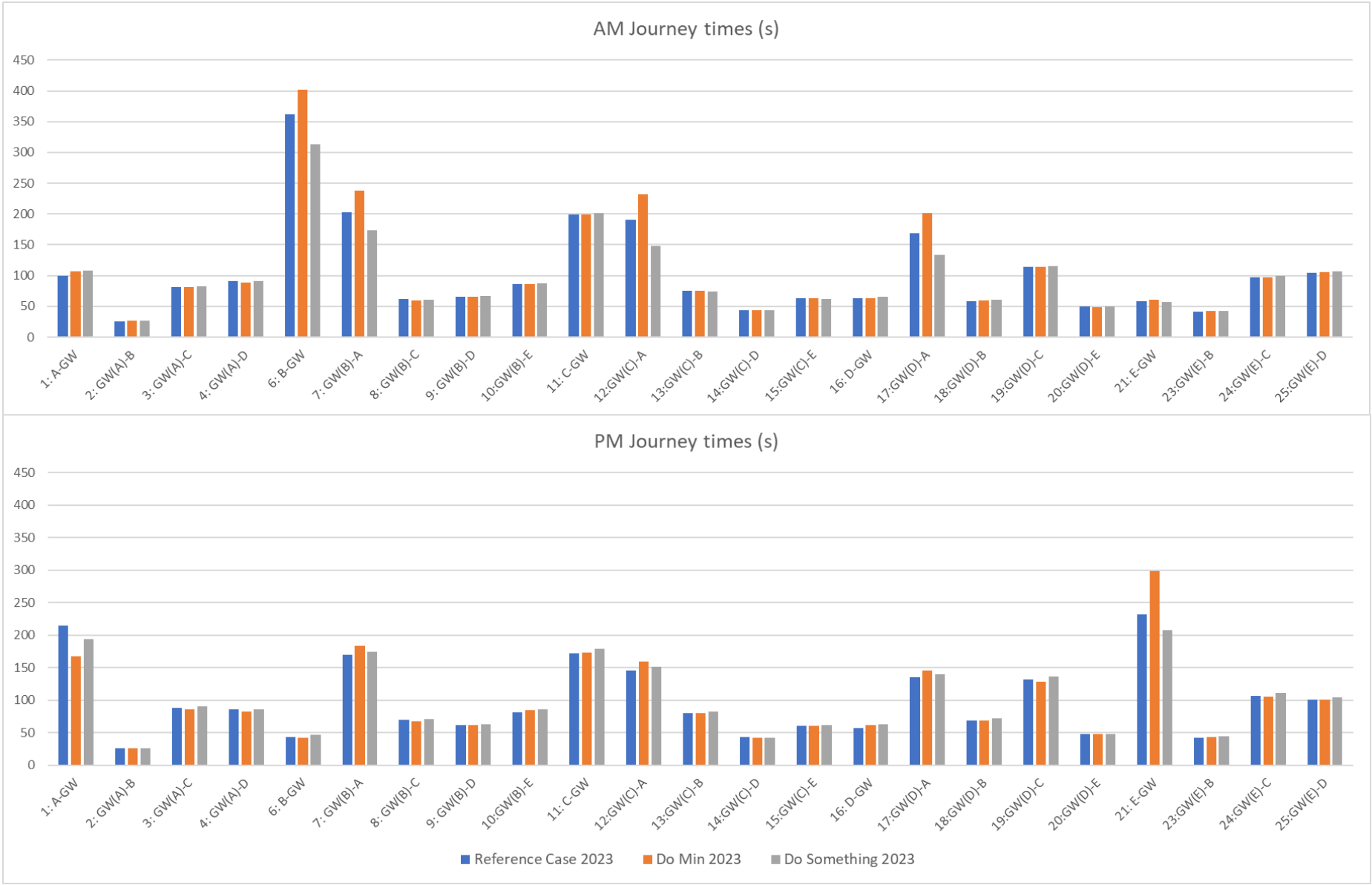

Figure 2. Modelled journey times.

Previous reviews highlighted significant increases in queues during the AM peak on the A5 northbound (TN10) in the Do Something scenario compared to the Reference Case. This issue was subsequently addressed as described in the previous model review (TN11). No increase in queueing on the A5 northbound has been observed in the models in this review.

Table 3 and Figure 7 show the network performance results, as produced by the models submitted by BWB.

There is predicted to be a significant reduction in overall average delay and latent demand with the implementation of the proposed mitigations in the AM peak hour (comparison between Reference Case, Do Minimum and Do Something).

The Total Delay figures include both the delay experienced by all vehicles loaded in the network, and the delay experienced by vehicles that could not enter the network during the simulation. The results indicate that the additional delay caused by the development in the PM peak hour is effectively mitigated in the Do Something Scenario. The results also show that there is less overall delay in the Do Something scenarios compared to the Reference Case scenarios in the AM peak hour.

It should be noted however that this assessment includes the mitigation at the Tilbrook Roundabout. The latent demand indicates, that due to congestion, not all vehicles are able to enter the model network.

Table 3. Modelled network performance results.

		Delay Avg (s)	Speed Avg (mph)	Veh arrived	Latent demand (veh)	Total delay[1] (s)
AM	Reference Case 2023	176	16	6822	820	1306666
	Do Min 2023	189	15	7087	1074	1455206
	Do Something 2023	149	17	7404	771	1191269
PM	Reference Case 2023	144	19	6901	117	1063895
	Do Min 2023	157	17	7076	296	1201331
	Do Something 2023	135	19	7266	128	1046921

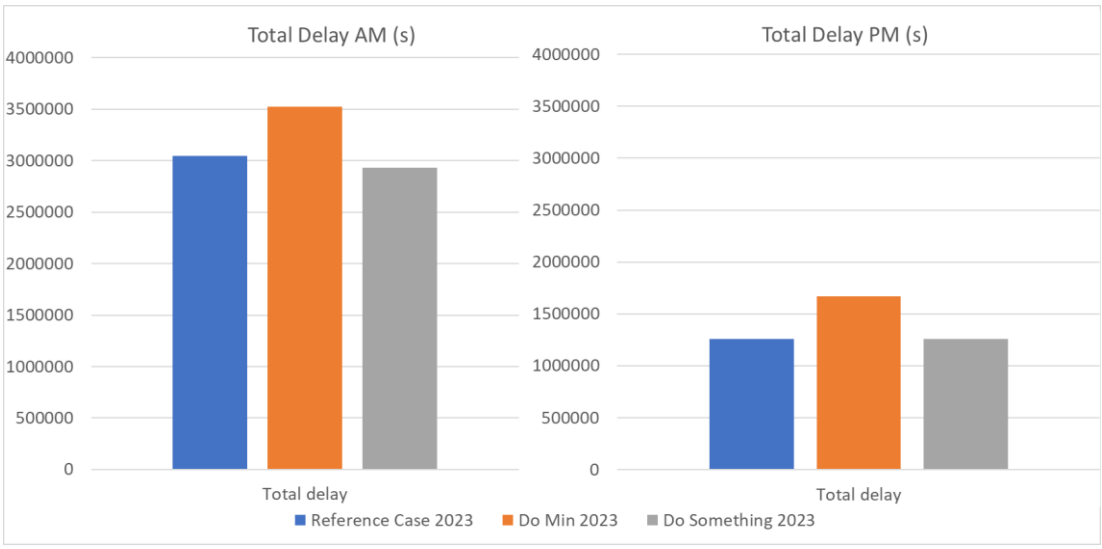

Figure 7. Network Performance results for total delay[1] including latent delay.

1 - Total delay is expressed in seconds and calculated as the sum of the total delay experienced by all vehicles that have been loaded onto the model at the end of the simulation plus the latent delay experienced by all vehicles that could not be loaded onto the network on time.

3 Conclusions

AECOM has undertaken an audit of the South Caldecotte Vissim Base (already approved in previous audits) and Forecast models, as part of a wider review of the potential impact of the proposed South Caldecotte development on the strategic and local road network.

All the coding issues identified and marked as significant during the previous audits of the models have been addressed.

The modelling results indicate that the proposed mitigations offset the main increase in journey times caused by the additional development trips on the approaches to the Kelly's Kitchen junction. The journey times on all defined routes across the modelled area remain similar or are reduced by the mitigation, compared to the Reference Case (without development scenario).

The network performance results show that due to the proposed mitigations, delays across the network are reduced by the proposed mitigations in the Do Something scenario, compared to the Reference Case. The proposed mitigations, overall, offset the increase in delay resulting from the proposed development trips in both peak hours.

This model shows that the junction, with the mitigation proposal in place and an optimal signal configuration, can effectively mitigate the impacts caused by the additional South Caldecotte development trips.