Land east of Junction 11 of the M40, Banbury

Transport Assessment Update

DTA

Transport Planning Consultants

Land east of Junction 11 of the M40, Banbury

Transport Assessment

19th March 2024
SJT\RMcC\23457-11 Transport Assessment Update

Prepared by:

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Prepared For:

Greystoke CB

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Appendices

1.0 Introduction

1.1 Greystoke CB commissioned David Tucker Associates (DTA) to provide highways and transport advice to support the outline planning application for the construction of up to 140,000m² of employment floorspace (use class B8 with ancillary offices and facilities), and servicing and infrastructure including new site accesses, internal roads and footpaths, landscaping including earthworks to create development platforms and bunds, drainage features and other associated works including demolition of the existing farmhouse. All matters of detail (including access) are reserved.

1.2 The application (23/03428/OUT) was validated on 5th December 2023. It was supported by a comprehensive Transport Assessment (DTA report Reference 23457-09b – 4th December 2023).

1.3 This Note provides an update on the position in respect of both National Highways (NH) and Oxfordshire County Council (OCC) as statutory highway authorities.

2.0 Update on Modelling and Chronology

2.1 Prior to the submission of the application, a pre-application request was made to OCC and NH. This focused on seeking to resolve outstanding modelling issues raised using the determination of application 22/01488/OUT.

2.2 As confirmed by OCC an appeal was lodged on the grounds of Non-Determination but was withdrawn before the hearing commenced. They confirm that "the main point of contention, on transport issues, was the lack of a valid micro-simulation model to determine the impact of the development on the local highway network."

2.3 Following discussion on scope, a detailed submission on traffic modelling was submitted to OCC and NH on the 23rd October 2023. Following further requests for information on 13th November 2023, NH confirmed that they would provide comments in January 2024. These were received on 5th January 2024. A response to that was submitted on 2nd February 2024 (**Appendix A**) and a meeting held on 9th February 2024 to discuss the modelling detail and that led to a further submission (on 29th February 2024). A copy of the submission is attached at **Appendix B**. The submission was also accompanied by the model files themselves which were issued direct to NH and OCC.

2.4 A response to that is awaited.

2.5 Throughout this process, the applicant and NH have worked collaboratively to resolve detailed technical queries to arrive at a final agreed model to allow the development to be tested. The applicant considers the work now submitted provides that basis but requires NH's confirmation of that to allow final runs of the development impact to be completed.

2.6 It is however the applicants view that none of the changes made to the modelling will affect the overall outcomes of the impact assessment. The results of the updated assessment are attached at **Appendix B**. The uncertainty log requested is attached at **Appendix C**.

2.7 Alongside discussions with NH, a formal pre-application request was made to OCC in October 2023. Their comments on the pre-app submission were received on 19th December 2023 (after the application was submitted). A further review of the Vissim modelling by OCC was received on 2nd February 2024. A full response to the planning application was received from OCC on 12th February 2024.

3.0 Response to OCC Comments received 12/02/24.

3.1 In their formal response to the application dated 12/02/24, OCC objected to the application for a number of reasons as summarised below:

i. The site is in an unsustainable location for walking and cycling.
ii. The proximity of the access roundabout to M40 Junction 11 is likely to lead to severe congestion and potential safety issues arising from queuing on the M40 off slip.
iii. Any further development around Junction 11 of the M40 will add to the severe congestion and air quality problems on the A422, particularly along Hennef Way – this development does not demonstrate how it would mitigate its impact on these issues through adequate sustainable travel connections or by highway improvements.
iv. Safe and suitable operation of affected highway junctions has not been demonstrated as full input and output details of the Vissim analysis have not been provided as part of this application, and errors have been identified in the details that have been submitted.
v. Based on the current modelling results, the proposed signalisation of the A361 does not mitigate the impacts of development.
vi. It has not been demonstrated that a signalised crossing of the A361 for pedestrians and cyclists may be incorporated at a safe and suitable location, and an appropriate access into the site is not proposed.

3.2 Their response also makes reference to requested S106 contributions which include the following. These are acceptable to the applicant subject to confirmation of compliance with the CIL Regulations Para 122.

- Strategic Transport (towards works on Hennef Way) - £970,709
- Public Transport Services - £600,000
- Travel Plan Monitoring - £34,210

3.3 A committee report has been prepared by Cherwell District Council which recommends refusal of the application on a number of Highway Grounds #2 and 3 (sustainability), #4, 5 and 6 (traffic impact).

3.4 Dealing with each point in turn:

Sustainability / Accessibility

3.5 The applicants' position in respect of accessibility is clearly set out in the Transport Assessment and needs to take account of both the Policy basis for considering the scheme and the Transport Vision (as confirmed in Section 3 of the TA).

3.6 The position taken by OCC in review of the application is both inconsistent with the policy requirement and inconsistent with other planning decisions (i.e. the allocation and consenting of employment uses immediately adjacent to the application site). It provides a wholly unreasonably narrow assessment of the issues.

3.7 In terms of safe access, the scheme provides for a signal controlled crossing of the A361. The OCC response seems to suggest that there is some doubt over its deliverability (on the spurious basis that it was not considered in the Stage 1 RSA). There are clearly numerous locations where such a crossing could be provided on the A361 and indeed if preferred by OCC more than one could be provided. There is no constraint in this respect given the outline nature of the application.

3.8 In terms of wider connections it is clear that from a locational perspective development of this type ought to be located adjacent to the strategic road network as a primary consideration. The NPPF requires the consideration of choice of travel modes to the site. These have to be considered in the context of likely demand, which in the case of a B8 development will generally be shift change related. Given the wide range of origins of staff, walking is unlikely to be a significant choice regardless of the site location and therefore the NPPF consideration should focus on the following:

Public Transport – A contribution to deliver this is agreed.

Car Sharing – Experience at similar sites confirms mode shares of 30 – 40% can be expected.

Cycling – There is clearly and demonstrably a safe route to the site as identified for the adjacent development and a safe connection to that route available. There is no credible basis for the OCC's objection in this regard.

Traffic Modelling and Impact

3.9 Reason for Refusal 4 relates to a design issue of the site access roundabout and its proximity to M40, Junction 11. The basis for this reason is wholly unclear given that whilst it is raised in summary as an issue by OCC, it is not discussed or identified as an issue in their technical appraisal of the application. Clearly the interaction between the two junctions is a modelling matter and the modelling clearly confirms the interaction will be acceptable. There is therefore no evidential basis for **Reason for Refusal 4**.

3.10 The applicant has made a substantial investment in preparing a comprehensive Vissim model of the area to allow the impact of the development to be assessed. This preparation of this work is necessarily iterative and NH have engaged actively in this regard.

3.11 Whilst the detail of modelling has been amended to reflect the comments received from both OCC and NH, the outcomes in terms of impact of the scheme are unlikely to material affected by the schemes. Subject to NH (and OCC) confirming they agree with model the development assessments can be re-run and the impacts discussion in detail.

3.12 The outstanding issues raised by OCC related to the use of VISVAP in the model as opposed to PC-MOVA. NH requested evidence that the Baseline green times and sat flows were calibrated, which was provided on 29th Feb. A query was also raised about growth in the model and this is attached at **Appendix C**. **This will resolve the suggested Reason for Refusal 6**.

3.13 As discussed above the applicant agrees to make reasonable contributions to off-site highway improvements. That clearly needs to be informed by the outcome of the modelling that all parties are working towards.

3.14 Clearly the consideration of any impact of the development needs to be considered against the test set by the NPPF at Para 114. This requires consideration of mitigation where there is a significant impact. Para 115 states that the application should <u>only</u> be refused if the residual cumulative impact of the development is considered severe. The NPPF provides no formal definition for the term 'severe'.

3.15 The way that the test of Severity should be applied was considered in detail in

Hawkhurst Parish Council v Tunbridge Wells DC [2020] EWHC 3019. The judgment was based on the 2019 version of the NPPF and therefore refers to Paragraphs 108 - 111. The current appeal is being considered under the 2023 version of the NPPF and therefore the relevant paragraph references are 110 - 113. The wording is identical except for the addition in a new 110c relating to the design of the scheme. That specific addition is not relevant to the application of the test.

3.16 Here, the Judge confirms that in the absence of a definition within the NPPF that:

"Inevitably a qualitative term of this kind used in the NPPF necessarily calls for the exercise of judgment on the part of the decisionmaker." (Para 111 of Judgment).

3.17 The judgment includes a discussion on the adequacy of the evidence base to make such a judgment. In this appeal case, all main parties (the LPA, LHA and appellant) agree that the Transport Assessment evidence base does provide adequate assessment to allow that judgment to be made.

3.18 The most pertinent conclusion of that judgment is set out in Para 138 where it is confirmed that:

"In my judgment, paragraph 109 [Note now 114] of the NPPF necessarily requires consideration of whether the residual cumulative impact of the proposed development is severe, not simply whether existing or projected congestion without that development would be severe."

3.19 On that basis it is the change that arises from the development that must be found 'severe'. Severe is defined in the OED as meaning 'very great'. In all reasonable terms, the interpretation of its use in Policy is that it sets a very high bar or hurdle. Traffic impact issues should in other words not prevent the deliverability of otherwise sustainable and appropriate development unless there are very significant and exceptional impacts arising.

3.20 In that respect therefore the suggested Reason for Refusal 5 applies wholly to the wrong test in respect of development impact. The test is not whether the development would add to existing "severe congestion and air quality problems on the A422, particularly along Hennef Way." Rather whether the development would create such an impact.

3.21 Based on the evidence submitted as part of the application there clearly and demonstrably will be no such impact and **Reason for Refusal 5 has no evidential basis**.

4.0 Conclusions

4.1 The conclusions of the Transport Assessment remain unaltered and are thus:

4.2 The development site will be designed to prioritise foot and cycle movements along desire lines through the development, linking to the external access points. The additional demand from the development will support the continuation of the 200-bus service and the interim support funding of service will be provided.

4.3 The primary vehicle access to the site will be taken from the A361 and will involve the creation of a primary site access roundabout and a secondary standard priority junction.

4.4 The local road network including M40 Junction 11 and the A422 corridor has been modelled in the microsimulation model VISSIM. The model shows:

- This model has been appropriately validated and fully covers the study area agreed with the NH and the LHAs;
- M40 junction 11 gyratory experiences queuing on the A361 approach in the reference case which will extend back to the site access;
- A361 queuing is addressed in full by the introduction of traffic signal control on this entry;
- M40 junction 11 slip roads accommodate the design flows;
- A422 corridor experiences stress during the peak hour periods in the reference case and the design flow scenarios; and
- A422-B4525 roundabout accommodates the design flows.

4.5 A review of the latest five-year personal injury collision data for the surrounding area has been undertaken and does not indicate any existing highway safety issues within the study area.

4.6 Overall, the development provides modern warehousing within a strategic corridor where the impact on Oxfordshire communities is minimised in accordance with local policy. Moreover, the arching policy aims are met as the proximity to the principal settlement (Banbury) will reduce car-based commuting. Subject to the proposed mitigation, there is no material residual operational or safety impact on the local highway network or M40 Junction 11.

Appendix A

SLR Consulting Limited

David Tucker Associates

Huscote Farm VISSIM

SLR Project No.: 431.000006.00000

2 February 2024

Revision: 01

RE: AECOM TECHNICAL NOTE 05

1.0 Introduction

1.1 SLR Consulting Ltd (SLR) has been commissioned by David Tucker Associates (DTA) to develop a VISSIM model in support of the Huscote Farm planning application.

1.2 DTA submitted the first package of models, supporting spreadsheets and reports to AECOM in October 2023. This included the Base year and future year development testing. AECOM has reviewed the submission and provided SLR with an audit report (AECOM Technical Note 05) on 5th January 2024.

1.3 SLR has reviewed the comments raised and updated the models as necessary. This note serves as a document of the changes that have been made in response to Technical Note 05.

2.0 Response to AECOM Audit Comments – Base Model

2.1 The section below will identify the paragraph number referred to within AECOM Technical Note 05, followed by text to confirm the SLR response to the issue(s) raised.

2.2 Paragraph 4.9, AECOM commented:

> *"There are some locations, especially at the approaches of roundabouts where there are occasional late lane changes of vehicles."*

2.3 SLR has reviewed the emergency stop distances and lane change distances on the approaches to junctions and updated the relevant links. Emergency stop distances were increased on links 10125, 10126, 10132, 10135, 10136, 10140, 10141, 10142, 10154, 10155, 10174, 10175.

2.4 Paragraph 4.11, AECOM commented:

> *"National Highways' microsimulation guidelines suggest that an average standstill distance could vary between 1.0 and 2.0 metres and recommend using 1.5 metres. SLR should update the model coding to reflect this recommendation."*

2.5 SLR has updated the average standstill distance for the 'Urban (motorised)' and 'Merging' driving behaviours from the VISSIM default of 2.0 metres to 1.5 metres.

2.6 Paragraph 4.30, AECOM commented:

> *"There is an additional signal head (Signal group 4) coded in Vissim which is not present on the ground."*

2.7 SLR has removed the additional signal head so that the right-turning movement is coded as an associated phase with the straight-ahead movement. An extra priority rule has also been added to the northbound approach to ensure no crossing of vehicles.

2.8 Paragraph 4.33, AECOM commented:

> *"SLR should review and update the inter-green times at the crossings in the Vissim models."*

2.9 SLR has calculated the pedestrian intergreen timings based on assumed crossing distances and updated the pedestrian crossings in the model.

2.10 Paragraph 4.36, AECOM commented:

> *"PT lines no. 2, 5 and 9 are assigned with a desired speed distribution of '50 mph Cars (TfL)'."*

2.11 SLR has updated these PT lines so that the initial speed distributions are now '50 mph Buses (TfL)'.

2.12 Paragraph 5.16, AECOM commented:

> *"SLR has not reported any saturation flow calibration at any junctions in the network."*

2.13 Saturation flow surveys were not included within the survey specification, which was circulated prior to commencement of the model build and agreed with AECOM in June 2023. Considering the level of calibration and validation achieved against a significant amount of survey data, including MCCs, ATCs, Queues, Journey Times and ANPR, saturation flows are considered surplus to requirements.

Additional Base Updates

2.14 After implementing the updates in response to the AECOM audit, The Ermont Way/Wildmere Road northbound journey time route exhibited a fail in both the AM and PM due to the modelled value now being too quick. SLR have adjusted the priority rules on Ermont Way northbound approach to the roundabout with Hennef Way to bring the journey time on this section closer to the observed again.

2.15 Secondly, in the AM, the Hennef Way eastbound journey time route became too quick as a result of the model updates. SLR has adjusted the priority rules on the A422 eastbound approaches to Concord roundabout and the Ermont Way roundabout to slow down this section in the model.

3.0 Summary

3.1 This note serves as a response to AECOM's Audit, detailing the steps SLR has taken to address the issues raised during review.

3.2 Alongside this note, an updated Base model has been submitted, and an updated LMVR.

3.3 SLR considers AECOM's audit comments relating to the Base model to have been addressed, with the model being suitable for future year testing.

Making Sustainability Happen

Technical Note 05

Project:	**National Highways Spatial Planning Arrangement**	Job No:	**607127604 – Q16DDO009.009**
Subject:	**M40 J11 Banbury - Review of Vissim Base, Forecast Models, LMVR and Forecasting Report**		
Prepared by:	**Ishan Tamhane**	Date:	**05/12/2023**
Checked by:	**Jay Shah**	Date:	**18/12/2023**
Verified by:	**Philip Arnold**	Date:	**21/12/2023**
Approved by:	**Steven Wood**	Date:	**04/01/2024**

1. Introduction

1.1. SLR Consulting, on behalf of David Tucker Associates (DTA), has developed Vissim models for the M40 Junction 11 in Banbury, Oxfordshire. These models were developed to assist with the planning application for the Huscote Farm land, situated to the east of Junction M40 J11 in Banbury.

1.2. National Highways (NH) has commissioned AECOM to undertake an audit of the Vissim base year and forecast year models including the associated Local Model Validation Report (LMVR) and Forecasting Report prepared for the planning application. The LMVR documents the development of the model including the calibration and validation results, whereas the Forecasting Report documents the impacts of the proposed development on the corridor in future years.

1.3. The purpose of the review is to establish if the base Vissim models developed for the study comply with the relevant DfT TAG criteria for model development as well as meeting the National Highways Microsimulation Guideline. This will determine whether the models are fit for the purpose in terms of providing a reliable assessment of the impacts of the proposed development.

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2. Scope of Review

2.1. The scope of this review is to undertake an audit of the Vissim base and forecast models developed by SLR Consulting. It includes the review of the supporting information for the Vissim models provided in the Vissim Local Model Validation Report (referred to as LMVR in the remainder of the document) and the Forecasting report.

2.2. AECOM has reviewed the following as part of this audit:

- Base and Forecast year Vissim models for the AM and PM peaks;
- Vissim LMVR (Ref: "VM230598.R002 Huscote Farm VISSIM LMVR");
- Traffic demand development spreadsheets supplied to AECOM;
- Calibration and validation spreadsheets; and
- Vissim Forecasting report (Ref: "VM230598.R003 Huscote Farm VISSIM Forecasting Report"); and
- Forecast results spreadsheets.

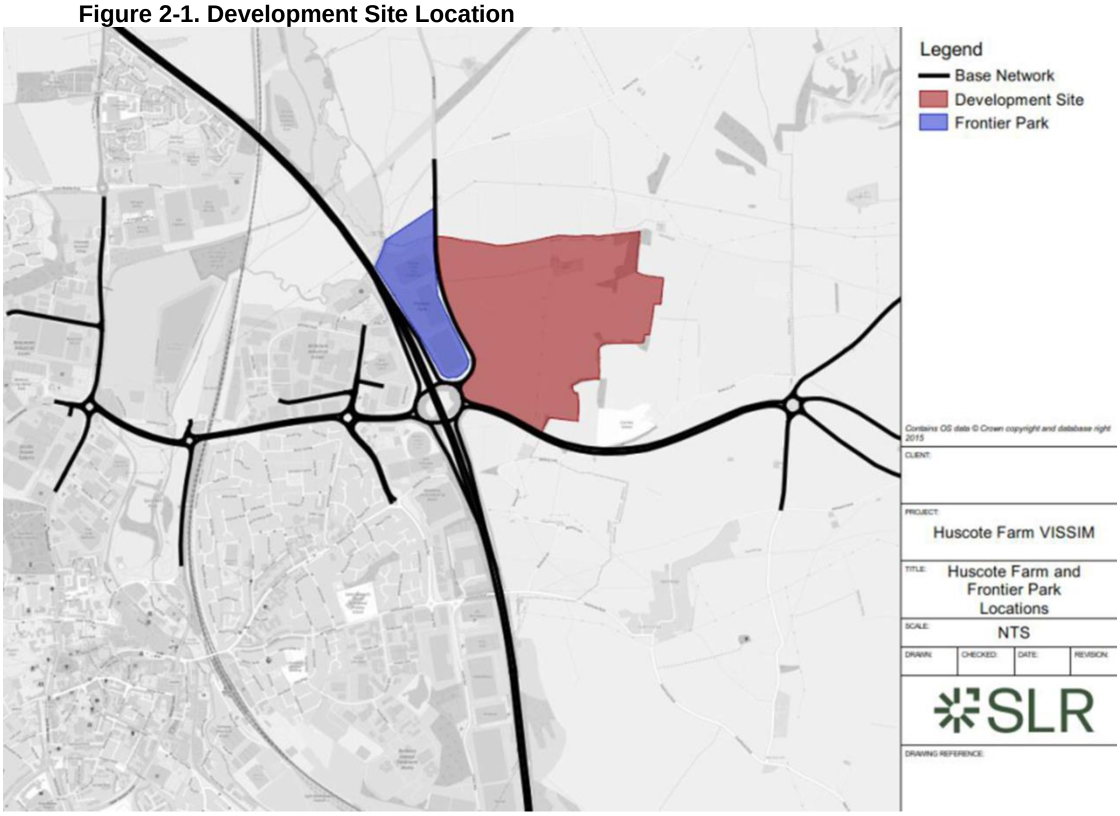
2.3. Issues/errors that were found in the audit have been classified into three levels:

- MINOR – The issues found/ observations that are likely to produce minimal changes in the results but should be updated as they may be significant in combination.
- MEDIUM – The issues found could have a medium impact on the results.
- **SIGNIFICANT** – The issues are considered errors and are likely to have a large/ significant impact on the performance of the models and results.

Scheme Context and Model Study Area

2.4. The Scheme is proposed to be constructed for up to 140,000 sqm. of employment floorspace, along with the associated infrastructure and access arrangements. The Reference Number for the planning application is 22/01488/OUT. Figure 2-1 shows the site location of the proposed development.

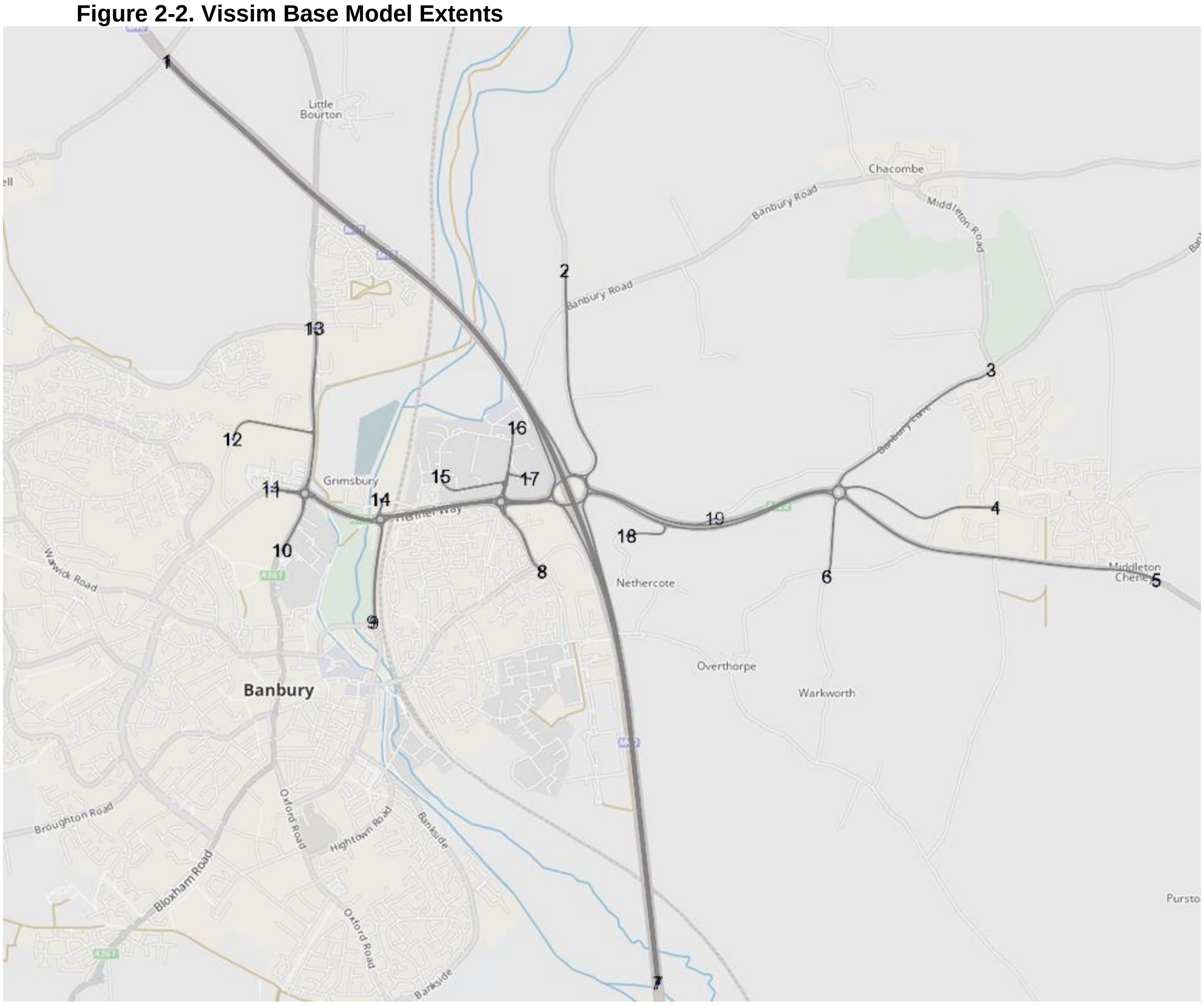
Figure 2-1. Development Site Location



Ref: SLR Consulting Forecasting Report

2.5. The Vissim Base model extent is shown in Figure 2-2 below. The main study area includes Banbury Interchange (M40 J11), the roundabout at A422/B4525/Mansion Hill to the east of M40 J11, and the three roundabouts to the west up to Ruscote Avenue. It also covers the two signal-controlled junctions on Southam Road/Beaumont Road and Wildmere Road/Brookhill Way.

Figure 2-2. Vissim Base Model Extents



Recommended Guidance

2.6. The review of the Vissim model LMVR document has been based on the following guidance:

- National Highways' Guidelines for the Use of Microsimulation Software which refers to TAG Unit M3-1 Highways Assignment Modelling; and
- TfL's Traffic Modelling Guidelines Version 4.0, which is useful comprehensive guidance for microsimulation models.

3. Review of Base Modelling Approach

Background

3.1. Section 2 of the LMVR notes that an existing 2017 Vissim Base Model, developed by DTA (David Tucker Associates) and Stantec was used to prepare forecasts, utilising growth factors from the Bicester Transport Model (BTM). However, based on DfT guidance on model age and due to the model base year predating the COVID-19 pandemic, a new Vissim model was developed from survey data collected in 2023.

Traffic Data

3.2. Manual Classified Count (MCC) and Automatic Number Plate Recognition (ANPR) surveys were conducted on Thursday 29th June 2023 between 07:00 -10:00 and 16:00 – 19:00 for all junctions in the modelling scope. It is noted that queue length data was also captured at all junctions where MCC data was collected.

3.3. Automatic Traffic Counts (ATCs) were collected for the 2 weeks from Thursday 22nd June 2023 to Wednesday 5th July 2023.

3.4. The locations of MCC, ANPR and ATC are shown in Figure 3-1 below.

Figure 3-1. Traffic Survey Data Locations

Ref: SLR Consulting LMVR

3.5. The dates and the weeks of the surveys in 2023 are on neutral days, weeks, and months and therefore acceptable.

3.6. AECOM has reviewed the match rate of the ANPR sites surveyed and has found the data reliable. This is further explained in Section 4.6 of this TN.

3.7. SLR has used WebTRIS data from the month of June 2023 to inform the traffic demand on the M40 mainline. Section 5.13 of the LMVR explains that the WebTRIS data was processed for neutral weekdays and school holidays were excluded. An outlier analysis was conducted on the data to identify and exclude outliers. The approach is acceptable.

3.8. Pedestrian and cyclist crossing data was also collected at the signalised pedestrian crossings in the network.

Representativeness of Survey data

3.9. SLR reviewed the representativeness of the single day MCC survey data on the M40 Junction 11 slip roads against the WebTRIS data analysed for the month of June. Table 3-1 presents the AM and PM peak hours comparison.

3.10. The comparison shows that there are no significant differences between the MCC and WebTRIS data during the AM peak. The largest difference is on the northbound M40 J11 off-slip during the PM peak where MCC flows are higher than WebTRIS flows by 159 vehicles. Overall, AECOM is satisfied that the MCC flows that were used for the development of the model, are representative of June 2023 flows.

Table 3-1 WebTRIS flows vs MCC flows at M40 Junction 11 slip roads

	AM Peak Hour (07:30-08:30)					
	Lights			Heavies		
	WebTRIS	MCC	Difference	WebTRIS	MCC	Difference
NB Off-Slip	570	575	5	59	64	5
NB On-Slip	486	455	-31	63	48	-15
SB Off-Slip	773	703	-70	98	79	-19
SB On-Slip	666	697	31	71	66	-5

	PM Peak Hour (16:30-17:30)					
	Lights			Heavies		
	WebTRIS	MCC	Difference	WebTRIS	MCC	Difference
NB Off-Slip	829	988	159	60	60	0
NB On-Slip	636	570	-66	33	43	10
SB Off-Slip	479	514	35	48	30	-18
SB On-Slip	544	575	31	38	26	-12

Peak Hours

3.11. SLR initially calculated the peak hours using the MCC turning flows at all the junctions in the network. The AM peak hour was 07.45-08.45 and the PM peak hour was 16.30-17.30. Section 5.4 of the LMVR also notes that the AM peak hour of 07.45-08.45 has only 10 vehicles more than the traffic flows during 07.30-08.30.

3.12. The M40 Junction11 (which is the key junction for the study) has a peak hour of 07.30-08.30 in the AM peak and 16.30-17.30 in the PM peak. The ANPR and ATC survey data analysis also showed the highest flows occurring between 07.30-08.30 in the AM peak and 16.30-17.30 in the PM peak. Based on this analysis, the model peak hour for the AM was chosen as 07:30 to 08:30 and 16:30 to 17:30 for the PM peak.

3.13. The modelling peak period is preceded by a thirty-minute 'warm up' and followed by a fifteen-minute 'cool-down' period, which is standard practice for microsimulation models.

3.14. AECOM is able to verify that the method adopted to calculate the peak hours and the chosen model periods are acceptable.

Model Assignment and Inputs

3.15. The model uses the dynamic assignment method to input traffic demand, meaning that vehicles are loaded onto the network using origin-destination matrices and routed based on distance and journey times. As the modelled network does not have any route choice between the OD pairs, there is only one path created for each OD pair.

3.16. The input matrices are for 15-minute intervals, which accurately capture the demand variations during the peak hour.

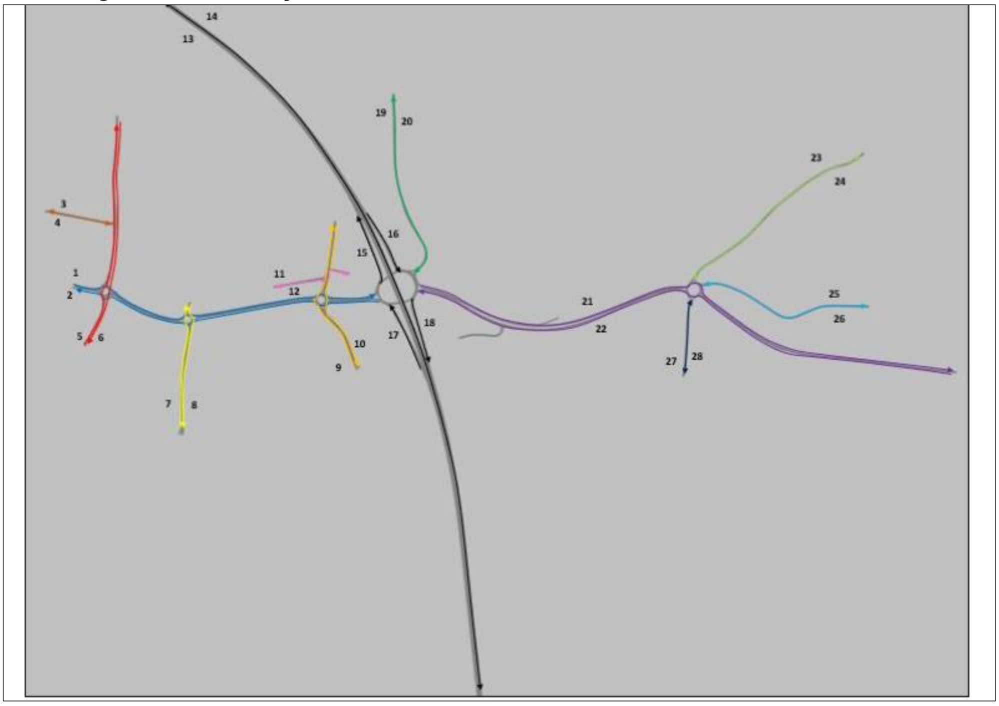
3.17. The processed survey data for Car and LGVs is combined to create a vehicle composition 'Lights' and similarly the vehicle types OGV1 and OGV2 are combined to create the 'Heavies' composition. The proportion of each vehicle type based on the MCC surveys is assigned in the vehicle compositions.

3.18. This is a standard approach to assign the traffic demand in the Vissim models and therefore acceptable.

Journey Time Data

3.19. Figure 3-2 illustrates the journey time routes used for journey time validation as presented in the LMVR. The defined journey time routes are acceptable, as these are defined for all the link sections of the network and cover all the key approaches of the M40 Junction 11.

Figure 3-2. Journey Time Routes



Ref: SLR Consulting LMVR

3.20. TomTom journey Time data covering the month of June 2023 was used for model validation. Section 5.16 of the LMVR notes that this data was processed to include neutral weekdays (Tuesdays, Wednesdays, and Thursdays) with school holidays excluded. The approach is standard and acceptable.

3.21. Section 5.17 of the LMVR presents the average sample size during each 15-minute interval of the AM and PM peak hours. Table 3-2 below shows that there are sufficient samples captured during the peak hours in both AM and PM peaks. However, it is noted that AECOM has not received any journey time processing spreadsheets and the observed journey time data presented in the LMVR is therefore taken at face value.

Table 3-2 Sample size of TomTom journey time data

Time Period	Average Sample Size
07:30-07:45	659.26
07:45-08:00	695.78
08:00-08:15	674.01
08:15-08:30	674.13
16:30-16:45	638.45
16:45-17:00	641.65
17:00-17:15	627.22
17:15-17:30	653.41

Ref: SLR Consulting LMVR

4. Base Model Development Review

Introduction

4.1. This section highlights the queries and concerns identified in the development of the Vissim models, including the development of traffic demand and network coding.

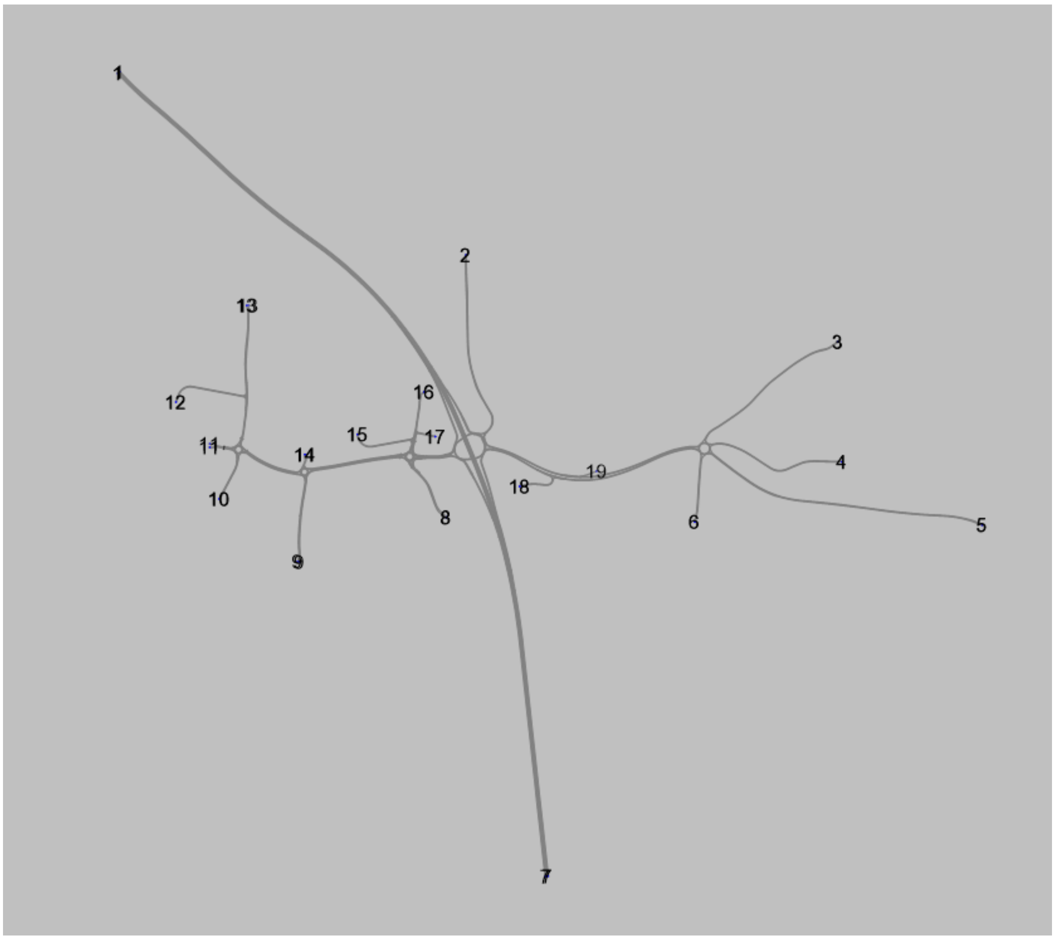
4.2. The following elements in the model have been checked:

- Traffic demand development and calculations;
- Network structure (link and connectors coding);
- Network objects such as Priority Rules, Reduced Speed Areas, Desired Speed Decisions, Detectors and Travel Time Markers;
- Signal Controllers;
- Public Transport Lines;
- Driving Behaviours;
- Speed acceleration and other distributions; and
- Consistency between time periods.

Base Model Traffic Demand Development

4.3. AECOM has reviewed the demand development spreadsheet and the LMVR to understand the methodology to calculate the base year traffic input matrices. There are 19 zones in the Vissim base year model as illustrated in Figure 4-1.

Figure 4-1 Vissim Zone Map



4.4. SLR has developed the traffic demand for the base year model using the ANPR and MCC survey data. WebTRIS data has been used to inform the M40 mainline traffic flows.

4.5. The demand matrices were developed using the following approach:

- The ANPR data was processed to derive a prior O-D matrix for each ANPR site for Car, LGV, OGV1 and OGV2 for the AM and PM peaks. The locations of the ANPR sites are shown below in Figure 4-2 for reference.
- The Car and LGV matrices were combined to develop the 'Lights' matrix and similarly, the OGV1 and OGV2 matrices were combined to create a 'Heavies' matrix.

Figure 4-2 ANPR Locations

- The prior matrix consisted of 11 zones covered by the 11 ANPR sites. Additional zones were created utilising the MCC survey data. The ANPR and MCC zones were combined to create a matrix consisting of 19 zones.

- MCC turning data was used to disaggregate the ANPR zones for some O-D movements – e.g. for the O-D pairs with ANPR 3 (in Figure 4-2) destinations were disaggregated to model zones 3, 4, 5, 6, and 19 (shown in Figure 4-1). MCC turning flow data was used for some of the O-D movements covered directly by MCC data (e.g., between Vissim zones 3, 4, 5, and 6 in Figure 4-1).

- WebTRIS data was analysed for the neutral weekday for each 15-minute matrix and was used to derive the O-D demand between the M40 mainline zones.

- The peak hour matrices developed using the ANPR, MCC and WebTRIS data were profiled into 15-minute intervals to accurately capture the build-up and fall in flow over the peak hour.

- Manual adjustments on the O-D movements were made to each 15-minute matrix to calibrate to the observed MCC turning count data and used in the base year model as traffic inputs.

4.6. The above methodology to calculate the demand is considered acceptable. AECOM has reviewed the calculations spreadsheets and makes the following observations/comments:

- The match rates for all the ANPR sites (22 cameras for 11 zones) were reviewed and it was found that the match rate for 19 camera sites was more than 90%. There were three ANPR camera sites which had a match rate ranging between 85-90%. This indicates the ANPR sites captured a majority of the trips and the prior matrix developed using ANPR data can therefore be considered reliable.

- It is noted that SLR did not use any journey time filters (defined as the maximum time assumed for any vehicle to enter and leave the ANPR cordon) to develop the prior ANPR matrix. There is a risk that vehicles travelling in the ANPR cordon and stopping in between for a long pause before exiting the cordon will be captured in the O-D movements.

- AECOM reviewed the calculations by using a journey time filter of 10 minutes. The calculations from AECOM indicated a modest difference in the prior matrix developed by AECOM and that used by SLR (less than 15 vehicles for any O-D pair in the peak hour). This suggested that the use of a journey time filter, although generally considered good practice, did not make a significant difference to the prior matrix and subsequent demand calculations. Therefore, this issue is considered as MINOR.

- A difference matrix between the pre and post manual adjustments is presented in the Appendix of the LMVR. AECOM has reviewed the spreadsheet with manual adjustments made to the O-D matrix to calibrate the traffic demand to understand if the manual adjustments result in a significant change in distribution patterns for each origin zone. The comparison between the pre and post manual adjustment matrices indicated very small differences suggesting that the distribution patterns in the final matrices are in line with the observed ANPR / MCC data.

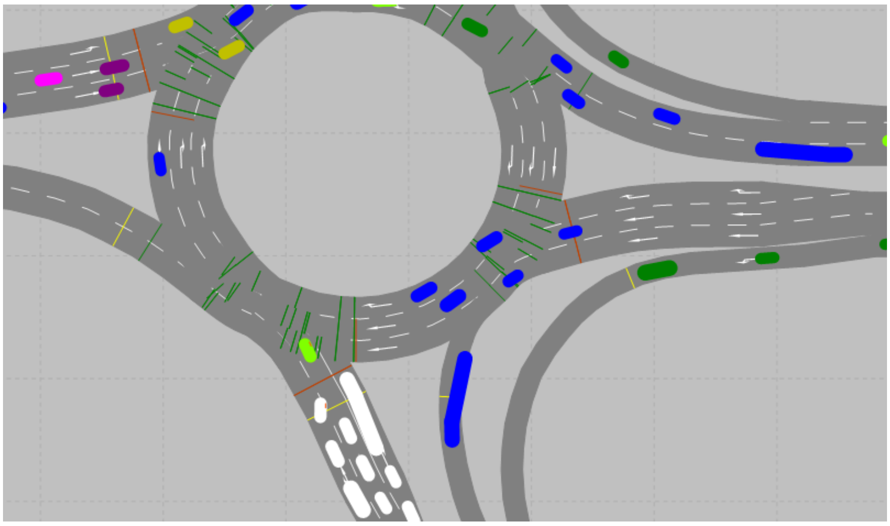
4.7. Based on the above comments and from the review, AECOM concludes that the base year demand development approach and methodology are acceptable.

Links and Connectors Structure

4.8. AECOM has reviewed the link and connector coding in the network. The network coding provides an accurate representation of the existing road network and matches the background imagery of Bing Maps and Google Street View.

4.9. The links where the emergency stop distance and the lane change distance are updated from the default settings, have been reviewed and are considered appropriate. However, there are some locations, especially at the approaches of roundabouts where there are occasional late lane changes of vehicles. An example of this is shown in Figure 4-3 below where a vehicle is changing lanes immediately prior to entering the roundabout. This issue is MINOR as this behaviour is not frequently observed during the simulation.

Figure 4-3 Late Lane Change of Vehicles



Driving Behaviours

4.10. AECOM has reviewed the driving behaviours used in the model. SLR has used the following four types of driving behaviours in the models:

- Urban (motorized) on all local roads (non-motorway);
- Right-side rule (motorized) on the motorway;
- Merging at merging and diverging sections in the network; and
- Footpath – All pedestrian crossings.

4.11. The use of the above driving behaviour is appropriate. However, it is noted that Vissim default driving behaviour is used which has an average standstill distance (headway) of 2.0 meters between the vehicles. This means that the average gap between the queuing vehicles is 2.0 meters. National Highways' microsimulation guidelines suggest that an average standstill distance could vary between 1.0 to 2.0 meters and recommend using 1.5 meters. SLR should update the model coding to reflect this recommendation from NH and update the modelling results. AECOM has tested the effect of adopting 1.5m which by reducing queue lengths has a slight impact on the validation results. This issue is therefore considered **MINOR.** The results of this assessment are presented in Section 5 of this TN.

Vehicle Compositions

4.12. The following vehicle compositions are coded in the models:

- Lights comprising of Cars and LGVs; and
- Heavies comprising of OGV1 and OGV2.

4.13. These proportions have been reviewed by AECOM and are found to match the survey data. Therefore, the vehicle compositions are appropriate.

Pedestrian and Cyclist Input

4.14. Pedestrian and Cyclist crossing data at the signalised pedestrian crossings was collected as part of the survey data during the AM and PM peak periods.

4.15. There are five signalised pedestrian crossings in the network. AECOM has verified that the pedestrian and cyclist volumes at the crossings have been input as per the survey data in 15-minute intervals.

Model Edges for Convergence and Route Choice

4.16. AECOM has reviewed the node-based turning movement known as "edges" which govern the routeing of vehicles in the network. The coding is appropriate as it follows the correct lanes for each movement on the roundabouts with multiple connectors.

4.17. There is no route choice in the model as there is only one path between the O-D zones. The models are converged to the correct parameters as follows:

- 95% of all path traffic volumes change by less than 5% for at least four consecutive iterations;

- 95% of the travel times on all paths change by less than 20% for at least four consecutive iterations.

4.18. Section 9.5 of the LMVR illustrates that the models converged in five initial runs in both AM and PM peaks, as there is no route choice.

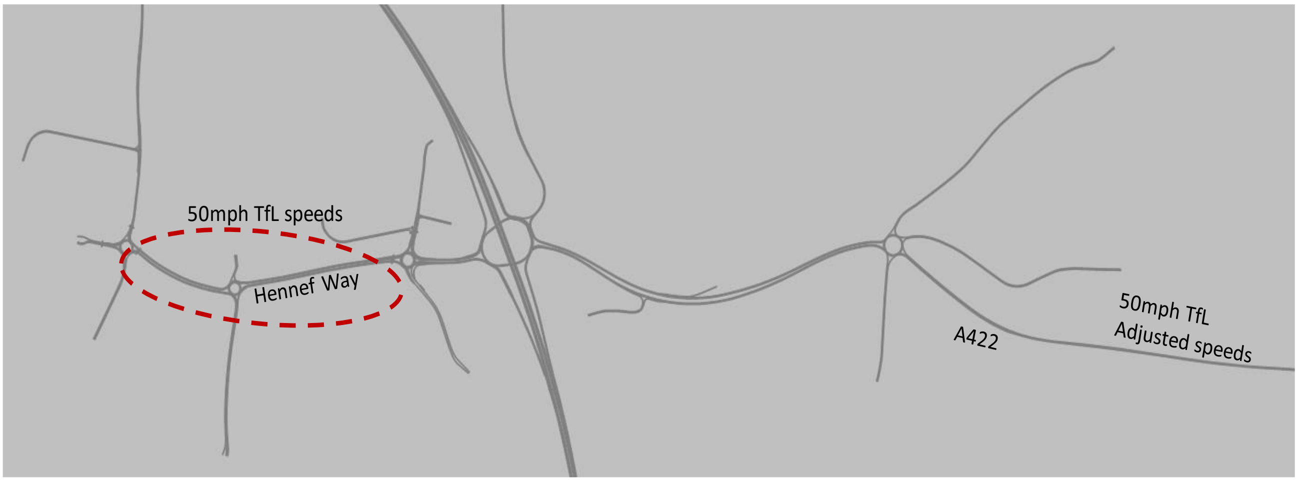
Desired Speed Decisions (DSD)

4.19. Desired Speed Decisions (DSD) are coded in Vissim models, so the vehicles travel at specific speeds along the network links. AECOM has reviewed the DSD coding in the network at all model entry points and at the locations where posted speed limit changes. Sections 8.1 to 8.3 of the LMVR explain the coding of DSDs in the network. SLR have coded the speed distributions from DfT's vehicle speed compliance statistics[1] which is an acceptable approach.

4.20. It is noted in the LMVR that for the 50mph speed limit along the Hennef Way corridor (shown in Figure 4-4), speed distribution from TfL's Vissim model template has been used as no DfT data is available. It is noted that NH's microsimulation guidelines provide the distribution of 50mph speed on the motorway, and Hennef Way is an urban road so using the NH distributions would not be a sensible approach. However, AECOM has reviewed the distributions of these speed limits, and the range is reasonable and in line with standard distributions of 50mph. Therefore, the speed limit distributions are acceptable.

4.21. It is noted that two separate speed distributions, '50 mph Cars (TfL) Adjusted' and '50 mph Buses (TfL) Adjusted' were created by modifying the original 50mph speed distribution from TfL on the A422 corridor (shown in Figure 4-4) which is a rural road. The LMVR advises that these distributions were coded so vehicles do not travel at low speeds of 25mph on rural roads where the posted speeds are 50mph. Ideally, the speed limit distribution at such locations should be coded using the ATC data where the average vehicle speed data can be determined. However, AECOM understands that there is no ATC data available at this location. AECOM has reviewed the speed distributions used and considers they are reasonable. Also, the section is not in close proximity to M40 Junction 11 and is unlikely to have an impact on its operation. Therefore, this issue is **MINOR**.

Figure 4-4 Locations of Desired Speed limits where 50mph distributions are used



[1] https://www.gov.uk/government/organisations/department-for-transport/series/speeds-statistics

Reduced Speed Areas

4.22. SLR has used the 'speed limitation in curves' function to model lower speeds at all turns and roundabouts in the model. This is a new feature in the Vissim 2023 version which enables lower vehicle speeds at turning movements and curved links.

4.23. To verify the appropriateness of this function, AECOM has reviewed the simulation and checked the speeds of vehicles on turning movement locations and on the circulatory. The vehicle speeds were found to be appropriate and were not significantly high on M40 Junction 11 which has the posted speed limit of National Speed Limit, with vehicle speeds varying between 20 to 30mph. Therefore, the use of this function is acceptable.

4.24. Some reduced speed areas have been coded to replicate congestion occurring at downstream junctions which are outside the study area. This approach is standard and acceptable.

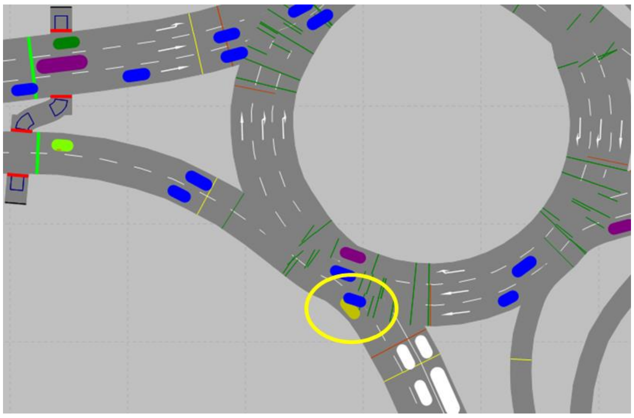
4.25. The LMVR also states that there is one additional reduced speed area coded in the PM peak on the Ruscote Avenue westbound exit link to replicate the congestion on the approach to the Lockheed Close roundabout (not within the model extents). AECOM has verified this by checking the 'typical traffic' at 18:00 on a Thursday in Google Maps as shown below in Figure 4-5.

Figure 4-5 Google Traffic showing queues on Ruscote Avenue WB

Priority Rules and Conflict Areas

4.26. AECOM has reviewed the priority rules and conflict areas by checking the model operation. It has been found that most of the priority rules and conflict areas have been coded appropriately and result in the realistic operation at priority-controlled junctions and roundabouts. However, there are few locations, especially on the Hennef Way/Ermont Way roundabout where vehicle overlaps are observed as shown below in Figure 4-6. Since such occurrences are very low in the model, this issue is considered to be **MINOR.**

Figure 4-6 Vehicles overlapping



Signal Controllers

4.27. There are three signalised junctions in the network – the M40 J11 partially signalised roundabout (Location 1), the Southam Road/ Beaumont Road junction (Location 2), and the Wildmere Road/Brookhill Way junction (Location 3). These are shown in blue in Figure 4-7. There are additional signalised pedestrian crossings in the network along the Hennef Way corridor and A423 Southam Road (referred to as A to D and marked in green in Figure 4-7).

Figure 4-7 Signalised locations in the network

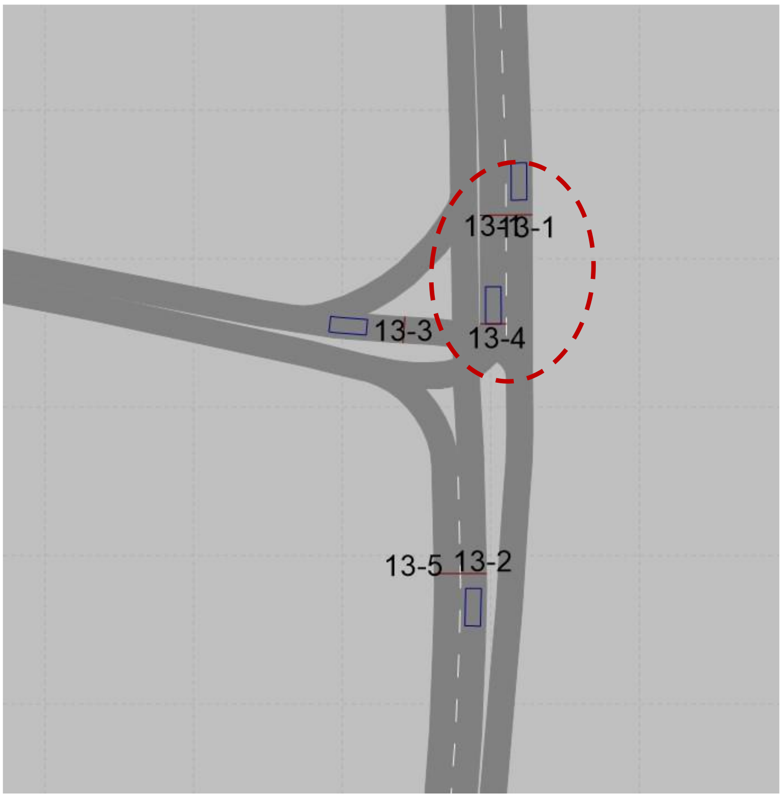
4.28. SLR obtained the survey data containing signal timing information for all three signalised junctions in the network on the same day as the MCC and ANPR surveys. The data was used to code the demand-dependent VAP (Vehicle Actuated Programming) signals to represent the inter-green times, maximum and minimum green times for stages. It is noted that AECOM has not received any processed data for the signals.

4.29. The coding of M40 Junction 11 is based on demand-dependent VAP with each approach arm having a separate stream. AECOM has not received the signal specification document so cannot review the coding of VAP. However, the operation has been reviewed and it appears to be appropriate.

4.30. At the Southam Road/ Beaumont Road junction (signal controller 13 in the Vissim model and Location 2 in Figure 4-7 above), AECOM identified errors in the coding of signal phases. Two different signal heads with different phases were coded for the right turning movement from the north – this is highlighted in Figure 4-8 below. There is an additional signal head (Signal group 4) coded in Vissim which is not present on the ground.

4.31. AECOM has reviewed the signal configuration, and this right-turning movement should be coded as an associated phase with straight-ahead movement – this means the same signal head should be coded with two signal groups (“Signal group 1” and “Signal group 4”). Similarly, the left turning movement from the south should be coded in Vissim to have “Signal group 2” and “Signal group 5”. AECOM notes that the green time on these signals is based on the observed signal time but the coding of the signal controller is incorrect. AECOM advises that the coding of this VAP should be updated in accordance with the signal specification document as this is an error. However, it is understood that changing the VAP is unlikely to significantly change the operation of this junction. Therefore, this issue is considered **MINOR.**

Figure 4-8 Extra Signal Head in the model



4.32. As noted in Figure 4-7, there are four signalised pedestrian crossing locations in the network:

- A422 Hennef Way, just west of the A422/Wildmere Road/Ermont Way roundabout;
- A423 Southam Road, just north of the A422/Southam Road roundabout;
- A422 Hennef Way, just east of the A422/Southam Road roundabout; and
- A422 Ruscote Avenue, just west of the A422/Southam Road roundabout

4.33. AECOM notes that all the pedestrian crossing signals are coded with the same 6-second inter-green following the pedestrian stage. This is a significantly short intergreen time period given that the pedestrians cross two or three lanes of traffic - this is deemed unsafe for the pedestrians. Section 6.7.2 of DfT's "Traffic Signs Manual" advises that inter-green times should be calculated based on the crossing length for pedestrians with an additional safety factor. This is a **SIGNIFICANT** issue as it can have an impact on the journey time validation results along the key routes and potentially capacity, where located near junctions. SLR should review and update the inter-green times at the crossings in the Vissim models.

4.34. AECOM has verified the impact of this issue (by coding the correct intergreen times) and found that some of the key journey time routes passing through the M40 Junction 11 do not change significantly. However, the journey time results for other routes change significantly. This is explained in detail in Section 5 of this document.

Public Transport Lines and Stops

4.35. AECOM has reviewed all PT lines and corresponding PT stops and confirms that these have been coded accurately in the model.

4.36. AECOM has found that PT lines no. 2, 5 and 9 are assigned with a desired speed distribution of '50 mph Cars (TfL)'. This means that the buses corresponding to these PT lines enter the network with an initial speed distribution of cars until they reach the first desired speed decision on the entry link and are assigned the correct speed distribution for buses. AECOM recommends that the initial speed distribution should be updated. This issue is considered **MINOR.**

4.37. A dwell time distribution of 20 to 30 seconds has been coded and assigned to all bus stops in the network which is considered appropriate.

5. Model Performance Review – Calibration/ Validation

Introduction

5.1. SLR has run the converged AM and PM peak base Vissim models for 10 different random seeds and compared the modelled results with the observed data.

5.2. The models are calibrated against the observed MCC traffic flows at all the junctions and the ATC link flows. The validation of the models is undertaken by comparing modelled journey times with observed journey times using the TomTom journey time data.

Model Flows Calibration

5.3. SLR Consulting has undertaken the link flow validation at the locations of five ATC sites and the turning count calibration at seven MCTC sites – the survey location map is shown in Figure 5-1 for ease of reference.

Figure 5-1. Traffic Survey Data Locations

5.4. The turning flow calibration results summary for the AM and PM peaks is shown in Table 5-1 and Table 5-2 for Lights and Heavies respectively. The results show that both the AM and PM peak models achieve the TAG criteria for calibration with all the turning flows within a GEH of 5.

5.5. AECOM has also reviewed the calibration results of M40 Junction 11 which is a key junction for this study. All turning movements at this junction are within a GEH of 3.

Table 5-1 Turning Flow Calibration Results - Lights

AM Peak Hour (07:30-08:30)		
GEH	**No. of Passes**	**% of Total**
<1	88	76%
<2	111	96%
<3	116	100%
<4	116	100%
<5	116	100%
PM Peak Hour (16:30-17:30)		
GEH	**No. of Passes**	**% of Total**
<1	84	72%
<2	110	95%
<3	115	99%
<4	116	100%
<5	116	100%

Ref: SLR Consulting LMVR

Table 5-2 Turning Flow Calibration Results - Heavies

AM Peak Hour (07:30-08:30)		
GEH	**No. of Passes**	**% of Total**
<1	98	84%
<2	113	97%
<3	116	100%
<4	116	100%
<5	116	100%
PM Peak Hour (16:30-17:30)		
GEH	**No. of Passes**	**% of Total**
<1	92	79%
<2	112	97%
<3	116	100%
<4	116	100%
<5	116	100%

Ref: SLR Consulting LMVR

5.6. SLR Consulting has undertaken link flow calibration in the AM and PM peaks using the ATC data at five sites. The results are summarised in Table 5.3 below.

Table 5-3 Link Flow Calibration Results for AM and PM peaks

AM Peak Hour (07:30-08:30)				
Site	Location	Observed	Modelled	GEH
1	A361 (North of M40 J11) NB	273	299	1.5
	A361 (North of M40 J11) SB	598	653	2.2
2	A422 (East of M40 J11) EB	933	1003	2.2
	A422 (East of M40 J11) WB	1073	1193	3.6
3	A422 (West of M40 J11) EB	1529	1588	1.5
	A422 (West of M40 J11) WB	2016	2160	3.2
4	Hennef Way (East of A4260) EB	1520	1818	7.3
	Hennef Way (East of A4260) WB	1773	1669	2.5
5	Hennef Way (West of A4260) EB	1372	1419	1.3
	Hennef Way (West of A4260) WB	1129	1139	0.3
PM Peak Hour (16:30-17:30)				
Site	**Location**	**Observed**	**Modelled**	**GEH**
1	A361 (North of M40 J11) NB	794	757	1.3
	A361 (North of M40 J11) SB	333	340	0.4
2	A422 (East of M40 J11) EB	1048	1152	3.1
	A422 (East of M40 J11) WB	942	997	1.8
3	A422 (West of M40 J11) EB	1832	1925	2.1
	A422 (West of M40 J11) WB	1663	1698	0.9
4	Hennef Way (East of A4260) EB	1700	1735	0.8
	Hennef Way (East of A4260) WB	2115	2094	0.5
5	Hennef Way (West of A4260) EB	1446	1357	2.4
	Hennef Way (West of A4260) WB	1401	1515	3.0

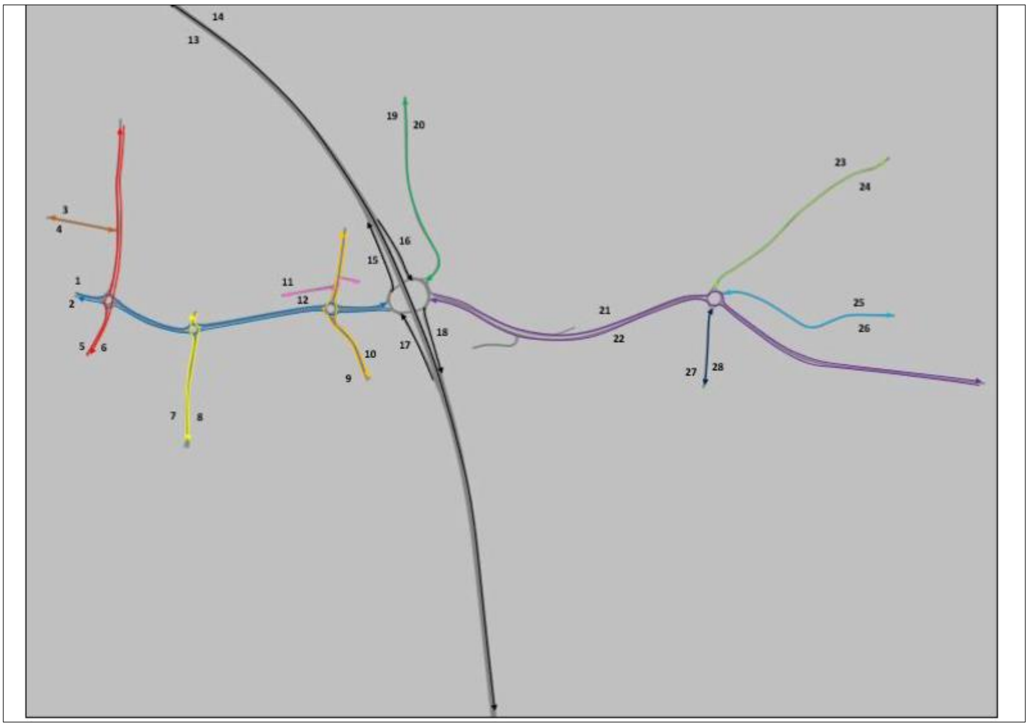
Ref: SLR Consulting LMVR

5.7. It is noted that one of the locations has a GEH value of more than 7. AECOM has reviewed this and notes that the ATC flow at this (site 4 between MCC sites 2 and 3) is significantly lower than the MCC flow. This may be explained by the queueing between the roundabouts, whereby the ATC data is not captured accurately. The turning flow calibration matches well at the Hennef Way eastbound approach with all movements reported being below GEH 3. Hence this is not considered as an issue.

Journey Time Validation

5.8. SLR has undertaken journey time validation for the following 28 routes as shown in Figure 5-2 below against the TomTom data collected in June 2023.

Figure 5-2 Journey Time Validation Routes



Source: SLR Consulting LMVR

5.9. TAG requires the modelled journey time along at least 85% of the routes to be within 15% of the observed journey time or 60 seconds (if higher than 15%). SLR has undertaken the journey time validation using the 15% criteria as the 60-second criteria is unsuitable for short routes in microsimulation models. The journey time validation results presented in the LMVR show that 100% of routes are validated in the AM peak, and 96% of routes are validated in the PM peak with one route failing marginally. Therefore, both the AM and PM peak models meet the TAG criteria.

5.10. As highlighted in Chapter 4 of this TN, AECOM has identified some issues in the development of the base year Vissim models. The impact of some of these issues is likely to affect the journey time in the Vissim models. In order to understand the magnitude of impacts, AECOM has carried out the following updates to the Vissim models which are likely to affect the modelled delays:

- Updated the lane change distances where the lane changes were deemed unrealistic (Section 4.9);
- Updated the average standstill distance to 1.5 meters in the “Urban Motorised” and “Merge” driving behaviours (Section 4.11); and
- Updated the pedestrian signals coding using the appropriate inter-green time between the pedestrian and traffic phases (Section 4.33).

5.11. The updated models by AECOM were evaluated for the same 10 random seeds and the journey time results validation results were compared with the results presented in the LMVR. Table 5-4 and Table 5-5 present the journey time validation results of key routes passing through M40 Junction 11 during AM and PM peaks respectively. The journey time validation results for the other routes are presented in Appendix A of this technical note.

Table 5-4 JT Validation Comparison - AM Peak

No.	Route	Length (m)	Obs. (s)	SLR Consulting Results				AECOM Results			
				Mod.	Diff (s)	Diff (%)	Result	Mod.	Diff (s)	Diff (%)	Result
1	Hennef Way EB	1854	307	280	-27	-9%	Pass	266	-41	-13%	Pass
2	Hennef Way WB	1843	137	145	8	6%	Pass	146	9	6%	Pass
13	M40 NB	5887	184	206	22	12%	Pass	206	22	12%	Pass
14	M40 SB	5890	189	211	22	12%	Pass	211	22	12%	Pass
15	M40 On-Slip NB	599	28	26	-3	-9%	Pass	26	-3	-9%	Pass
16	M40 Off-Slip SB	492	45	40	-5	-11%	Pass	39	-5	-12%	Pass
17	M40 Off-Slip NB	526	43	48	4	10%	Pass	47	3	7%	Pass
18	M40 On-Slip SB	528	26	24	-2	-7%	Pass	24	-2	-8%	Pass
19	A361 NB	1262	68	68	0	0%	Pass	68	0	0%	Pass
20	A361 SB	1251	127	125	-2	-1%	Pass	109	-17	-14%	Pass
21	A422 EB	3631	165	175	9	6%	Pass	175	9	6%	Pass
22	A422 WB	3599	187	180	-7	-4%	Pass	179	-8	-4%	Pass

Table 5-5 JT Validation Comparison - PM Peak

No.	Route	Length (m)	Obs. (s)	SLR Consulting Results				AECOM Results			
				Mod.	Diff (s)	Diff (%)	Result	Mod.	Diff (s)	Diff (%)	Result
1	Hennef Way EB	1854	170	184	13	8%	Pass	186	16	9%	Pass
2	Hennef Way WB	1843	203	191	-13	-6%	Pass	192	-12	-6%	Pass
13	M40 NB	5887	187	211	24	13%	Pass	211	24	13%	Pass
14	M40 SB	5890	183	206	22	12%	Pass	206	22	12%	Pass
15	M40 On-Slip NB	599	28	26	-2	-8%	Pass	25	-2	-8%	Pass
16	M40 Off-Slip SB	492	45	42	-2	-5%	Pass	43	-2	-5%	Pass
17	M40 Off-Slip NB	526	39	43	4	10%	Pass	43	3	9%	Pass
18	M40 On-Slip SB	528	25	23	-1	-6%	Pass	23	-2	-6%	Pass
19	A361 NB	1262	67	72	4	7%	Pass	72	5	7%	Pass
20	A361 SB	1251	77	88	11	14%	Pass	88	10	14%	Pass
21	A422 EB	3631	161	176	15	9%	Pass	176	15	9%	Pass
22	A422 WB	3599	174	172	-2	-1%	Pass	171	-3	-1%	Pass

5.12. The results presented in Tables 5-4 and 5-5 indicate that the coding updates result in a slight change of journey time for some of the routes passing through the M40 Junction 11 in both AM and PM peaks. It is also noted that Route 20 in the AM peak changes significantly. However, all routes pass the journey time validation criteria of 15% with the coding updates.

5.13. The journey time results for some of the routes not passing through the M40 Junction 11 show significant differences when compared with the results extracted by SLR. The results are presented in Appendix A – three routes fail to validate in both AM and PM peaks. This suggests that the issues identified by AECOM have an impact on the performance of the models. AECOM recommends that the coding updates are adopted, and the journey time validation results are updated within the LMVR.

Queue Length Validation

5.14. SLR has presented a queue length comparison between the observed and modelled queues. Although queue length validation is not a TAG requirement (because of the variable nature of queues, particularly if observations are captured on a single day), it is a good practice to compare the queue lengths on key junction approaches. The AM and PM peak queue length comparison for the M40 Junction 11 approaches is presented in Table 5-6 and Table 5-7 respectively.

5.15. The comparison shows a reasonable match on the approach arms of the M40 Junction 11. However, AECOM notes that addressing the issues identified by AECOM is likely to change the queue results in the models. Therefore, AECOM recommends that the queue length comparison be updated based upon the coding changes.

Table 5-6 Queue Results at M40 Junction 11 AM Peak

Junction Number	Junction Name	No.	From	Peak Hour 07:30-08:30		
				Average Observed	Average Modelled	Difference
1	M40 J11	1	M40 North	9	10	1
		2	Internal Queue 1	10	14	4
		3	A361	17	22	5
		4	A422 East	15	13	-3
		5	Internal Queue 2	17	13	-4
		6	M40 South	7	9	1
		7	Internal Queue 3	5	16	10
		8	A422 West	13	14	1
		9	Internal Queue 4	11	5	-6

Source: SLR Consulting LMVR

Table 5-7 Queue Results at M40 Junction 11 AM Peak

Junction Number	Junction Name	No.	From	Peak Hour 16:30-17:30		
				Average Observed	Average Modelled	Difference
1	M40 J11	1	M40 North	6	7	0
		2	Internal Queue 1	7	23	16
		3	A361	6	5	-1
		4	A422 East	12	8	-4
		5	Internal Queue 2	12	7	-4
		6	M40 South	11	13	2
		7	Internal Queue 3	8	13	5
		8	A422 West	23	20	-2
		9	Internal Queue 4	11	11	0

Source: SLR Consulting LMVR

Saturation Flow Calibration

5.16. SLR has not reported any saturation flow calibration at any junctions in the network. Section 7.5 and Appendix A of the National Highways Microsimulation guidelines recommend that the outturn saturation flow should be reviewed to demonstrate that reasonable values are obtained as this determines the capacity of the junction. This issue is **SIGNIFICANT** and AECOM recommends that a saturation flow comparison be carried out at the key signalised junction (M40 Junction 11).

Summary

5.17. Based on the findings presented in Chapter 4 of this TN, and reviewing the calibration/validation results in Chapter 5 of this TN, AECOM recommends that the base year Vissim models be updated to resolve the issues and errors identified in this TN.

5.18. While these issues identified by AECOM may have minimal impact on the base year model results, the impact may be more significant in the future year assessment as the traffic flows are greater.

5.19. AECOM recommends that the calibration and validation results should be updated, and the saturation flow calibration prepared for key junctions in the network. This will result in a more robust base year model and ensure that the impact of the proposed Scheme is assessed accurately.

6. Forecast Model Development

Introduction

6.1. To assess the impacts of future developments, an opening year forecast was prepared for the year 2026 and a future year forecast for the year 2032. The forecasting report notes that the future year assessment was undertaken for 2032 representing 10 years after the date of the registration of the application in accordance with the criteria set out in the DfT circular dated January 2022. AECOM notes that the full development will be completed in 2026 and therefore the traffic generated from the proposed development is the same in 2026 and 2032 future years.

Modelled Scenarios

6.2. SLR has developed the following AM and PM peak scenarios in the forecast years of 2026 and 2032:

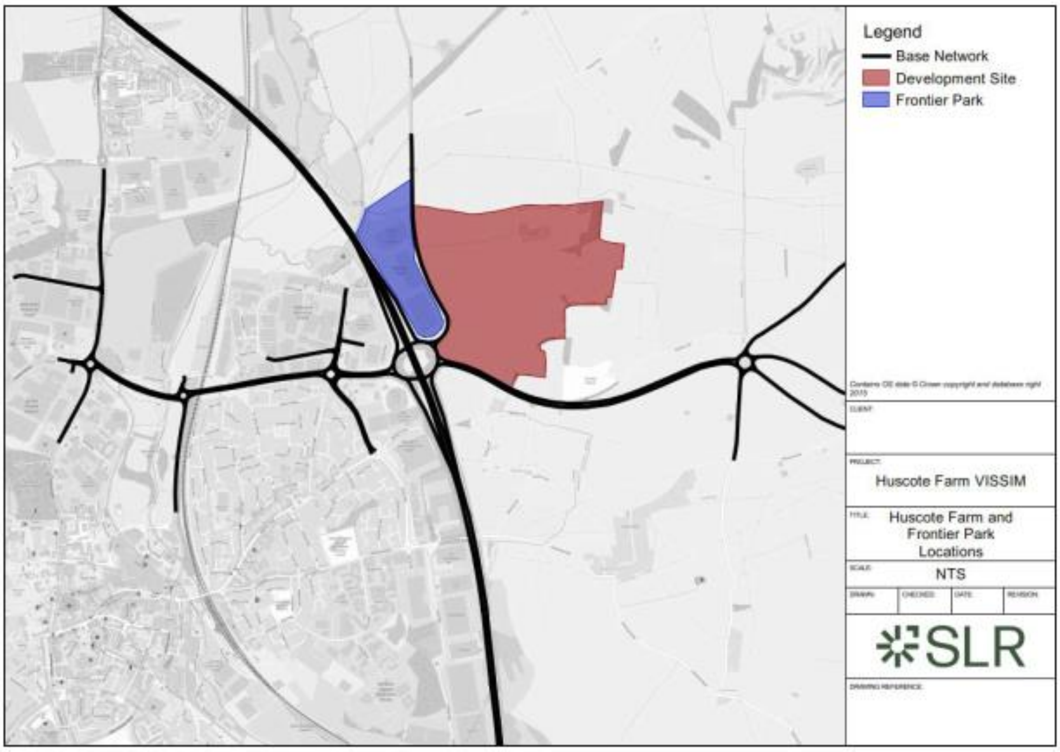
- Reference Case models which include the traffic growth and committed development scheme traffic;
- Do Minimum models using the Reference Case models to include the development traffic from the proposed Huscote Farm site; and
- Do Something models using the Do Minimum models to assess the impacts of the proposed mitigation as part of the Scheme.

6.3. It should be noted that the Do Minimum models represent the development of the Huscote Farm site but without the mitigation proposals. The Do Something models include the mitigation.

Development Sites in forecast modelling

6.4. Two developments are included within the forecast model; the Frontier Park development, which is a committed development, and the Huscote Farm development, which is the development being assessed. The locations of both these development sites are shown below in Figure 6-1.

Figure 6-1 Development Site Locations



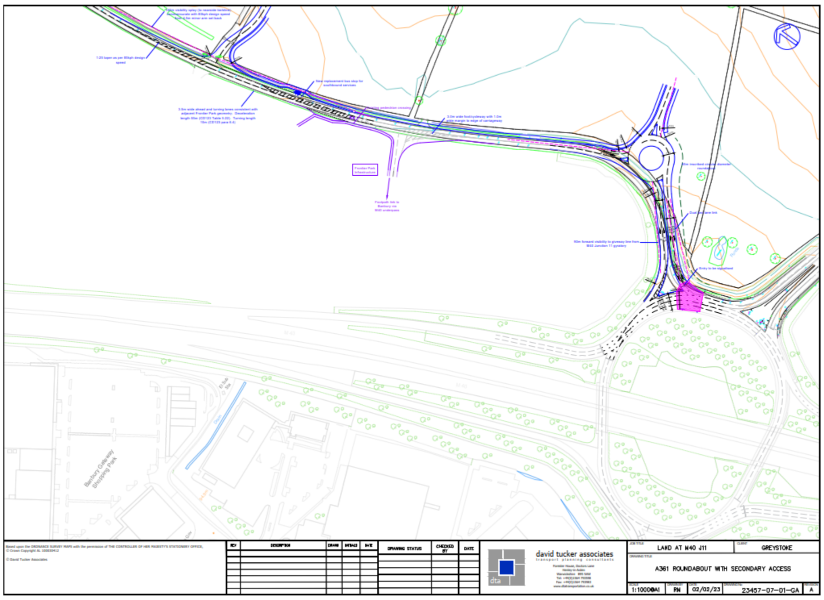
Ref: SLR Consulting Forecasting Report

6.5. The site of Frontier Park is situated adjacent to the A361 at Junction 11, positioned between the M40 and A361. The access arrangement features a straightforward priority junction with a right turn lane designated by a ghost island. The model has incorporated the site access based on a drawing supplied by DTA, sourced from the Frontier Park Transport Assessment. The model includes the newly integrated bus laybys along the A361 and a reduced speed limit of 40mph in proximity to the Frontier Park development site.

6.6. The Huscote Farm development site features two access points along the A361; a priority junction equipped with a right turn lane on a ghost island located just north of the Frontier Park access, and a three-arm roundabout to the south that links to Junction 11.

6.7. Drawing from the analysis outlined in the Huscote Farm Transport Assessment, it is assumed that 65% of development trips will utilise the roundabout, while the remaining 35% will use the access provided by the priority junction. The access plan consisting of the priority junctions and the roundabout for the proposed developments is shown below in Figure 6-2.

Figure 6-2 Development access plan



6.8. It is unclear if the Uncertainty Log data has been reviewed to verify if there are no other committed developments in or around the study area. It is therefore recommended that a review of the Uncertainty Log data is carried out to check that there are no other planned development schemes in or around the study area. If the Uncertainty Log check was undertaken, SLR must document this in their forecasting report. This issue is **SIGNIFICANT**.

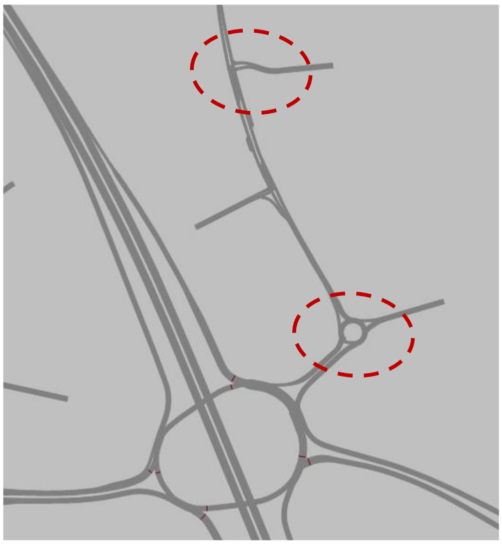
Forecast Models Coding changes

6.9. Figure 6-3 shows the coding of the junction which provides access for the development trips from the Frontier Park development. The coding of this junction was included in the Reference Case, Do Minimum, and Do Something models.

Figure 6-3 Frontier Park (Committed Scheme) Development Access coding

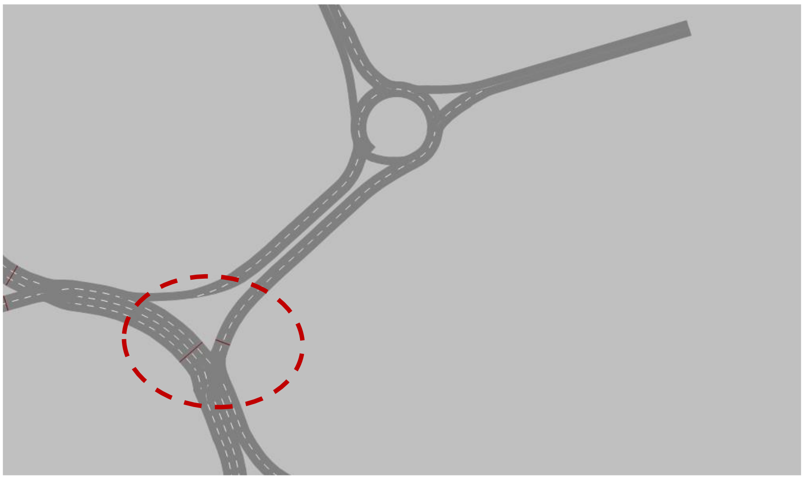
6.10. The Vissim model coding of the two access points of the proposed Huscote Farm development is shown in Figure 6-4. These development accesses were coded in the Do Minimum and Do Something networks.

Figure 6-4 Huscote Farm (Proposed Scheme) Development Access coding



6.11. The proposed mitigation signalises the A361 approach arm at the M40 Junction 11 as shown in Figure 6-5 below. The signal coding was included in the Do Something model network to assess the mitigation impacts on the M40 Junction 11.

Figure 6-5 Do Something Mitigation Coding (Signals at A361 approach arm)



6.12. AECOM has reviewed the coding of these schemes in the Vissim model and has found it to be accurate.

6.13. AECOM has undertaken checks to verify if there are any coding inconsistencies between the base and forecast models. There were no inconsistencies found as the sections of the network unaffected by the proposed developments remained the same in all the forecast models and were consistent with the calibrated/ validated base year models.

6.14. Section 5.1 of the forecasting report notes that "*the VAP signals at M40 Junction 11 used in the base year Vissim models have been replaced by fixed time signals in all the forecast scenarios to ensure consistent offsets between the approach arms and circulating signal heads that follow. Early iterations of testing suggested that the variable signal plans, and therefore variable offsets, were not sufficient to accommodate the higher levels of traffic once growth and development were included, and measures needed to be taken to avoid unrealistic circulatory congestion.*"

6.15. AECOM has reviewed the signal operation and notes that a 60-second fixed-time signal is coded at the M40 Junction 11. Whilst the signal operation is reasonable, the coding of a single fixed time controller in Vissim is an incorrect approach. The junction operates with different streams and therefore different controllers with fixed time VAPs should be coded in Vissim to accurately model the M40 J11 signal. It is noted that the coding of fixed-time VAPs will not change the operation of the roundabout. However, the coding should be updated for accuracy and therefore this issue is **MEDIUM**.

Forecast Demand Development

Reference Case Models

6.16. The forecast year traffic demand for the 2026 and 2032 Reference Case scenarios was developed as follows:

- The base year 2023 traffic matrices were uplifted using the TEMPro v8.1 growth factors for 2026 and 2032; and
- The committed scheme development traffic from Frontier Park development was added to the TEMPro uplifted growth matrices.

6.17. AECOM has reviewed the calculations and has the following comments/observations:

- TEMPro version 8.1 database has been used by SLR to compute the growth factors for the 2026 and 2032 forecast years based on the 'High Growth' scenario. The Vissim model extends over three areas in TEMPro. The growth at the zone level for each OD pair was calculated based on the area it fell under and an overall average growth was calculated comprising of growth from all OD pairs.
- AECOM calculated the growth factors from TEMPro v8.1 and compared them against the overall average growth factors used by SLR as presented in Table 6-1 below. The differences were negligible.

Table 6-1 Average TEMPro Factors

AM Peak		PM Peak	
2023-2026	2023-2032	2023-2026	2023-2032
1.0299	1.0917	1.0303	1.0919

Ref: SLR Consulting Forecasting Report

- Section 2.3 of the forecasting report states "*DTA has provided SLR with peak hour trip generation and distribution for the Frontier Park committed development. This gave the split of trips at M40 Junction 11, disaggregated between Lights and Heavies. To proportion trips to/from the zones off A422 East and West from/to Junction 11, SLR used trip distributions provided by DTA which were based on outputs from the strategic Banbury Traffic Model.*" The methodology to calculate the future year demand for the Reference Case models is appropriate and acceptable.

- Section 2.5 of the forecasting report states that "*Frontier Park trips were provided for a pre-AM peak (07:00-08:00) and AM peak hour (08:00-09:00). Since the Vissim AM peak hour used for the Base model is 07:30- 08:30, the average of the two hourly matrices was calculated to provide a 07:30-08:30 Frontier Park matrix for Vissim*".

  AECOM disagrees with the approach to average the two matrices as this assumes a flat profile of traffic from the proposed development site. The AM peak hour matrix from 08.00 to 09.00 has higher volumes compared to the matrix from 07.00 to 08.00. This issue is considered **MEDIUM**. AECOM recommends the adoption of two matrices (07:30 to 08: 00 and 08:00 to 08:30) – this will ensure that the peak hour development traffic flows from 08:00 to 09:00 will be profiled correctly. Alternatively, the 08.00 to 09.00 peak hour matrix should be used to ensure the assessment is based upon higher flows and is therefore robust. In the PM peak, Frontier Park trips were provided for the peak hour between 17:00 and 18:00. This hourly matrix was directly integrated into the Vissim simulation for the 16:30-17:30 peak hour.

Do Minimum and Do Something Models

6.18. The traffic demand for the Do Minimum and Do Something scenarios was developed by adding the development trips from the proposed Huscote Farm site to the Reference Case matrices. While this approach is acceptable, AECOM has concerns over the derivation of the trips from Huscote Farm.

6.19. Section 4.2 of the forecasting report states that: "*Like the Frontier Park trips, development trips were provided for a pre-AM peak (07:00-08:00) and AM peak hour (08:00-09:00). These were applied to the VISSIM AM peak hour in the same way by averaging the two hourly matrices to give 07:30-08:30 development matrices. The PM development peak is 17:00-18:00 which has been applied directly on top of the VISSIM 16:30-17:30 peak hour.*" This issue is considered **MEDIUM** and should be addressed in the same way as Frontier Park, either by creating separate matrices for 07:30 to 08:00 and 08:00 to 08:30 or by adopting the matrix for 08:00-09:00.

6.20. The AM peak forecast demand summary is presented below in Table 6-2 whereas the PM peak summary is presented in Table 6-3.

Table 6-2 Forecast Demand Summary - AM Peak

	Base Lights	Base Heavies	Growth Lights	Growth Heavies	Frontier Park Lights	Frontier Park Heavies	Dev Lights	Dev Heavies	Total
2023 Base	10929	996	-	-	-	-	-	-	11926
2026 Ref	10929	996	112	9	186	17	-	-	12249
2026 DM/DS	10929	996	112	9	186	17	291	193	12732
2032 Ref	10929	996	791	72	186	17	-	-	12991
2032 DM/DS	10929	996	791	72	186	17	291	193	13475

Ref: SLR Consulting Forecasting Report

Table 6-3 Forecast Demand Summary - PM Peak

	Base Lights	Base Heavies	Growth Lights	Growth Heavies	Frontier Park Lights	Frontier Park Heavies	Dev Lights	Dev Heavies	Total
2023 Base	12446	680	-	-	-	-	-	-	13126
2026 Ref	12446	680	175	8	169	6	-	-	13485
2026 DM/DS	12446	680	175	8	169	6	369	93	13947
2032 Ref	12446	680	943	52	169	6	-	-	14296
2032 DM/DS	12446	680	943	52	169	6	369	93	14758

Ref: SLR Consulting Forecasting Report

7. Forecast Model Results

Introduction

7.1. The forecast year Vissim models were run for 10 random seeds (identical to the base year model) to assess the impacts for the future year scenarios of 2026 and 2032.

7.2. As noted in Section 5.17 above, AECOM has recommended that the base model coding be amended and therefore the forecast models will require updating. Furthermore, as noted in Sections 6.8, 6.17, and 6.19 above in this TN, AECOM has concerns with some of the assumptions to calculate the forecast year demand from the development sites.

7.3. Addressing these issues will result in changes to the forecast year results presented in the Forecasting Report.

Model Results

7.4. SLR has reported on the journey time differences and average delay differences between the scenarios in the Forecasting Report. However, in order to better understand the impacts of the proposed development at the M40 Junction 11, AECOM has extracted the average network delay results and the average speed results on the links in the network. The following sections of this TN summarise the results extracted by AECOM from the forecast year Vissim models.

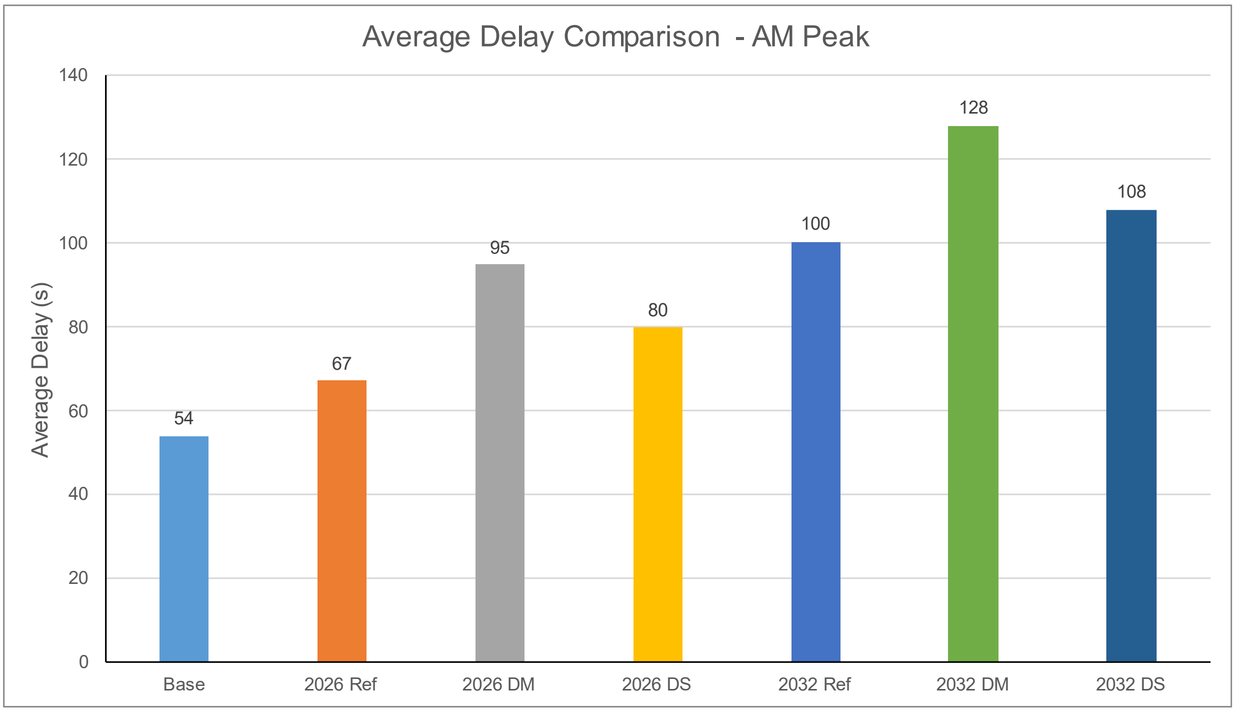
Average Network Delay Results

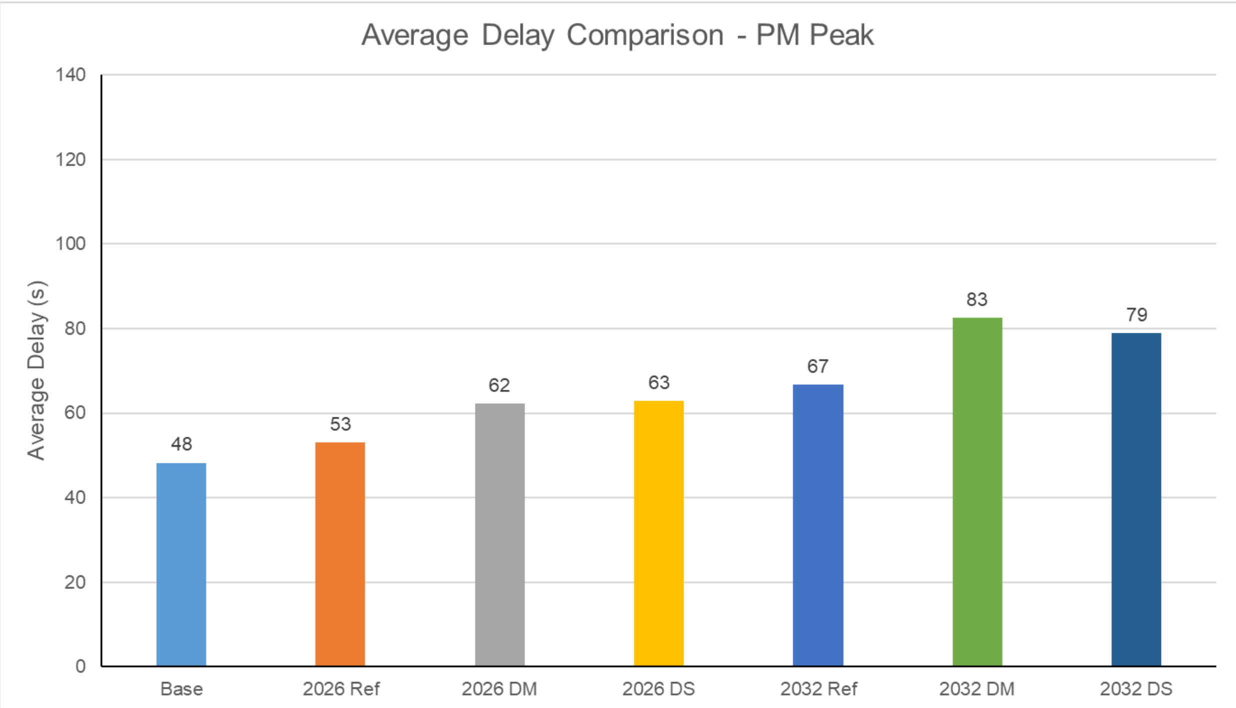
7.5. The AM and PM peak average network delay results are presented in Figure 7-1.

7.6. The 2026 and 2032 forecast year scenarios demonstrate similar patterns of delays in the AM peak. The delay increases as a result of increased traffic flows in the Reference Case models compared to the base year models. The Do Minimum scenario models (with the Huscote Farm development) predict a further increase in delays compared to the Reference Case scenario models indicating that the proposed development will increase the congestion in the network. The proposed mitigation scheme results in an improvement compared to the Do Minimum models, but the delays are higher than the Reference Case models suggesting that the proposed Scheme with mitigation will not eliminate the delays caused by the Huscote Farm development.

7.7. The PM peak results show similar patterns as observed in the AM peak results. However, the magnitude of delays is less in the PM peak. It is noted that the proposed mitigation scheme does not reduce the delays compared to the Do Minimum scenario in 2026 indicating that the signals do not reduce congestion.

Figure 7-1 Average Delay Comparison Results – AM and PM peaks





Average Speed Results

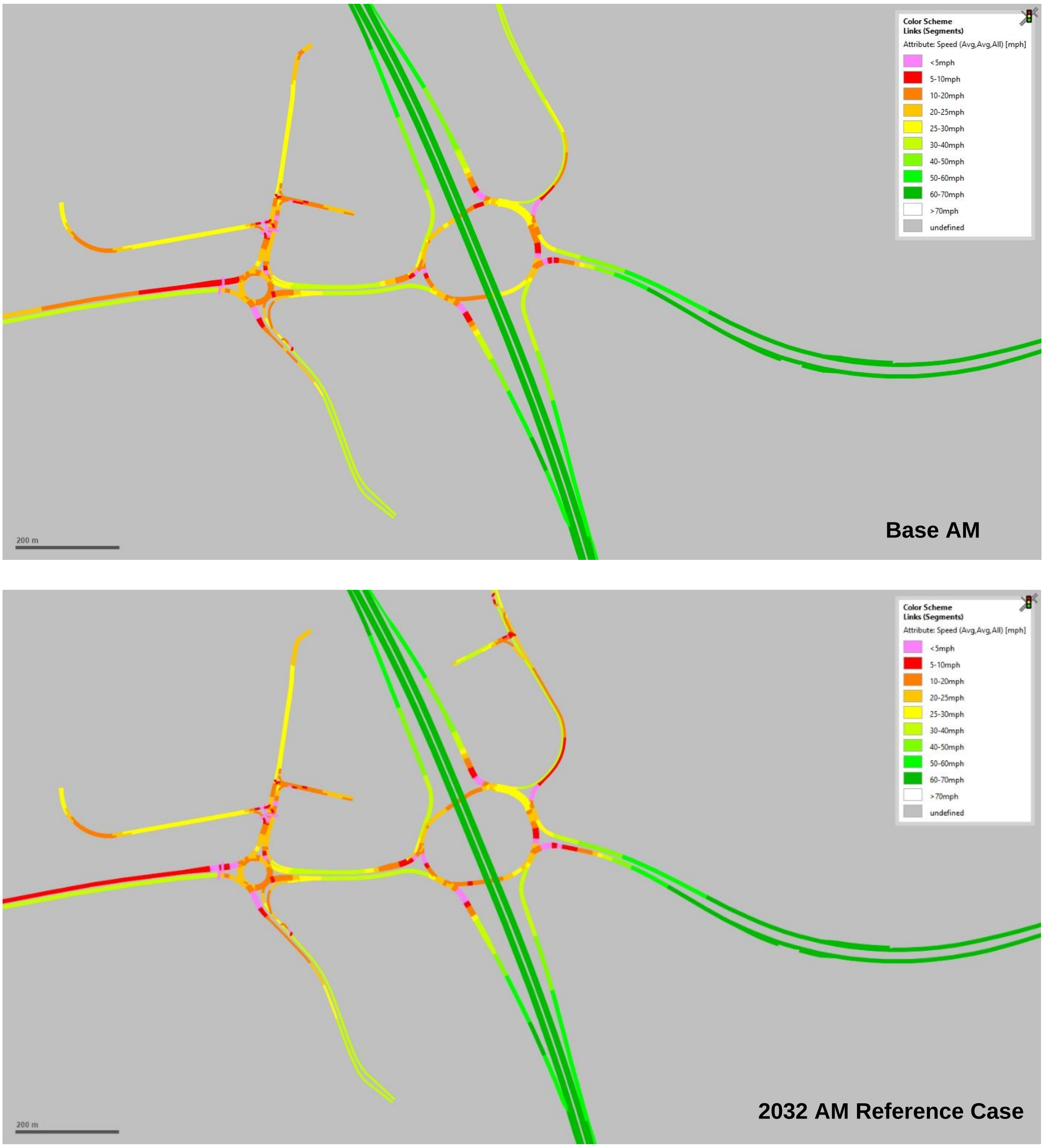
7.8. Speed plots for 2032 are presented in Figures 7-2 to 7-7 below and show the peak hour average speed of vehicles on each section of the network in miles per hour (mph). The colour bands on the average speed plots represent the average link speed across the peak hour, showing congested links (pink/red) and free flow conditions (green/yellow).

7.9. The forecast year traffic demand summary presented in Chapter 6 of this TN shows that the overall traffic demand is higher in 2032 compared to 2026. Therefore, AECOM has presented the average speed results of 2032 to assess the worst-case impacts. The average speed results of 2026 are presented in Appendix B.

2032 Reference Case

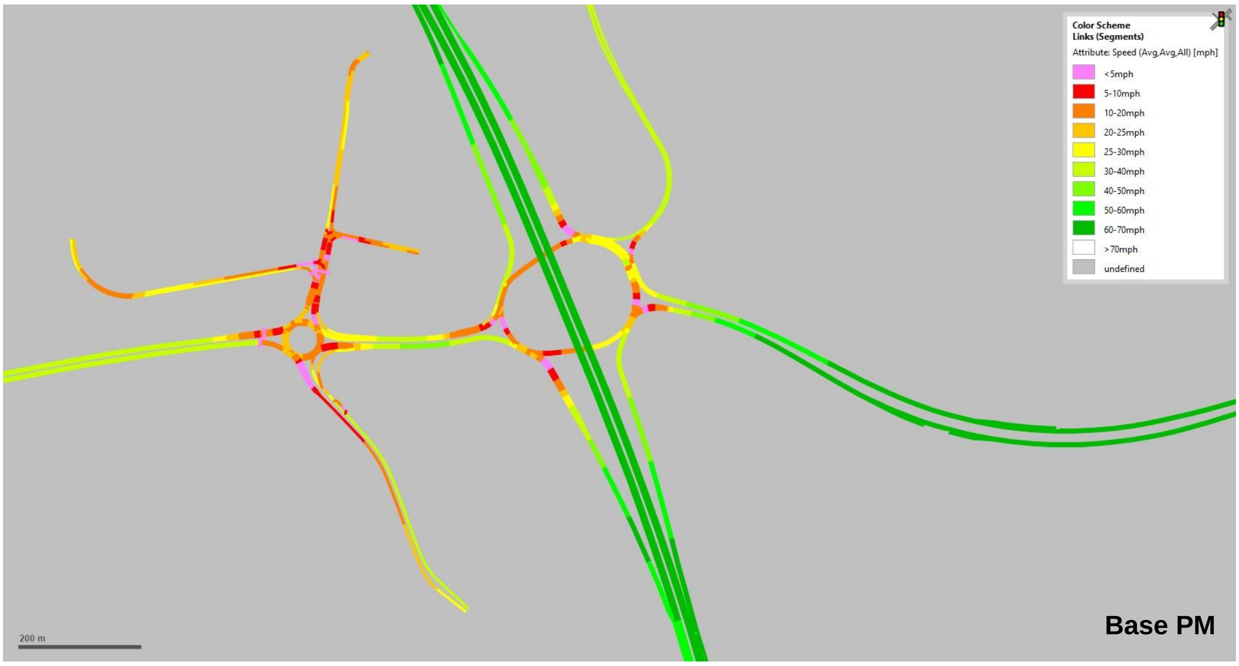
7.10. Figure 7-2 presents the speed results comparison of the base year AM peak models and 2032 Reference Case models. The comparison shows there is more congestion on the Hennef Way eastbound corridor (west of the M40 J11) in the Reference Case. The Reference Case models do not predict any significant increase in queueing on the A422 approach arms of the M40 J11 in the eastbound and westbound directions. The congestion patterns on the slip roads remain similar in both scenarios. There is an increase in traffic on the A361 southbound approach arm in the Reference Case scenario – this is due to the additional traffic flows from the Frontier Park development.

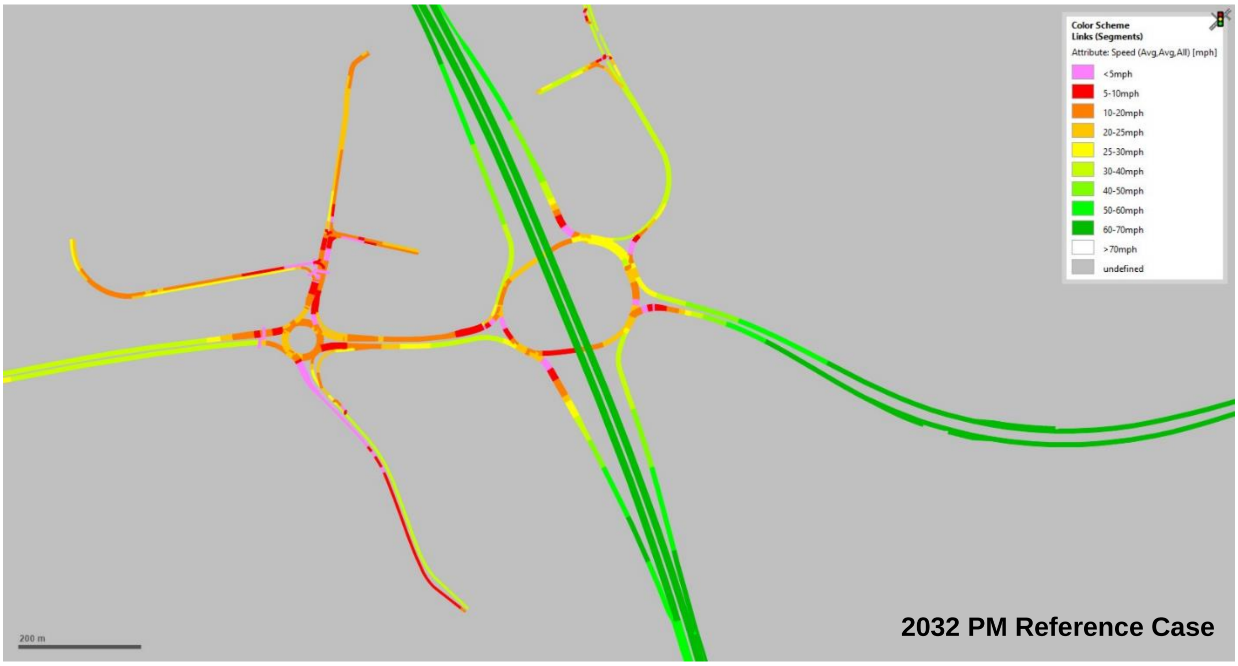
Figure 7-2 Average Speed Results - Base AM (top) and 2032 AM Reference Case (bottom)



7.11. Figure 7-23 presents the speed results comparison of the base year PM peak models and 2032 Reference Case models. This shows there is no significant increase in congestion on the M40 J11 off-slip approaches. The westbound approach arm (A422) remains unaffected as a result of the additional traffic in the Reference Case. However, there is an increase in congestion on the A422 eastbound approach arm. The queues on this approach affect the operation of the Hennef Way/ Ermont Way roundabout (west of the M40 Junction 11). There is a marginal increase in queues on the A361 approach arm due to the traffic generated from the Frontier Park development.

Figure 7-3 Average Speed Results - Base PM (top) and 2026 PM Reference Case (bottom)



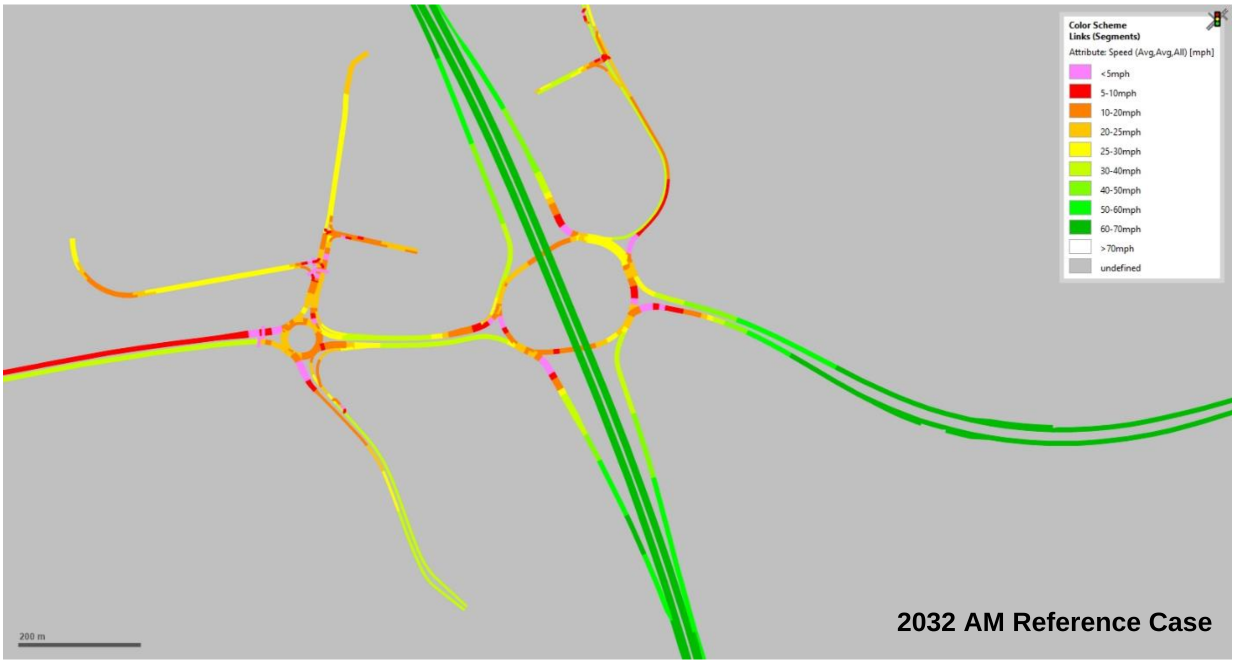


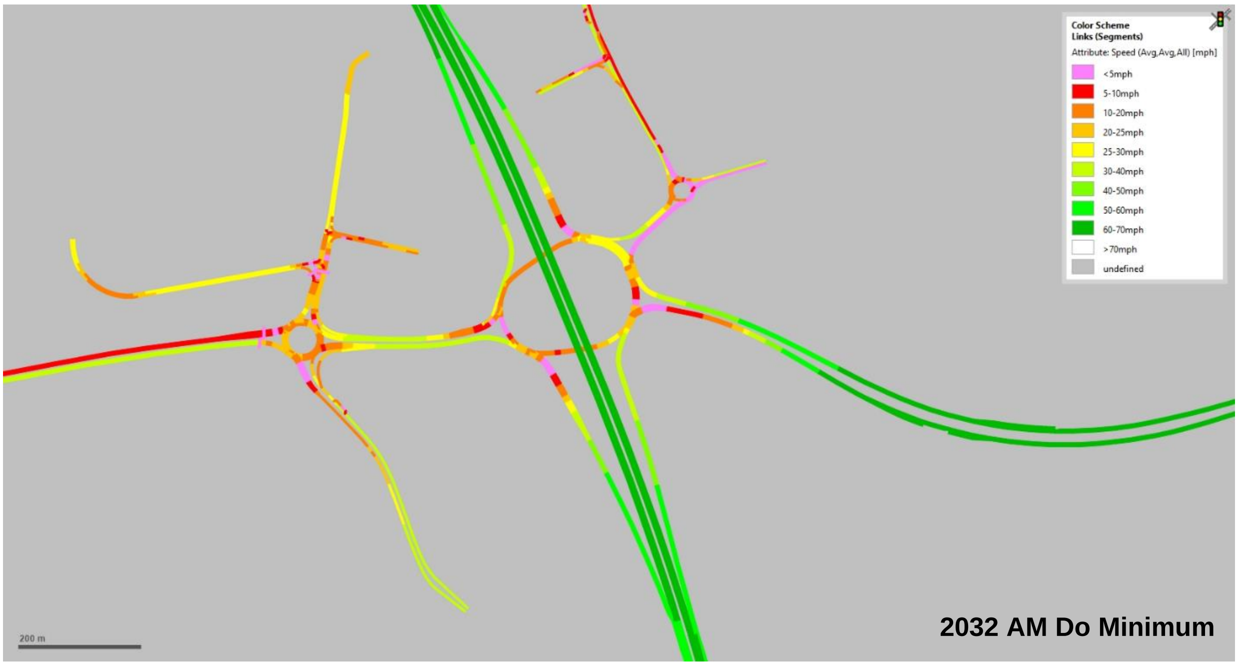
2032 Do Minimum

7.12. Figure 7-4 compares the AM peak average speed results for the 2032 Do Minimum scenario with the Reference Case scenario to assess the impact of the Huscote Farm development.

7.13. The Do Minimum models (with Huscote Farm development) demonstrate a significant increase in congestion along the A361 approach arm as a result of the additional traffic from Huscote Farm. The queues extend back to the newly proposed priority-controlled roundabout. The other approach arms of the M40 J11 also show a marginal increase in queues.

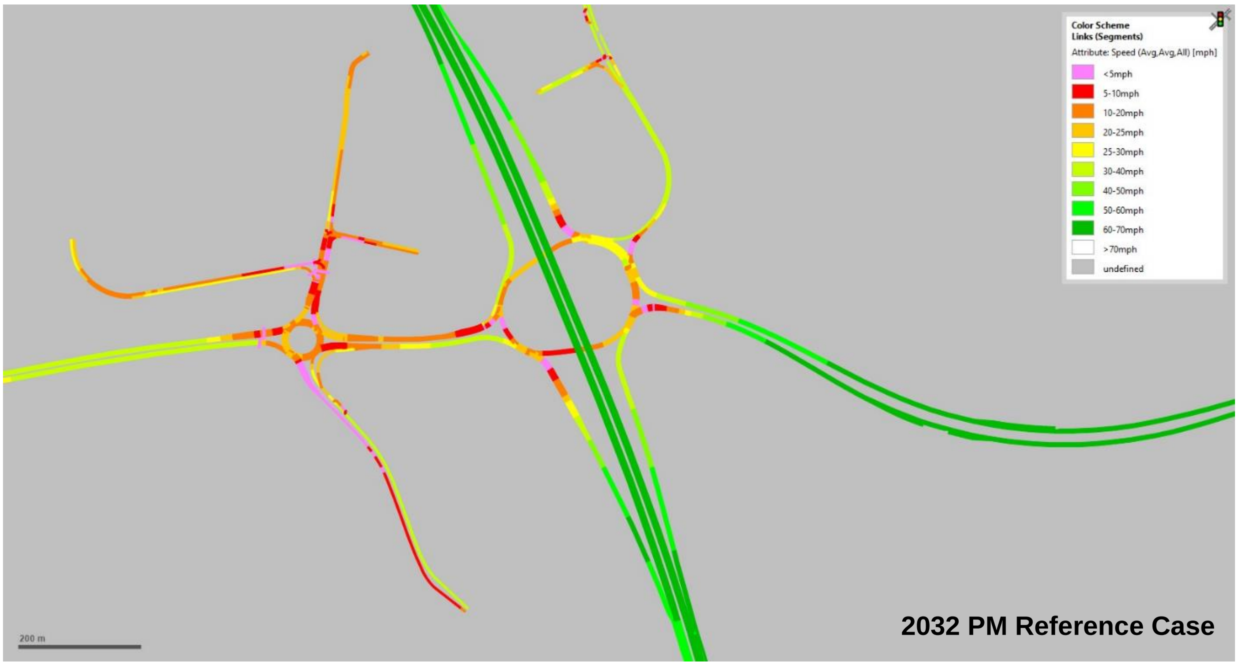
Figure 7-4 Average Speed Results – 2032 AM Reference case (top) and 2032 AM Do Minimum (bottom)

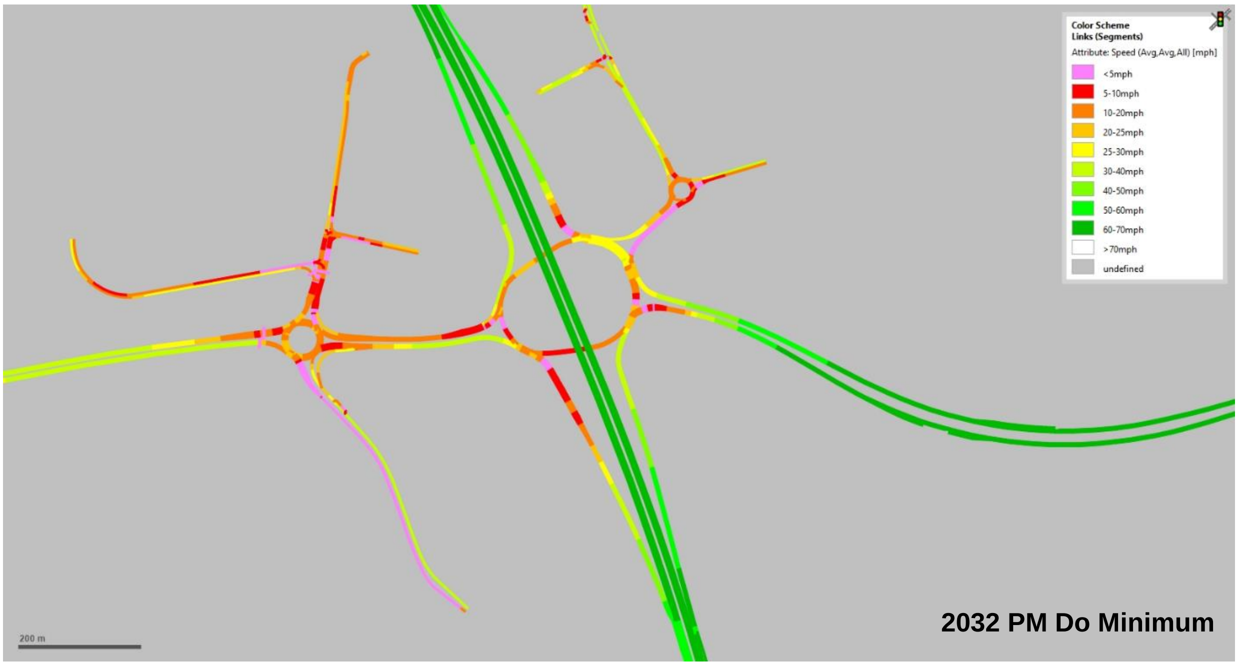




7.14. Figure 7-5 compares the PM peak average speed results for the 2032 Do Minimum scenario with the Reference Case scenario. The PM peak Do Minimum scenario (with Huscote Farm development) shows a notable increase in delays on the northbound off-slip approach arm of the M40 J11. The queues on the A361 approach arm also increase due to the additional traffic from the proposed Huscote Farm development. Congestion increases on the A422 westbound approach arm at the Hennef Way/ Ermont Way roundabout.

Figure 7-5 Average Speed Results – 2032 PM Reference case (top) and 2032 PM Do Minimum (bottom)



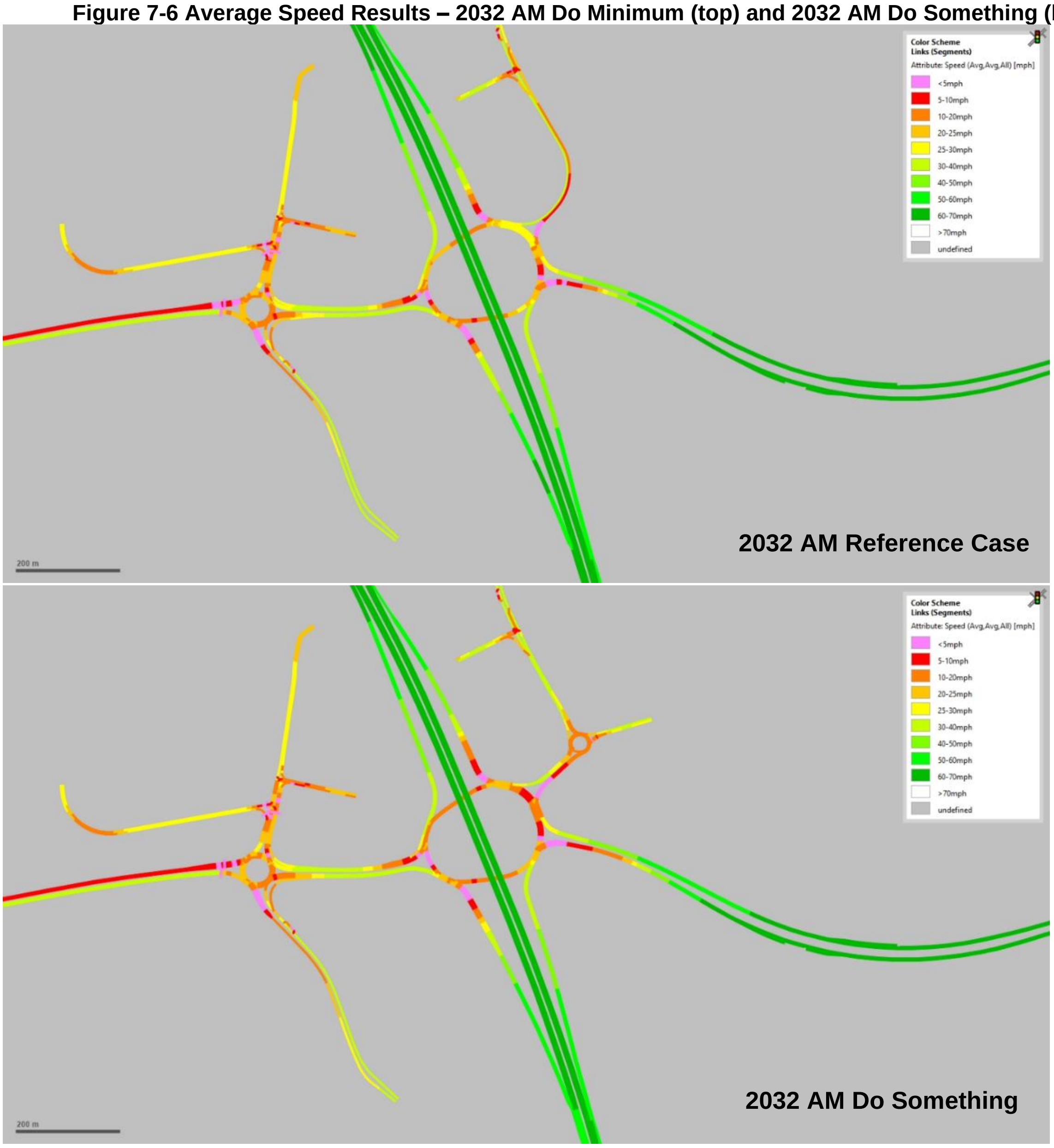


2032 Do Something

7.15. Figure 7-6 compares the Do Something average speeds with the Reference Case for the AM peak. The Do Something includes the mitigation proposals including signalising the A361 approach arm. This demonstrates the impact of the proposed Huscote Farm development together with the proposed mitigation.

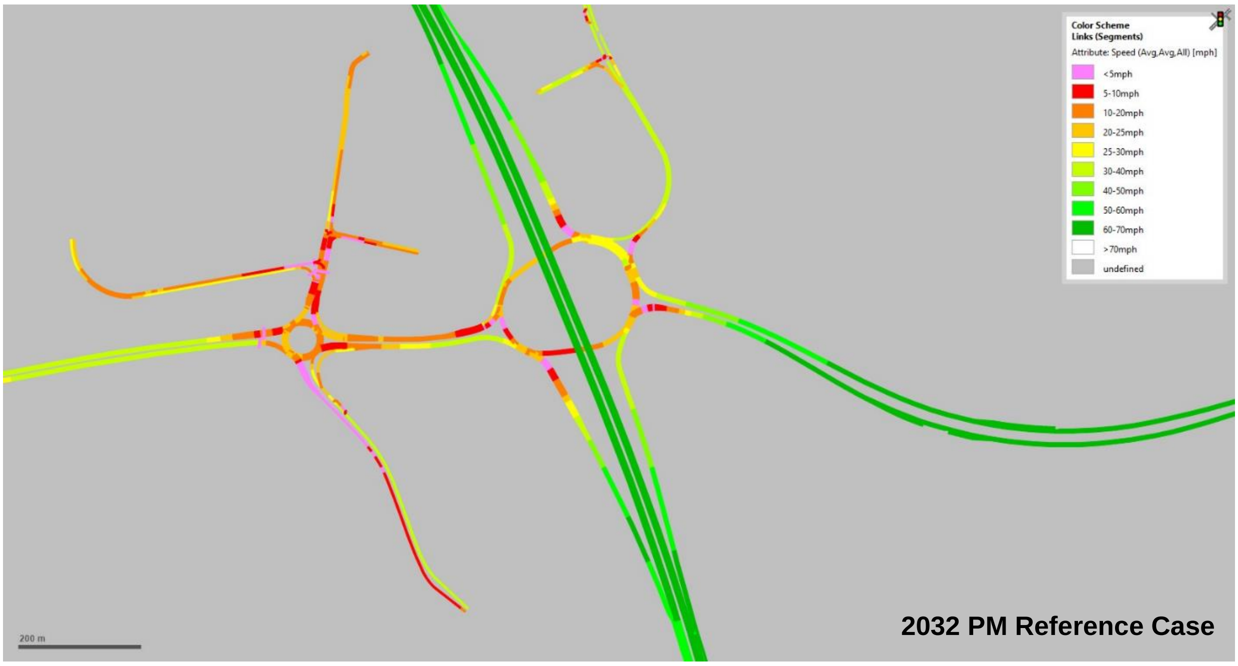
7.16. The proposed signals significantly reduce congestion on the A361 approach compared to the Do Minimum scenario (Figure 7-4). However, the queues are not eliminated and continue to affect the operation of the roundabout that provides access to the Huscote Farm development. There is a slight increase in queueing on the A422 westbound approach arm compared to the Reference Case scenario. The M40 J11 off-slip approaches do not show significant differences in the queues. This demonstrates that the proposed scheme is unlikely to affect the operation of the M40 mainline corridor.

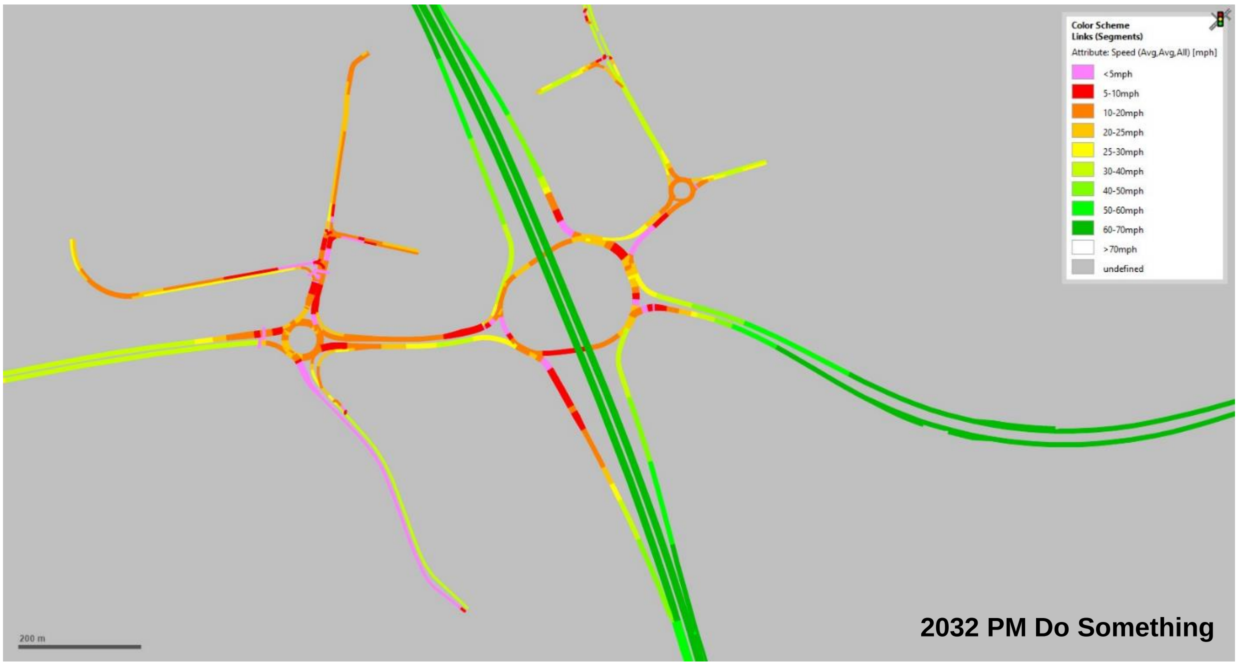
Figure 7-6 Average Speed Results – 2032 AM Do Minimum (top) and 2032 AM Do Something (bottom)



7.17. Figure 7-7 compares the PM peak average speed results of the 2032 Do Something models with the Reference Case. The proposed mitigation at the A361 arm of the M40 Junction 11 reduces queues on this approach compared to the Do Minimum scenario but it remains higher than the Reference Case scenario. There are more queues on the M40 Junction 11 circulatory and on the off-slip approach arms in the Do Something scenario compared to the Reference Case scenario indicating that the proposed Scheme and the mitigation affect the operation of M40 Junction 11. The queues on the northbound slip road are significantly higher but do not affect the mainline corridor.

Figure 7-7 Average Speed Results – 2032 PM Do Minimum (top) and 2032 PM Do Something (bottom)





Proposed Development Impacts on the Strategic Road Network (SRN)

Junction Delay Results at M40 J11

7.18. AECOM has analysed the junction delay results at M40 J11 and compared them for all the 2023 forecast scenarios for the AM and PM peaks. The results are presented in Table 7-1.

Table 7-1 M40 J11 Average Junction Delay Comparison (s)- 2032 AM and PM Peaks

Average Delay Comparison (seconds)	2032 Reference Case	2032 Do Minimum	2032 Do Something
AM Peak	22	29	28
PM Peak	20	29	29

7.19. The comparison for both the AM and PM peaks demonstrates that the average delay increases in the Do Minimum scenario compared to the Reference Case scenario as a result of the development traffic from Huscote Farm. The mitigation scheme of signalising the A361 approach arm has an insignificant impact on the average junction delay in the AM peak Do Something scenario with delays reducing by 1 second compared to the Do Minimum scenario. In the PM peak, there is no change in average delay due to mitigation. This indicates that the mitigation measures are not effective in reducing the delays due to the additional traffic generated by the development at Huscote Farm.

Queue Length Results on the M40 off slips

7.20. AECOM has also extracted the average and maximum queue length on the M40 Junction 11 off-slip approach arms. “Average Queue” is the average over the entire peak hour whereas the “Maximum Queue” is the maximum queue length captured in the entire peak hour (a single occurrence). Table 7-2 and Table 7-3 compare the average and maximum queue lengths for the 2023 forecast scenarios for the AM and PM peaks respectively.

7.21. It should be noted that the length of the M40 northbound offslip is 470 meters whereas the southbound offslip has a length of 425 meters.

7.22. The AM peak results show that both the average and maximum queue lengths in all the 2032 forecast year scenarios are well within the length of the slip roads and hence within the stacking capacity on both northbound and southbound off-slips. The results show that the queueing patterns increase as a result of the proposed Scheme and are not reduced by the proposed mitigation measures.

7.23. The PM peak results show similar patterns as observed in the AM peak. The queues increase as a result of the Huscote Farm development with the mitigation measures having no impact on reducing the queues.

7.24. The southbound off-slip queues in all the forecast scenarios are short with sufficient queueing space. The northbound queues are significantly higher in the PM peak compared to the Reference Case. While this analysis indicates there is sufficient queueing space to accommodate the increase in queues on this approach arm, it is noted that the maximum queue in the Do Something scenario (376 meters), is within less than 100 meters of the total slip road length. For this reason, AECOM recommends that the queue length analysis should be re-assessed based upon addressing the issues with the model that were highlighted in Section 7.2 of this TN.

Table 7-2 Queue Length Comparison - 2032 AM Peak

Location	2032 AM Reference Case		2032 AM Do Minimum		2032 AM Do Something	
	Average Queue (m)	Maximum Queue (m)	Average Queue (m)	Maximum Queue (m)	Average Queue (m)	Maximum Queue (m)
M40 SB Off-Slip	25	85	34	98	62	127
M40 NB Off-Slip	28	70	37	81	36	79

Table 7-3 Queue Length Comparison - 2032 PM Peak

Location	2032 PM Reference Case		2032 PM Do Minimum		2032 PM Do Something	
	Average Queue (m)	Maximum Queue (m)	Average Queue (m)	Maximum Queue (m)	Average Queue (m)	Maximum Queue (m)
M40 SB Off-Slip	20	60	27	70	42	80
M40 NB Off-Slip	30	94	248	327	281	376

8. Conclusions

8.1. AECOM was appointed by National Highways (NH) to review the Vissim base models, forecast models, LMVR and Forecasting report developed by SLR Consulting to assess the impacts of the proposed development (Huscote Farm) near M40 Junction 11 in Banbury.

8.2. As part of the audit, AECOM reviewed the Vissim base and forecast models and other supporting spreadsheets and reports (LMVR documenting the base model results and the Forecasting Report documenting the forecast model results).

8.3. This Technical Note (01) has been prepared to document the findings of the review. The purpose of the review was to determine whether the Vissim model was developed in accordance with the DfT's TAG and National Highways Microsimulation guidelines and to determine whether the results of the model validation met the Department for Transport validation criteria. The review also determined if the approach to developing the forecast Vissim model was appropriate and if the model could be relied upon to accurately predict the impacts of the proposed development.

8.4. The base model demand development methodology was considered acceptable. The base model network development review indicated that there were some errors/ issues in the coding of the Vissim models, especially with the signals. AECOM amended the models to take account of these issues to determine the impact on the journey time validation results.

8.5. Based upon AECOM's re-assessment, the key journey time routes passing through the M40 Junction 11 were validated, however, some of the journey time results for other routes changed significantly and failed validation. Therefore, in order to develop a robust base model, AECOM recommends that SLR update the coding of the base models to address the issues identified by AECOM and to provide updated calibration and validation results.

8.6. AECOM recommends that the Saturation flow calibration be undertaken at the M40 Junction 11 to demonstrate that the junction is modelled with reasonable capacity. The forecast model results using the base model are unlikely to be accurate.

8.7. Forecasts have been prepared for 2026 and the future year assessment for the year 2032 to assess the impacts of the proposed development. Reference Case models (with traffic growth and committed developments), Do Minimum models (with the proposed Huscote Farm development) and Do Something models (with the proposed mitigation scheme) were developed. The proposed Huscote Farm development is planned to be fully built by 2026.

8.8. AECOM has reviewed the approach to developing the forecast year demand and raised concerns/ issues about some of the assumptions as summarised below:

- assurance on the committed development schemes considered for this study; and
- incorrect approach to average the AM peak development traffic matrices from the Frontier Park and Huscote Farm developments.

Addressing these issues is likely to result in different modelling outputs. Therefore, AECOM recommends that the forecast models be updated to address these issues. The forecast models should be developed from the updated base year model to incorporate the coding changes.

8.9. AECOM has reviewed the model results and found that the proposed mitigation measure of signalising the approach arm of the M40 Junction 11 is likely to result in a modest reduction in delays caused by the Huscote Farm development. However, the delays remain higher compared to the Reference Case scenario indicating that the proposed mitigation scheme is unlikely to be fully effective in reducing the delays. It is noted that the proposed development at Huscote Farm will increase the queueing on the M40 northbound and southbound off-slips. The PM peak models demonstrate significant congestion on the M40 northbound off-slip. The queues are forecast to remain within the stacking space available and would not affect the operation of the M40 mainline corridor. However, there is a risk that the changes in modelling assumptions and updates to the coding of the models could affect the predicted queues on the slip road. Therefore, AECOM recommends that a reassessment of queue lengths be carried out once the models are amended.

8.10. AECOM recommends that the base year model results are updated after addressing the coding issues and sent to AECOM for approval. AECOM recommends that forecast models be revised and the updated results presented to AECOM so the impacts of the proposed development can be assessed and understood.

Appendix A - JT Validation Comparison AM and PM peaks (All journey time routes)

No.	Route	Length (m)	Obs. (s)	SLR Consulting Results				AECOM Results			
				Mod.	Diff (s)	Diff (%)	Result	Mod.	Diff (s)	Diff (%)	Result
1	Hennef Way EB	1854	307	280	-27	-9%	Pass	266	-41	-13%	Pass
2	Hennef Way WB	1843	137	145	8	6%	Pass	146	9	6%	Pass
3	Beaumont Road EB	524	58	50	-8	-13%	Pass	50	-8	-14%	Pass
4	Beaumont Road WB	524	51	57	6	12%	Pass	57	6	12%	Pass
5	Southam Road NB	1356	110	106	-4	-4%	Pass	108	-2	-2%	Pass
6	Southam Road SB	1374	136	122	-14	-10%	Pass	125	-12	-8%	Pass
7	Concord Avenue/Grimsbury Green NB	687	62	54	-8	-12%	Pass	54	-8	-12%	Pass
8	Concord Avenue/Grimsbury Green SB	678	63	67	5	8%	Pass	61	-1	-2%	Pass
9	Ermont Way/Wildmere Road NB	923	125	110	-15	-12%	Pass	99	-25	-20%	Fail
10	Ermont Way/Wildmere Road SB	922	94	86	-8	-9%	Pass	86	-8	-9%	Pass
11	Wildmere Road/Brookhill Way EB	610	75	75	0	-1%	Pass	75	-1	-1%	Pass
12	Wildmere Road/Brookhill Way WB	612	74	84	11	14%	Pass	85	11	15.22%	Fail
13	M40 NB	5887	184	206	22	12%	Pass	206	22	12%	Pass
14	M40 SB	5890	189	211	22	12%	Pass	211	22	12%	Pass
15	M40 On-Slip NB	599	28	26	-3	-9%	Pass	26	-3	-9%	Pass
16	M40 Off-Slip SB	492	45	40	-5	-11%	Pass	39	-5	-12%	Pass
17	M40 Off-Slip NB	526	43	48	4	10%	Pass	47	3	7%	Pass
18	M40 On-Slip SB	528	26	24	-2	-7%	Pass	24	-2	-8%	Pass
19	A361 NB	1262	68	68	0	0%	Pass	68	0	0%	Pass
20	A361 SB	1251	127	125	-2	-1%	Pass	109	-17	-14%	Pass
21	A422 EB	3631	165	175	9	6%	Pass	175	9	6%	Pass
22	A422 WB	3599	187	180	-7	-4%	Pass	179	-8	-4%	Pass
23	Banbury Lane NB	993	62	56	-5	-8%	Pass	57	-5	-8%	Pass
24	Banbury Lane SB	977	64	69	5	8%	Pass	68	4	6%	Pass
25	Mansion Hill EB	949	62	64	1	2%	Pass	63	1	1%	Pass
26	Mansion Hill WB	943	65	74	9	14%	Pass	74	9	14%	Pass

27	Overthorpe NB	464	33	28	-5	-14%	Pass	28	-5	-16%	Fail
28	Overthorpe SB	468	27	24	-3	-10%	Pass	24	-3	-10%	Pass

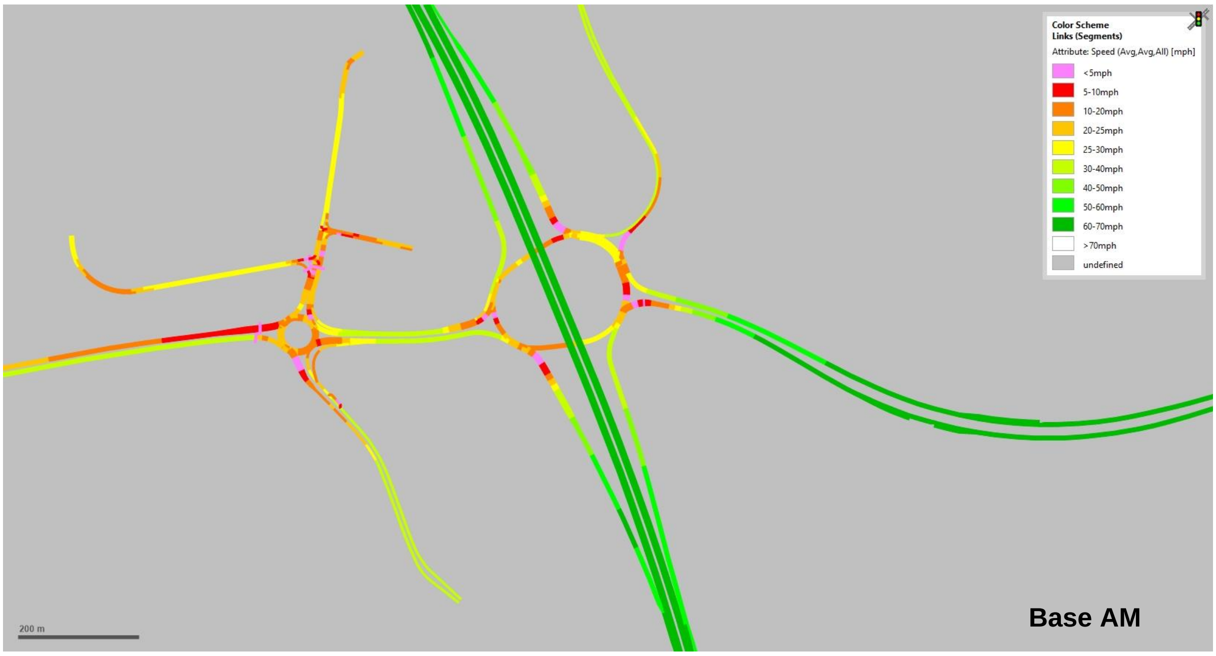
No.	Route	Length (m)	Obs. (s)	SLR Consulting Results				AECOM Results			
				Mod.	Diff (s)	Diff (%)	Result	Mod.	Diff (s)	Diff (%)	Result
1	Hennef Way EB	1854	170	184	13	8%	Pass	266	-41	-13%	Pass
2	Hennef Way WB	1843	203	191	-13	-6%	Pass	146	9	6%	Pass
3	Beaumont Road EB	524	59	63	3	6%	Pass	50	-8	-14%	Pass
4	Beaumont Road WB	524	55	55	0	-1%	Pass	57	6	12%	Pass
5	Southam Road NB	1356	139	127	-12	-9%	Pass	108	-2	-2%	Pass
6	Southam Road SB	1374	124	123	-1	-1%	Pass	125	-12	-8%	Pass
7	Concord Avenue/Grimsbury Green NB	687	66	63	-3	-5%	Pass	54	-8	-12%	Pass
8	Concord Avenue/Grimsbury Green SB	678	63	53	-10	-16%	Fail	61	-1	-2%	Pass
9	Ermont Way/Wildmere Road NB	923	185	189	4	2%	Pass	99	-25	-20%	Fail
10	Ermont Way/Wildmere Road SB	922	123	118	-6	-5%	Pass	86	-8	-9%	Pass
11	Wildmere Road/Brookhill Way EB	610	111	108	-3	-3%	Pass	75	-1	-1%	Pass
12	Wildmere Road/Brookhill Way WB	612	105	103	-3	-3%	Pass	85	11	15%	Fail
13	M40 NB	5887	187	211	24	13%	Pass	206	22	12%	Pass
14	M40 SB	5890	183	206	22	12%	Pass	211	22	12%	Pass
15	M40 On-Slip NB	599	28	26	-2	-8%	Pass	26	-3	-9%	Pass
16	M40 Off-Slip SB	492	45	42	-2	-5%	Pass	39	-5	-12%	Pass
17	M40 Off-Slip NB	526	39	43	4	10%	Pass	47	3	7%	Pass
18	M40 On-Slip SB	528	25	23	-1	-6%	Pass	24	-2	-8%	Pass
19	A361 NB	1262	67	72	4	7%	Pass	68	0	0%	Pass
20	A361 SB	1251	77	88	11	14%	Pass	109	-17	-14%	Pass
21	A422 EB	3631	161	176	15	9%	Pass	175	9	6%	Pass
22	A422 WB	3599	174	172	-2	-1%	Pass	179	-8	-4%	Pass
23	Banbury Lane NB	993	58	53	-4	-7%	Pass	57	-5	-8%	Pass
24	Banbury Lane SB	977	62	70	8	13%	Pass	68	4	6%	Pass

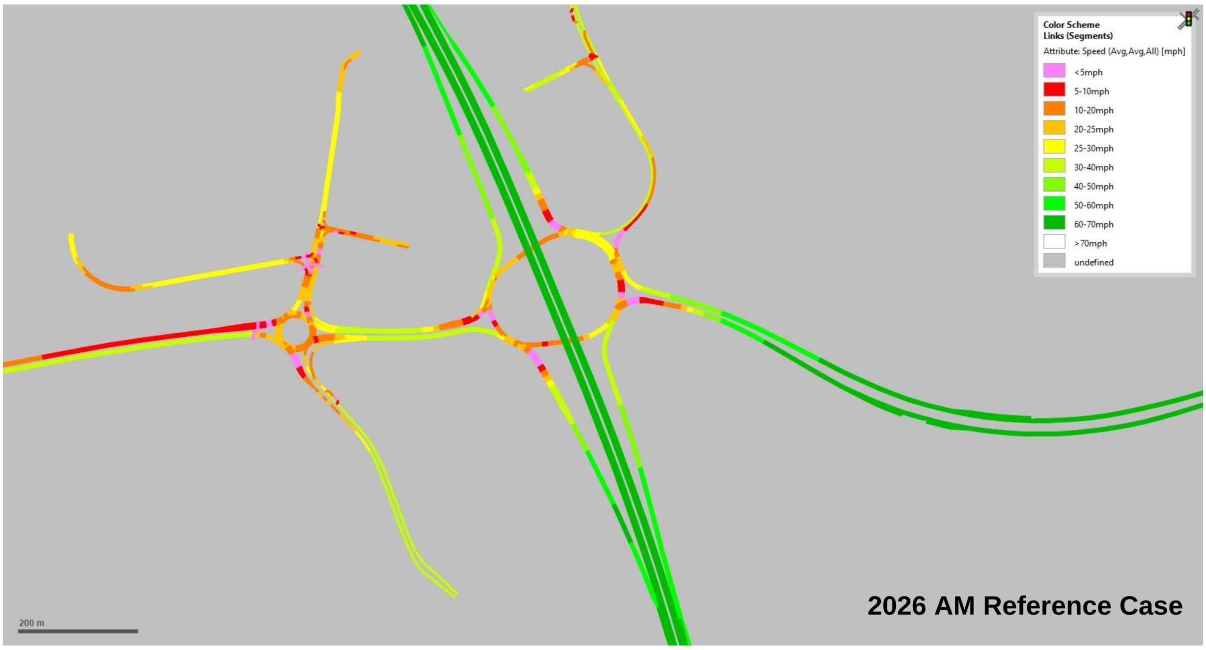
25	Mansion Hill EB	949	60	66	6	10%	Pass	63	1	1%	Pass
26	Mansion Hill WB	943	64	72	8	12%	Pass	74	9	14%	Pass
27	Overthorpe NB	464	30	29	-1	-2%	Pass	28	-5	-16%	Fail
28	Overthorpe SB	468	27	24	-3	-10%	Pass	24	-3	-10%	Pass

Appendix B – 2026 Forecast Years Average Speed Results Comparison

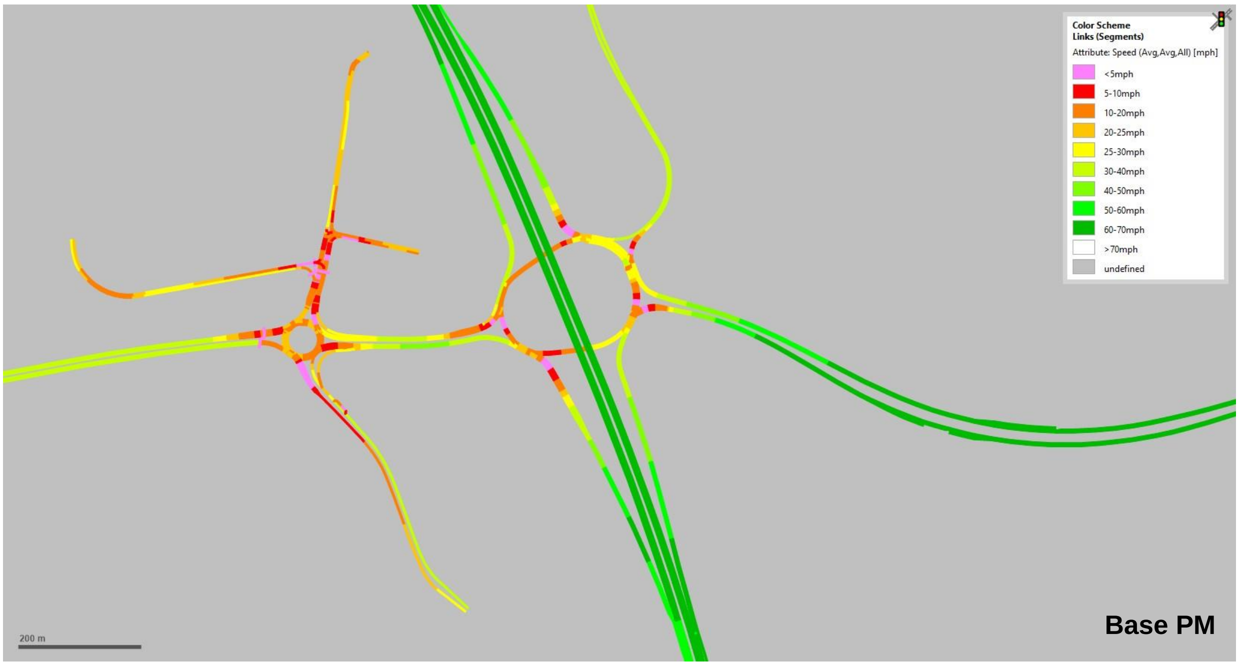
2026 Reference Case

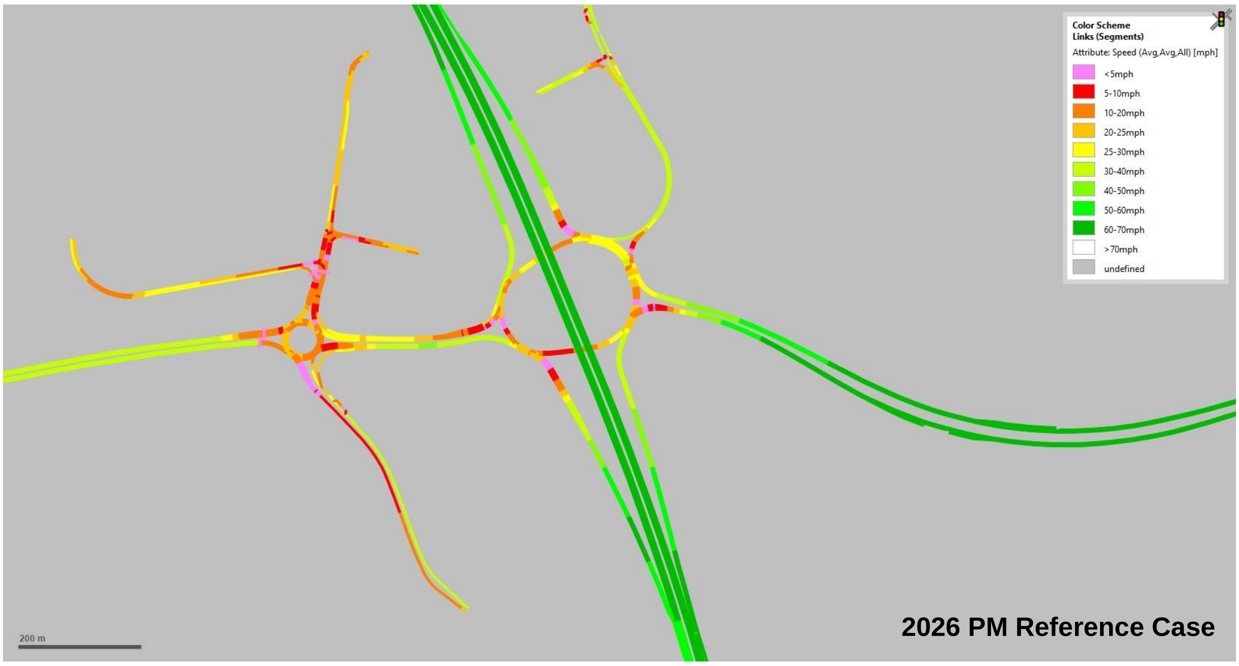
Average Speed Results - Base AM (top) and 2026 AM Reference Case (bottom)





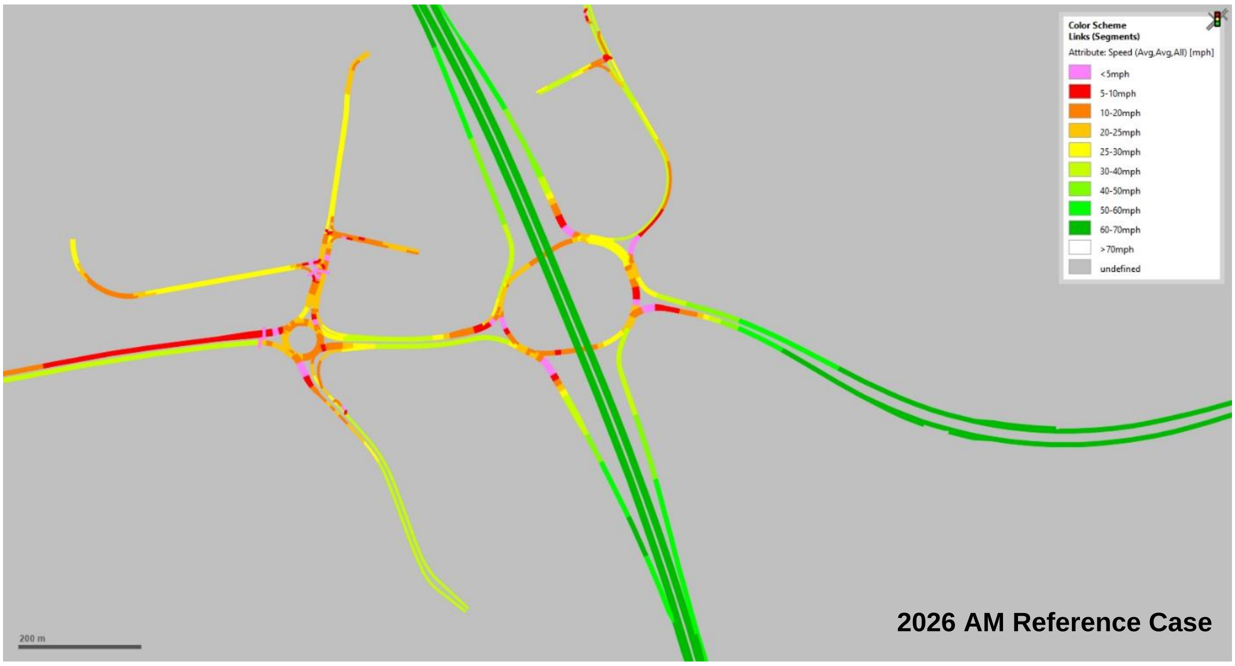
Average Speed Results - Base PM (top) and 2026 PM Reference Case (bottom)

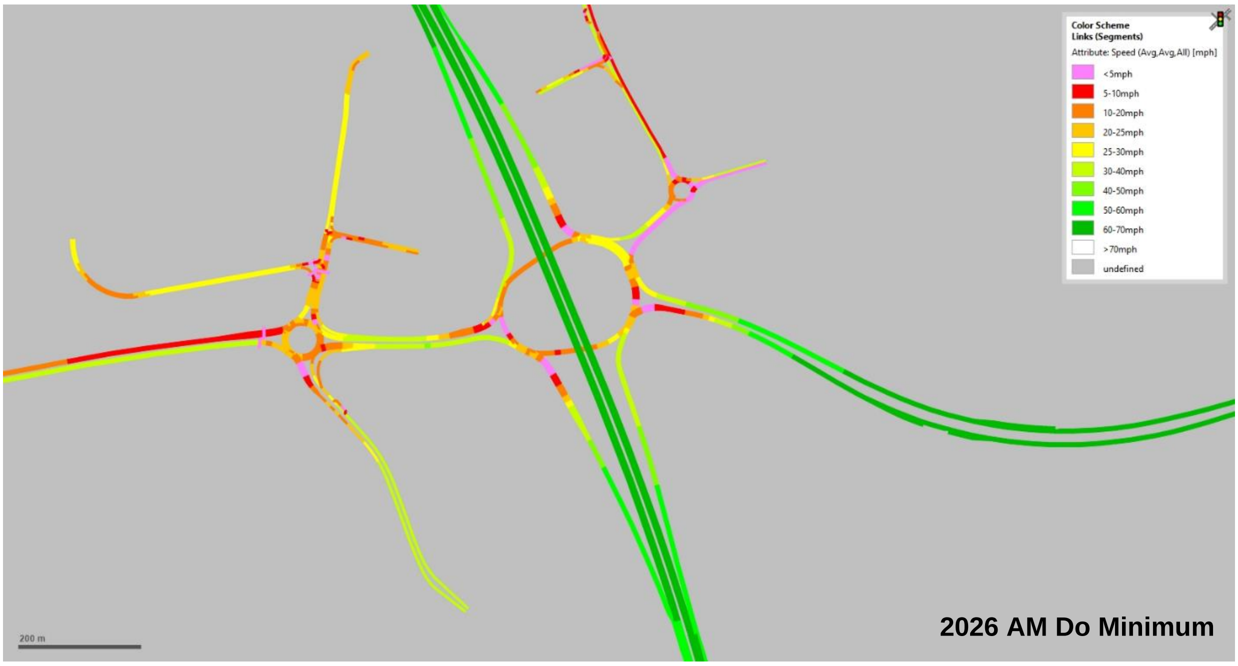




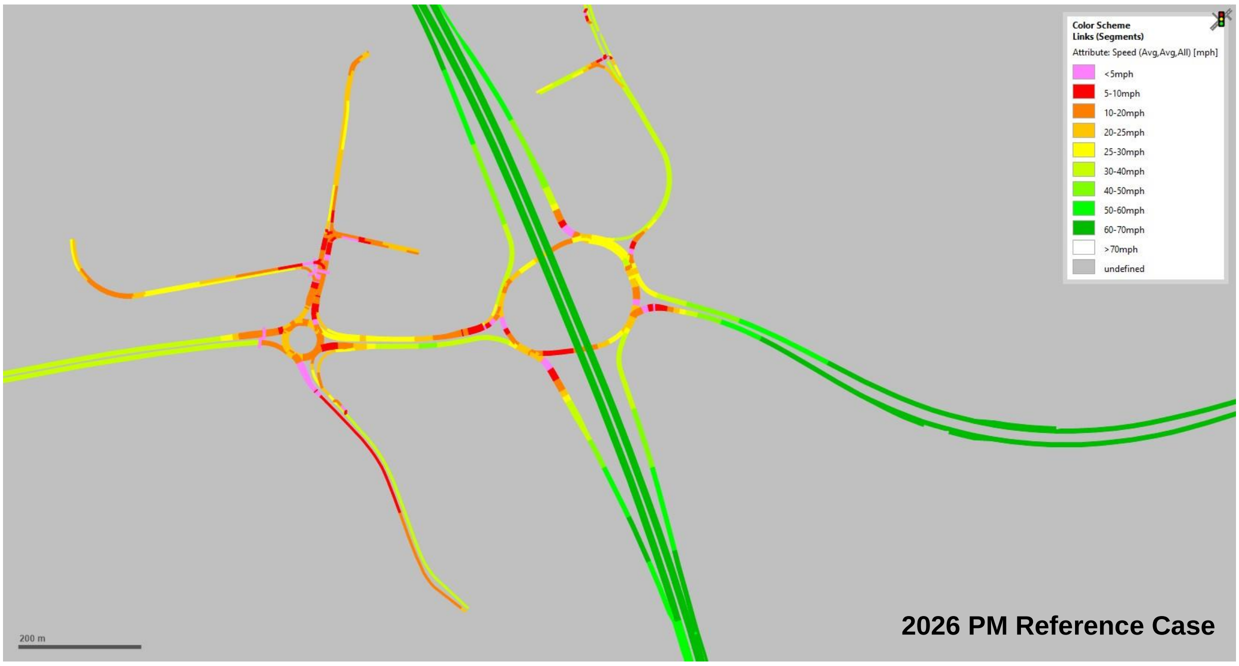
2026 Do Minimum

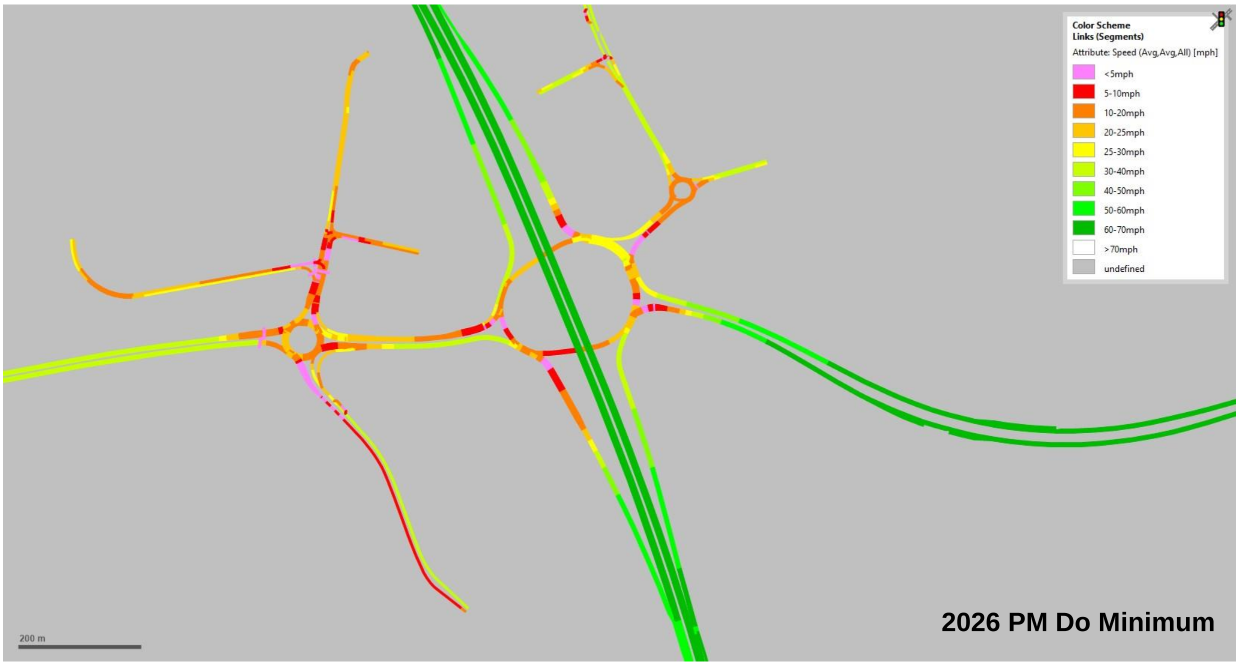
Average Speed Results – 2026 AM Reference case (top) and 2026 AM Do Minimum (bottom)





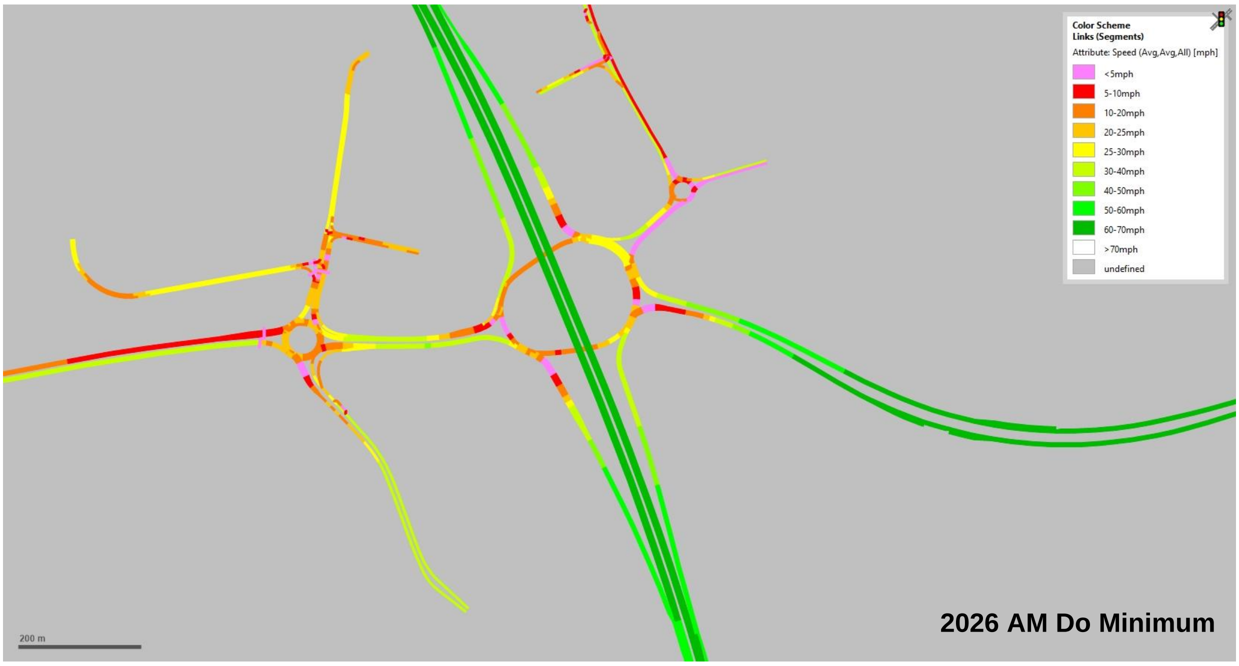
Average Speed Results – 2026 PM Reference case (top) and 2026 PM Do Minimum (bottom)

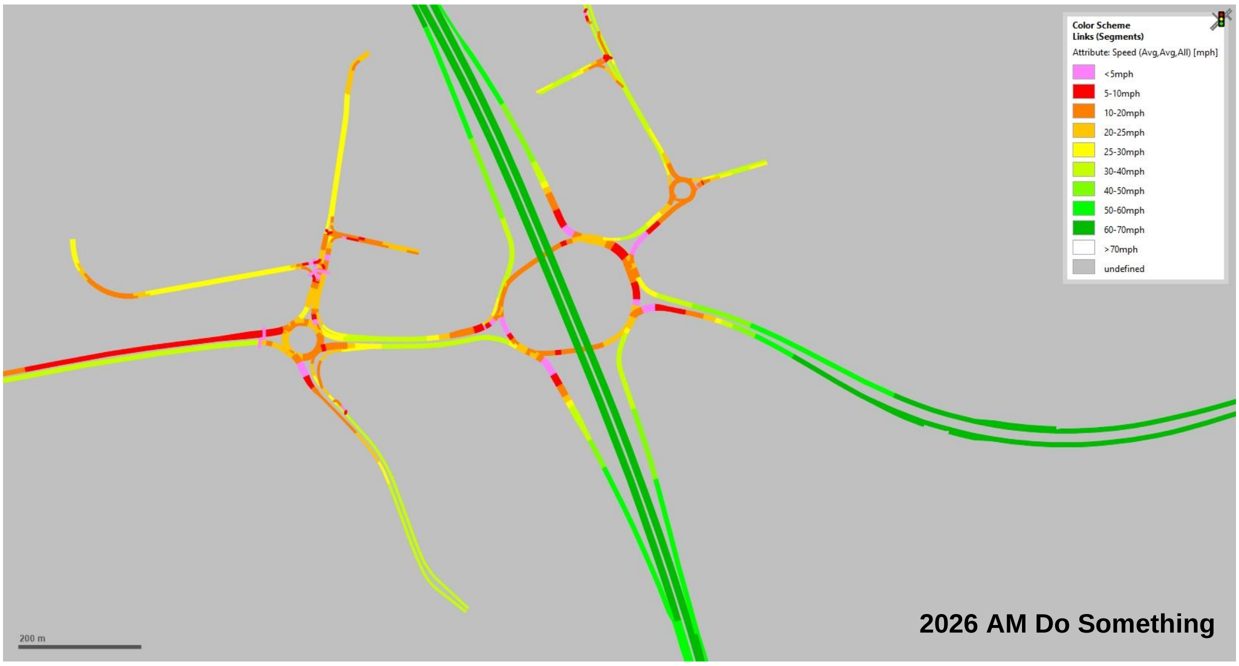




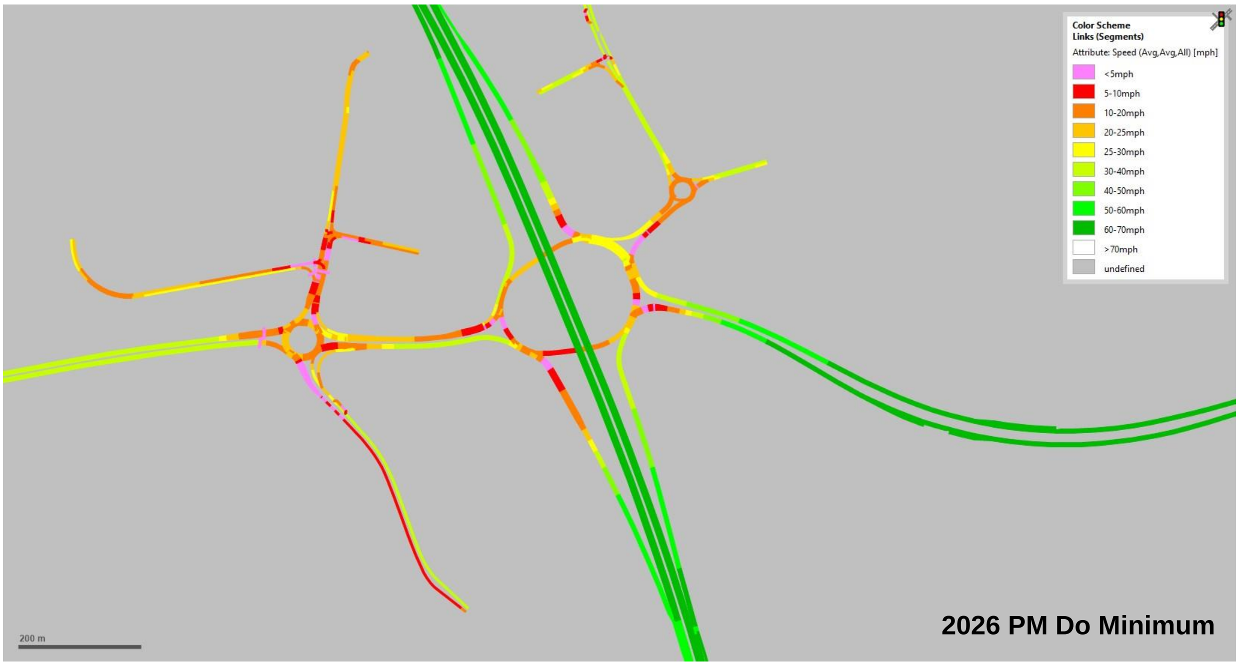
2026 Do Something

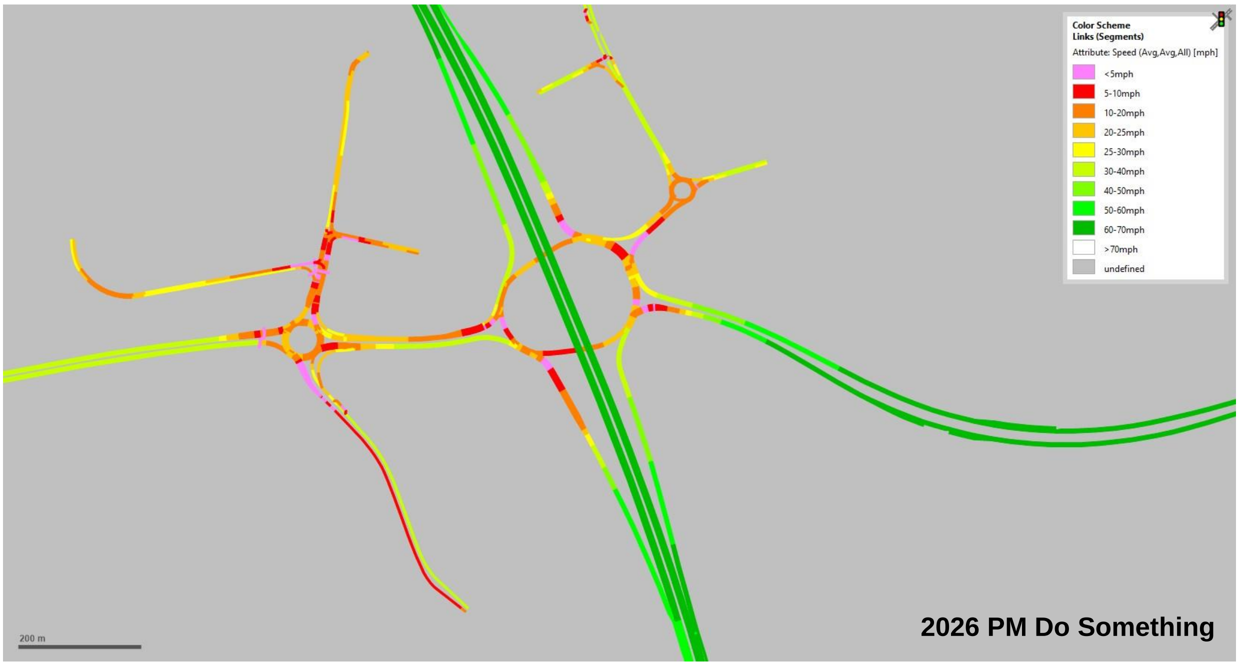
Average Speed Results – 2026 AM Do Minimum (top) and 2026 AM Do Something (bottom)





Average Speed Results – 2026 PM Do Minimum (top) and 2026 PM Do Something (bottom)





Appendix B

Local Model Validation Report

Huscote Farm VISSIM

David Tucker Associates

Prepared by:

SLR Consulting Limited

7th Floor, 36 Great Charles Street, Birmingham , B3 3JY

SLR Project No.: 431.000006.00000

13 February 2024

Revision: 01

Making Sustainability Happen

Revision Record

Revision	Date	Prepared By	Checked By	Authorised By
01	15 September 2023	AC	AH	AC
	Click to enter a date.			
	Click to enter a date.			
	Click to enter a date.			
	Click to enter a date.			

Basis of Report

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Acronyms and Abbreviations

LMVR	Local Model Validation Report
DTA	David Tucker Associates
BTM	Banbury Transport Model
NH	National Highways
DfT	Department for Transport
MCC	Manual Classified Count
ANPR	Automatic Number Plate Recognition
ATC	Automatic Traffic Counters

1.0 Introduction

1.1 SLR Consulting Ltd (SLR) has been approached by David Tucker Associates (DTA) to develop a VISSIM model in support of a live planning application for the construction of up to 140,000 sq m of employment floorspace, along with the associated infrastructure and access arrangements. The Reference Number for the planning application is 22/01488/OUT.

1.2 The development is situated on land to the east of Junction 11 of the M40 (Banbury Interchange).

1.3 This Local Model Validation Report (LMVR) covers the scope, methodology, and the outputs for the Base year model, which will provide the basis upon which the forecasting and development impact assessments can be undertaken.

2.0 Background

2.1 SLR is aware that there is an existing 2017 VISSIM Base model, which DTA had planned to use which is being developed by Stantec, with forecasting to be informed by the Banbury Transport Model (BTM).

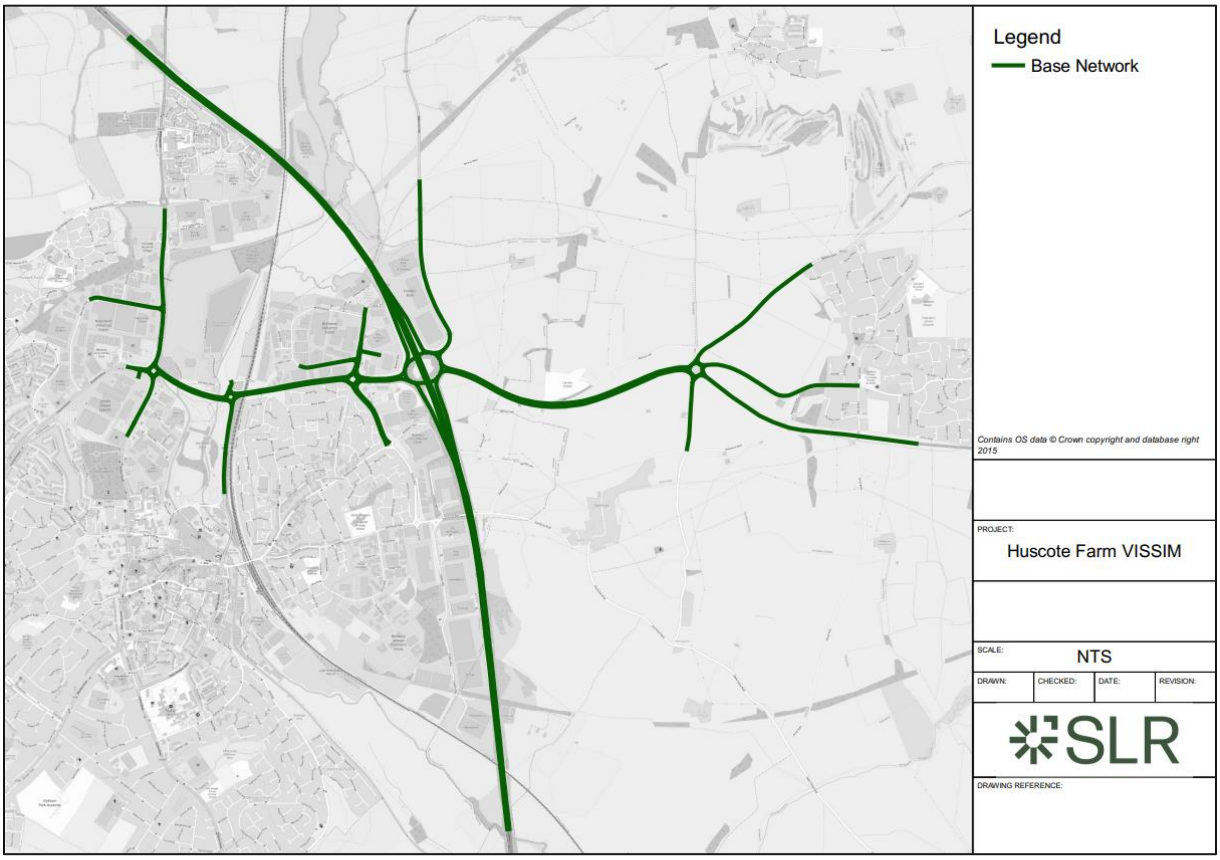
2.2 A significant benefit of creating a new model with new survey data is that the existing Base year of 2017 not only exceeds DfT guidance on model age, but also predates the COVID-19 pandemic which has had a significant impact on travel patterns and behaviours.

3.0 Model Scope

3.1 The core study area encompasses Banbury Interchange (M40 J11), A422/B4525/Mansion Hill roundabout to the east, and the three roundabouts to the west up to Ruscote Avenue. The two signalised junctions on Southam Road/Beaumont Road and Wildmere Road/Brookhill Way are also included.

3.2 Figure 1 below provides an overview of the study area:

Figure 1: VISSIM Core Study Area



3.3 The approach and exit links are coded such that observed queuing and other notable behaviours can be replicated within the modelling, whilst also allowing sufficient distance for lane changing from model input to junction approach.

4.0 Model Specifications & Parameters

4.1 The model has been developed, calibrated, and validated with the following specifications:

VISSIM Version:	VISSIM 2023.06
Simulation Resolution:	5
Number of Seeds:	10
Base Year:	2023
AM Simulation Period (Evaluation Period):	07:00-08:45 (07:30-08:30)
PM Simulation Period (Evaluation Period):	16:00-17:45 (16:30-17:30)
Assignment Method:	Dynamic Assignment
Calibration Assessment Criteria:	2023 Turn Counts
Validation Assessment Criteria:	2023 TomTom Journey Time Data

5.0 Survey Data

MCCs, ANPR & ATCs

5.1 The locations of the MCC, ANPR and ATC surveys are shown in Figure 2 below:

Figure 2: MCC, ANPR, and ATC Locations

5.2 Manual Classified Count (MCC) surveys and Automatic Number Plate Recognition (ANPR) data collection was carried out on Thursday 29th June 2023 between the hours of 07:00-10:00 and 16:00-19:00 for all junctions within the model area.

5.3 Automatic Traffic Counts (ATCs) were collected for the 2-week period from Thursday 22nd June 2023 to Wednesday 5th July 2023.

5.4 Peak hour determination was carried out by SLR using the MCC data. The total number of vehicles arriving at each surveyed junction for each hour on a rolling 15-minute basis within the 07:00-10:00 and 16:00-19:00 periods was calculated, and the sum of these taken to provide the number of surveyed trips arriving at all junctions. This gave peak hours of 07:45-08:45 and 16:30-17:30. This was compared to the total number of vehicles arriving at M40 J11 (due to the strategic significance of this junction), where peak hours were calculated as 07:30-08:30 in the AM, and 16:30-17:30 again in the PM. As the second busiest hour in the AM for all junctions is also 07:30-08:30 (only ~10 vehicles less than the total for 07:45-08:45), SLR has assumed this to be the most appropriate peak hour for the AM to align with what is more typically used.

5.5 The peak hours calculated from the MCCs have been compared to the peak hours determined from the ATC and ANPR surveys. From the ANPR data, the total vehicles travelling between each O-D was calculated for each hour on a rolling 15-minute basis. This gave peak hours of 07:30-08:30 and 16:30-17:30, aligning with the chosen hours from the MCCs. For the ATCs, the sum of total vehicles captured at each location was determined for each hour on a rolling 15-minute basis, again giving peak hours of 07:30-08:30 and 16:30-17:30.

Matrix Build

5.6 ANPR has been used to create the prior matrix to inform the initial step in matrix estimation. The origin-destination data has been processed for each 15-minute period within the AM and PM peak hours, giving trip distributions between each ANPR location. Since as ANPR sites 3 and 11 (see Figure 2) serve more than one zone in VISSIM, the counts at these locations were proportioned to the corresponding zones using the MCCs. For VISSIM zones that were not directly covered by an ANPR site (movements within A422/B4525/Mansion Hill roundabout, and trips to/from Wildmere Road/Brookhill Way), turn counts were informed by the MCCs using proportional calculations through adjacent junctions.

5.7 ANPR U-turn movements were reviewed, and a cap of 2-minutes applied to the site-in site-out time stamps. This ensures short-distance trips that return to their origin within the same time period are not double counted as U-turns.

5.8 Both ANPR and MCC data was disaggregated into Car, LGV, OGV1, and OGV2 which SLR has combined to create Lights and Heavies matrix levels.

5.9 The MCC surveys were used to calculate the split of Cars and LGVs within the Lights user class, and OGV1 and OGV2 within the Heavies user class. Total counts during the peak periods at all MCC sites were used to determine the split which is applied to the VISSIM Light and Heavy matrices.

5.10 30-minute warm-up and 15-minute cool down periods have also been included. Matrices for these periods have been created in the same way as those for the peak hours.

5.11 The peak hour matrices were minorly adjusted throughout the calibration process to ensure the initial VISSIM matrices (primarily informed by ANPR data) match the MCCs. ANPR distributions have been calculated to show the percentage split of trips across each destination ANPR zone from each origin. The ANPR distributions within the model remain similar to the raw ANPR distributions, with a maximum difference of 8% between the VISSIM distributions and the ANPR distributions. The complete distributions informed by the raw ANPR data compared to the distributions within the matrices in VISSIM are evidenced in **Appendix A**.

WebTRIS

5.12 June 2023 WebTRIS data has been used to inform trip numbers on the M40 mainline. Data has been extracted in 15-minute intervals to be input into the corresponding matrices for AM and PM.

5.13 All WebTRIS data was subject to sifting and sense-checking to ensure the derived average was representative and robust. Firstly, the data was processed to exclude non-neutral days leaving only Tuesday-Thursday dates, thereby excluding the traditionally quieter days within the week. The school holiday on 1st June was additionally excluded.

5.14 Secondly, the resulting dataset was further analysed to ensure no outliers existed. To help highlight and remove these outliers from the average, the statistical middle 50% (Interquartile Range [IQR]) was calculated which divided the dataset into four equal groups. By subtracting the first quarter (25%) from the third quarter (75%), the middle 50% remains. It is generally agreed that a suitable upper and lower bound for the dataset can be calculated by multiplying the IQR by 1.5, and applying this tolerance to either side of the middle 50%. Any values which fell outside of these boundaries were removed from the average value that was ultimately used for matrix development to ensure the data was representative and did not include any spurious data.

5.15 As an additional check, WebTRIS data for the on- and off-slips at Junction 11 has also been extracted and compared against the MCC data. The tables below demonstrate how the slip data matches well, providing evidence that the survey day is representative of typical conditions.

Table 1: AM WebTRIS vs MCC On-Slip and Off-Slip flows at Junction 11

	AM Peak Hour (07:30-08:30)					
	Lights			Heavies		
	WebTRIS	MCC	Difference	WebTRIS	MCC	Difference
NB Off-Slip	570	575	5	59	64	5
NB On-Slip	486	455	-31	63	48	-15
SB Off-Slip	773	703	-70	98	79	-19
SB On-Slip	666	697	31	71	66	-5

Table 2: PM WebTRIS vs MCC On-Slip and Off-Slip flows at Junction 11

	PM Peak Hour (16:30-17:30)					
	Lights			Heavies		
	WebTRIS	MCC	Difference	WebTRIS	MCC	Difference
NB Off-Slip	829	988	159	60	60	0
NB On-Slip	636	570	-66	33	43	10
SB Off-Slip	479	514	35	48	30	-18
SB On-Slip	544	575	31	38	26	-12

TomTom

5.16 Journey times were obtained from the TomTom database covering the month of June 2023, excluding Mondays, Fridays, Saturdays, and Sundays. Thursday 1st June was also excluded due to school holidays.

5.17 Average sample size as provided by the TomTom raw data is tabulated below:

Table 3: TomTom Sample Hit Rates

Time Period	Average Sample Size
07:30-07:45	659.26
07:45-08:00	695.78
08:00-08:15	674.01
08:15-08:30	674.13
16:30-16:45	638.45
16:45-17:00	641.65
17:00-17:15	627.22
17:15-17:30	653.41

Queue Lengths

5.18 Queue data was provided alongside the MCCs, again for Thursday 29th June 2023 with queue length surveyed at all approaches in 5-minute intervals.

6.0 Signals

6.1 There are three signalised junctions within the model extent (excluding separate signalised pedestrian crossings). These are:

i) M40 Junction 11

ii) Wildmere Road/Brookhill Way junction

iii) A423 Southam Road/Beaumont Road junction

6.2 Signal timing data was provided for each junction for Thursday 29th June 2023, the same date that the MCC and ANPR surveys were conducted.

6.3 Data was presented in terms of the times each signal changed state, which SLR has processed to determine the parameters governing the signal programs for each junction, for example intergreen times, maximum and minimum green times, and signal stages. The signal programs have been input using VAP due to each signalised junction operating on a demand-responsive basis.

6.4 Four signalised pedestrian crossings are also present within the model extent. These are located:

i) A422 Hennef Way, just west of the A422/Wildmere Road/Ermont Way roundabout

ii) A423 Southam Road, just north of the A422/Southam Road roundabout

iii) A422 Hennef Way, just east of the A422/Southam Road roundabout

iv) A422 Ruscote Avenue, just west of the A422/Southam Road roundabout

6.5 Pedestrian crossing data was collected in 15-minute intervals during the AM and PM periods. This was disaggregated into pedestrians and cyclists at each crossing. These values have been replicated in VISSIM, and use VAP programs to allow the crossings to be demand responsive.

7.0 Public Transport

7.1 Online data sources were interrogated to provide morning and evening peak timetables which were replicated in the modelling. The services included are as follows:

i) 77

ii) B4

iii) 200

iv) 500

v) B9

7.2 Bus dwell times use a linear distribution of 20-30s across the model, which is considered to be in line with industry standards.

8.0 Vehicle Speeds, Conflicts & Driving Behaviours

8.1 The model has utilised speed distributions as calculated from the DfT vehicle speed compliance statistics[1]. These are used to control vehicle entry speeds in the model and speed limit changes across the model extent. Since as no information is available regarding a 50mph speed distribution in the DfT statistics, the Transport for London VISSIM Template distribution has been used in cases where a 50mph speed limit is required.

8.2 Throughout the process of journey time validation, it became apparent that in some locations the unadjusted speed distributions resulted in speeds that were too slow across sections of the network. Each distribution contains a small number of vehicles that travel at the slower end of the distribution curve. On single lane sections of highway this results in modelled speeds that are too slow as all vehicles are beholden to the speed of the slowest vehicle ahead of them. Also some sections exhibited slow speeds where on-site observations suggested this would not occur in reality (such as on the A422 East of the roundabout with Banbury Lane, where road geometry and visibility mean that no vehicles would be expected to be driving at the slower end of the 50mph speed distribution; speeds which can be as low as 25mph if left unadjusted). Hence to reduce the issue of vehicles travelling at speeds at the lower end of the distribution holding up traffic behind them, additional speed distributions with the suffix “Adjusted” have been added and assigned to areas of the network where required. This has only been required for the 50mph speed distribution.

8.3 The model uses the ‘speed limitation in curves’ function present in versions of VISSIM from 2023. This means VISSIM will adjust a vehicle’s speed according to the brake radius reaction of a link, reducing the need for individual reduced speed areas to be added to the network. Some reduced speed areas have still been added to the network however if additional measures were required, for example to slow vehicles on an exit link leading up to a junction off the network, or to represent parked cars on the side of the road. The reduced speed areas used rely upon the VISSIM default km/h distributions as these generally contain a lower range at the extremes of the distribution curves compared with the TfL and DfT mph distributions, and where vehicle speeds are to be controlled due to physical or geometric reasons these tighter controls are necessary.

8.4 Conflicting movements between vehicles are primarily controlled by Priority Rules, which were adjusted as part of the calibration process and are unchanged between AM and PM peak periods. Conflict Areas are also included at some locations (e.g. bus lay-bys) where additional conflict management was considered necessary to prevent vehicles crossing over one another.

8.5 Three driving behaviours have been used in the model. Any non-strategic local roads have been set to the driving behaviour for urban roads, which was altered from the VISSIM default to ensure vehicle behaviour at an amber signal was set to “Stop same as red”, as per the latest accepted best practice. All strategic links were set to the VISSIM default Right-side rule behaviour, and a merge/diverge driving behaviour was added and used for any links where this behaviour is required.

[1] https://www.gov.uk/government/organisations/department-for-transport/series/speeds-statistics

Period Specific Differences

8.6 Both AM and PM model networks remain identical aside from one reduced speed area present in the PM but not the AM. This is on the Ruscote Avenue westbound exit link and uses a speed distribution of 12 km/h to slow vehicles on the approach to the Lockheed Close roundabout, just outside the model network. PM journey time data suggests that the PM peak experiences delays on this westbound section which also causes delay on Hennef Way westbound and Southam Road northbound approaches to the roundabout upstream. This has been cross-checked with Google Maps typical traffic data which shows slow vehicle speeds in this area in the PM peak.

9.0 Assignment and Convergence

9.1 The model includes the dynamic method of vehicle assignment and must therefore be converged to an acceptable level.

9.2 Throughout the model, no route choice exists aside from which lane vehicles use to merge from the on-slips to the M40. Hence, the only purpose of convergence is to ensure both lanes on each on-slip are appropriately used.

9.3 To converge the models, the simulation was run consistently until a series of criteria were met.

9.4 DMRB[2] and TfL[3] state that a model is considered to be converged when the following set of criteria are met:

- 95% of all path traffic volumes change by less than 5% for at least four consecutive iterations
- 95% of the travel times on all paths change by less than 20% for at least four consecutive iterations
- The percentage change in user costs or time spent within the network (V) should be less than 1% for four consecutive iterations

9.5 The final four runs were as follows:

Table 4: AM Convergence Results

Run Reference Number	Volume on Paths < 5%	Travel Times on Paths < 20%	Total Travel Time % Change from previous run
2	100.0%	100.0%	0.0%
3	100.0%	100.0%	0.0%
4	100.0%	100.0%	0.0%
5	100.0%	100.0%	-0.01%

Table 5: PM Convergence Results

Run Reference Number	Volume on Paths < 5%	Travel Times on Paths < 20%	Total Travel Time % Change from previous run
2	100.0%	98.1%	0.41%
3	100.0%	98.7%	0.0%
4	100.0%	99.0%	0.0%
5	100.0%	99.4%	0.0%

[2] Design Manual for Roads and Bridges, Volume 12, Section 2, Part 1, Chapter 4, Department for Transport 1996
[3] Traffic Modelling Guidelines, TfL Traffic Manager and Network Performance Best Practice Version 3.0, Transport for London 2010

9.6 Results show that both the AM and PM Base models converge to DMRB criteria on all 3 of the criteria, with 100% of volumes on paths changing by less than 5% for four consecutive runs, >98% of travel times on paths changing by less than 20%, and total travel time changing by 1%.

10.0 Calibration & Validation Results

Overview

10.1 The AM and PM models were run for 10 random seed runs as per best practice, starting at seed number 42 and increasing in increments of 1. The average results from all 10 runs are presented in this section.

Turn Count Calibration

10.2 Flow calibration is a process whereby modelled flow outputs are compared to the equivalent observed traffic flows across the network.

10.3 The Geoffrey E. Havers (GEH) statistic is a standard way of comparing the observed and modelled flows, as defined in DMRB, Volume 12, Chapter 4. The GEH value is similar to a chi-squared test and also incorporates both relative and absolute errors in order to give an overall measure of the accuracy of the modelled flow.

10.4 The GEH statistic has the benefit of removing bias that exists when comparing flows of different magnitudes using percentages, such that a difference of 10 in a flow of 100 vehicles per hour (vph) is less significant (GEH = 1) than a difference of 100 in a flow of 1000 vph (GEH = 3.2).

10.5 The GEH statistic is calculated by:

$$GEH = \sqrt{\frac{(M-C)^2}{(M+C)/2}}$$

Where:

GEH = GEH statistic

M = Modelled flow

C = Observed flow

10.6 An extract of the calibration guideline criteria is shown in the table overleaf:

Table 6: WebTAG Link Flow Criteria[4]

Criteria	Description of Criteria	Acceptability Guideline
1	Individual flows within 100 veh/h of counts for flows less than 700 veh/hr	>85% of Cases
	Individual flows within 15% of counts from 700 to 2700 veh/hr	>85% of Cases
	Individual flows within 400 veh/hr of counts for flows more than 2700 veh/hr	>85% of Cases
2	GEH <5 for individual flows	>85% of Cases

10.7 Turn count calibration results demonstrate that both AM and PM peak hour Base models exceed the guideline GEH pass-rate of 85%. The AM and PM Base models achieve 100% for both Lights and Heavies. A summary of the results can be seen in the following tables; full turn count results can be found in **Appendix B.**

Table 7: AM and PM Turn Count Calibration Results - Lights

AM Peak Hour (07:30-08:30)		
GEH	**No. of Passes**	**% of Total**
<1	91	78%
<2	112	97%
<3	116	100%
<4	116	100%
<5	116	100%
PM Peak Hour (16:30-17:30)		
GEH	**No. of Passes**	**% of Total**
<1	85	73%
<2	111	96%
<3	115	99%
<4	116	100%
<5	116	100%

[4] TAG Unit M3.1, Para. 3.2.8 Table 2, Department for Transport January 2014

Table 8: AM and PM Turn Count Calibration Results - Heavies

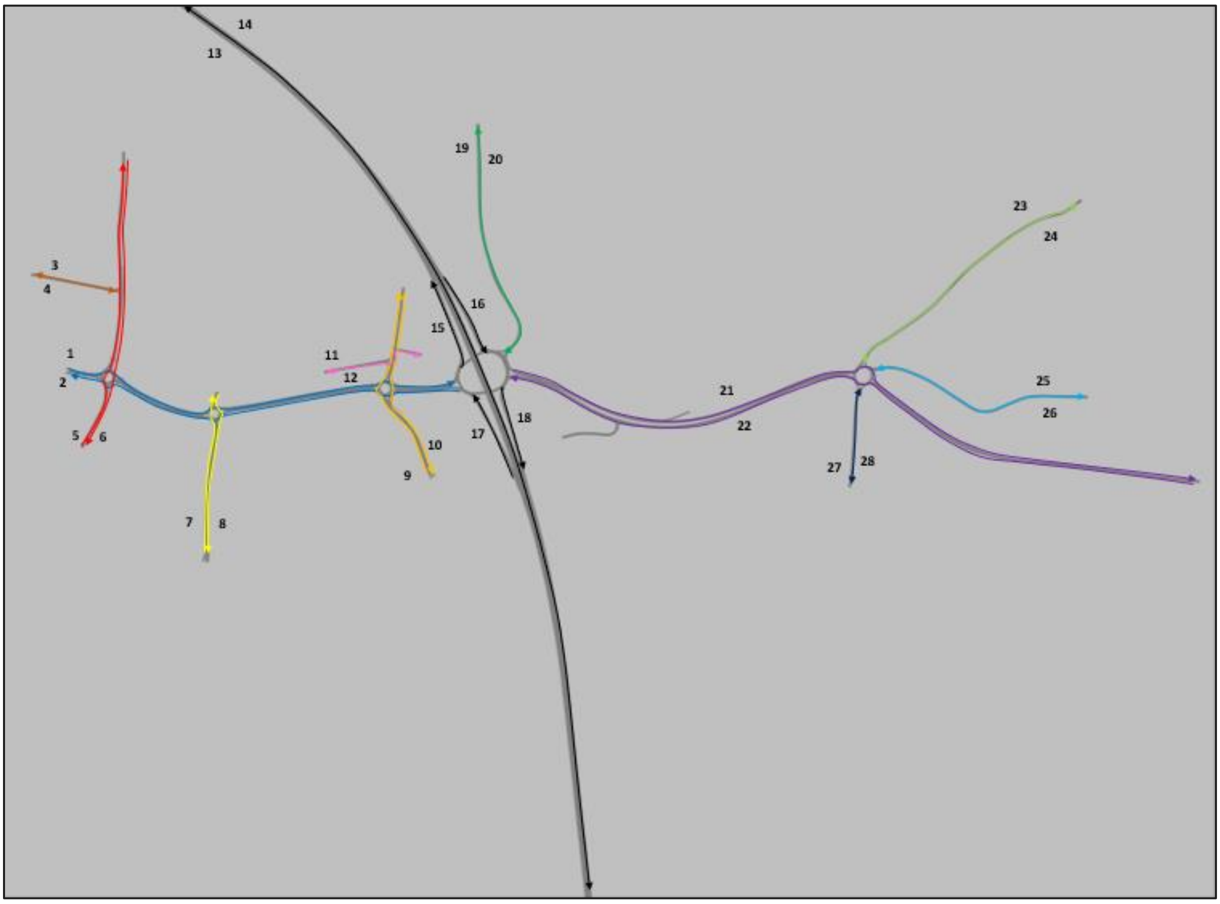
AM Peak Hour (07:30-08:30)		
GEH	**No. of Passes**	**% of Total**
<1	97	84%
<2	113	97%
<3	116	100%
<4	116	100%
<5	116	100%
PM Peak Hour (16:30-17:30)		
GEH	**No. of Passes**	**% of Total**
<1	93	80%
<2	113	97%
<3	116	100%
<4	116	100%
<5	116	100%

10.8 The results demonstrate that 100% of modelled turn counts achieve a GEH of less than 4, thereby exceeding DMRB guidance for turn count calibration in a microsimulation model.

Journey Time Validation

10.9 The model was validated to a total of 28 journey time routes covering the majority of the model extent. The figure below provides an illustration of the routes.

Figure 3: Journey Time Validation Routes



10.10 An extract of the journey time validation criteria is shown in the table below:

Table 9: WebTAG Journey Time Validation Criteria[5]

Criteria	Description of Criteria	Acceptability Guideline
1	Modelled times along routes should be within 15% of surveyed time (or 1 minute, if higher than 15%)	>85% of Cases

10.11 The TomTom observed data has been provided in 15-minute periods. SLR has calculated peak journey times by using the number of samples from each segment to calculate a weighted value. The modelled journey times have also been collected every 15-minutes and peak hour values weighted by flow from the model.

[5] TAG Unit M3.1, Para. 3.2.10 Table 3, Department for Transport January 2014

10.12 The results are tabulated below:

Table 10: AM Journey Time Validation Results

AM Peak Hour (07:30-08:30)							
	Route Name	Obs	Mod	Diff	% Diff	Pass?	Pass 15%
1	Hennef Way EB	307	272	-36	-12%	Pass	Pass
2	Hennef Way WB	137	147	9	7%	Pass	Pass
3	Beaumont Road EB	58	49	-8	-14%	Pass	Pass
4	Beaumont Road WB	51	57	6	12%	Pass	Pass
5	Southam Road NB	110	108	-2	-2%	Pass	Pass
6	Southam Road SB	136	125	-12	-8%	Pass	Pass
7	Concord Avenue/Grimsbury Green NB	62	54	-8	-12%	Pass	Pass
8	Concord Avenue/Grimsbury Green SB	63	66	3	5%	Pass	Pass
9	Ermont Way/Wildmere Road NB	125	102	-22	-18%	Pass	Fail
10	Ermont Way/Wildmere Road SB	94	86	-8	-9%	Pass	Pass
11	Wildmere Road/Brookhill Way EB	75	75	-1	-1%	Pass	Pass
12	Wildmere Road/Brookhill Way WB	74	84	11	15%	Pass	Pass
13	M40 NB	184	206	22	12%	Pass	Pass
14	M40 SB	189	211	22	12%	Pass	Pass
15	M40 On-Slip NB	28	26	-3	-9%	Pass	Pass
16	M40 Off-Slip SB	45	38	-6	-14%	Pass	Pass
17	M40 Off-Slip NB	43	46	3	7%	Pass	Pass
18	M40 On-Slip SB	26	25	-2	-6%	Pass	Pass
19	A361 NB	68	68	0	0%	Pass	Pass
20	A361 SB	127	151	25	19%	Pass	Fail
21	A422 EB	165	175	10	6%	Pass	Pass
22	A422 WB	187	179	-8	-4%	Pass	Pass
23	Banbury Lane NB	62	56	-5	-8%	Pass	Pass
24	Banbury Lane SB	64	68	4	7%	Pass	Pass
25	Mansion Hill EB	62	64	1	2%	Pass	Pass
26	Mansion Hill WB	65	74	9	14%	Pass	Pass
27	Overthorpe NB	33	28	-5	-15%	Pass	Fail
28	Overthorpe SB	27	24	-3	-10%	Pass	Pass

Table 11: PM Journey Time Validation Results

PM Peak Hour (16:30-17:30)							
	Route Name	Obs	Mod	Diff	% Diff	Pass?	Pass 15%
1	Hennef Way EB	170	189	19	11%	Pass	Pass
2	Hennef Way WB	203	193	-10	-5%	Pass	Pass
3	Beaumont Road EB	59	62	3	5%	Pass	Pass
4	Beaumont Road WB	55	55	0	0%	Pass	Pass
5	Southam Road NB	139	127	-12	-8%	Pass	Pass
6	Southam Road SB	124	124	0	0%	Pass	Pass
7	Concord Avenue/Grimsbury Green NB	66	62	-4	-6%	Pass	Pass
8	Concord Avenue/Grimsbury Green SB	63	54	-9	-14%	Pass	Pass
9	Ermont Way/Wildmere Road NB	185	197	12	6%	Pass	Pass
10	Ermont Way/Wildmere Road SB	123	112	-11	-9%	Pass	Pass
11	Wildmere Road/Brookhill Way EB	111	99	-12	-11%	Pass	Pass
12	Wildmere Road/Brookhill Way WB	105	97	-8	-8%	Pass	Pass
13	M40 NB	187	211	24	13%	Pass	Pass
14	M40 SB	183	206	22	12%	Pass	Pass
15	M40 On-Slip NB	28	26	-2	-8%	Pass	Pass
16	M40 Off-Slip SB	45	42	-3	-7%	Pass	Pass
17	M40 Off-Slip NB	39	43	4	10%	Pass	Pass
18	M40 On-Slip SB	25	24	-1	-5%	Pass	Pass
19	A361 NB	67	72	5	8%	Pass	Pass
20	A361 SB	77	89	11	15%	Pass	Pass
21	A422 EB	161	177	16	10%	Pass	Pass
22	A422 WB	174	170	-4	-2%	Pass	Pass
23	Banbury Lane NB	58	53	-4	-7%	Pass	Pass
24	Banbury Lane SB	62	69	7	12%	Pass	Pass
25	Mansion Hill EB	60	67	6	10%	Pass	Pass
26	Mansion Hill WB	64	72	8	12%	Pass	Pass
27	Overthorpe NB	30	29	-1	-3%	Pass	Pass
28	Overthorpe SB	27	24	-3	-10%	Pass	Pass

10.13 The results show that the AM and PM achieve a pass rate of 89% and 100% respectively.

10.14 The routes falling outside of the 15% criteria in the AM are Ermont Way/Wildmere Road NB, A361 SB, and Overthorpe NB. These fall out by 4s, 6s and 1s respectively, however all satisfy the 60s criteria and so are considered acceptable in light of the other results.

10.15 The sectional breakdown of routes across the model can be found in **Appendix C.**

Queue Length Validation

10.16 Neither TfL, DMRB nor WebTAG provide any specific guidelines on queue assessments. DMRB actually states that *"precise validation of queue lengths can be difficult because of the volatility of the observed data"*[6].

10.17 Likewise, TfL identify that *"The level of accuracy in queue measurement surveys can often be lower than for other surveys as the definition of a queue can be subjective as well as difficult to identify."*[7], and *"Queue lengths are generally not used for validation purposes due to the difficulty in measuring them on street, however comparing modelled levels of queuing to those observed on street can indicate where inaccuracies may exist in a model."*[8]

10.18 Queue length surveys can provide an estimation of conditions at the site but cannot be expected to be replicated accurately within a model. Reasons for this include:

i) The tendency for the model results to fluctuate between different model runs;

ii) The day-to-day variance in real-life conditions at the site meaning that results taken from one day cannot be applied too rigidly; and

iii) The software's mathematical interpretation of queue lengths compared with the subjective nature of human interpretation during manual surveys.

10.19 Nevertheless, queue length data is a useful dataset with which to gather an understanding of the general pattern of delay across a junction.

10.20 In this case, the modelled queue length is defined as the maximum queue observed within any given 5-minute period. This is averaged across the hour and compared with the model equivalent to provide a general overview of queue conditions on all approaches. Results are reported within **Appendix D.**

[6] Design Manual for Roads and Bridges, Volume 12 Section 2, para 4.4.31 May 1996
[7] Traffic Modelling Guidelines Version 4.0, TfL September 2021, Para 2.3.4.4
[8] Traffic Modelling Guidelines Version 4.0, TfL September 2021, Para 2.4.2

ATC Validation

10.21 ATC data for the peak hours has been processed for the two-week period and compared to the modelled outputs at each site in both directions. The table below demonstrates the total vehicle comparison:

Table 12: AM and PM ATC Validation Results using 2-week ATC Data – Total Vehicles

AM Peak Hour (07:30-08:30)				
Site	**Location**	**Observed**	**Modelled**	**GEH**
1	A361 (North of M40 J11) NB	312	299	0.7
	A361 (North of M40 J11) SB	551	653	4.2
2	A422 (East of M40 J11) EB	1019	998	0.7
	A422 (East of M40 J11) WB	1003	1193	5.7
3	A422 (West of M40 J11) EB	1455	1583	3.3
	A422 (West of M40 J11) WB	2064	2155	2.0
4	Hennef Way (East of A4260) EB	1571	1810	5.8
	Hennef Way (East of A4260) WB	1765	1670	2.3
5	Hennef Way (West of A4260) EB	1364	1418	1.5
	Hennef Way (West of A4260) WB	1111	1138	0.8
PM Peak Hour (16:30-17:30)				
Site	**Location**	**Observed**	**Modelled**	**GEH**
1	A361 (North of M40 J11) NB	647	758	4.2
	A361 (North of M40 J11) SB	352	340	0.7
2	A422 (East of M40 J11) EB	1084	1148	1.9
	A422 (East of M40 J11) WB	801	997	6.6
3	A422 (West of M40 J11) EB	1792	1919	2.9
	A422 (West of M40 J11) WB	1634	1697	1.6
4	Hennef Way (East of A4260) EB	1648	1734	2.1
	Hennef Way (East of A4260) WB	2116	2097	0.4
5	Hennef Way (West of A4260) EB	1397	1357	1.1
	Hennef Way (West of A4260) WB	1331	1512	4.8

10.22 GEH values greater than 5 are present in the AM for Site 2 WB and Site 4 EB, and in the PM again for Site 2 WB.

10.23 In all cases where the GEH is above 5, the modelled turn count is higher than the observed, demonstrating that the model is robust. Comparisons with the modelled outputs and the MCC/ANPR data shows that the model matches both of these well, and so it is likely that the ATC tubes have undercounted trips in these locations.

10.24 Furthermore, the ATC data has been processed for the singular day of Thursday 29th June 2023 to match the date of the MCC and ANPR surveys. This is presented in the table below:

Table 13: AM and PM ATC Validation Results using 29th June ATC Data – Total Vehicles

AM Peak Hour (07:30-08:30)				
Site	**Location**	**Observed**	**Modelled**	**GEH**
1	A361 (North of M40 J11) NB	273	299	1.5
	A361 (North of M40 J11) SB	598	653	2.2
2	A422 (East of M40 J11) EB	933	998	2.1
	A422 (East of M40 J11) WB	1073	1193	3.6
3	A422 (West of M40 J11) EB	1529	1583	1.4
	A422 (West of M40 J11) WB	2016	2155	3.0
4	Hennef Way (East of A4260) EB	1520	1810	7.1
	Hennef Way (East of A4260) WB	1773	1670	2.5
5	Hennef Way (West of A4260) EB	1372	1418	1.2
	Hennef Way (West of A4260) WB	1129	1138	0.3
PM Peak Hour (16:30-17:30)				
Site	**Location**	**Observed**	**Modelled**	**GEH**
1	A361 (North of M40 J11) NB	794	758	1.3
	A361 (North of M40 J11) SB	333	340	0.4
2	A422 (East of M40 J11) EB	1048	1148	3.0
	A422 (East of M40 J11) WB	942	997	1.8
3	A422 (West of M40 J11) EB	1832	1919	2.0
	A422 (West of M40 J11) WB	1663	1697	0.8
4	Hennef Way (East of A4260) EB	1700	1734	0.8
	Hennef Way (East of A4260) WB	2115	2097	0.4
5	Hennef Way (West of A4260) EB	1446	1357	2.4
	Hennef Way (West of A4260) WB	1401	1512	2.9

10.25 The AM still demonstrates a GEH value above 5 for Site 4 EB. The modelled output is higher than the observed ATC value and so can be considered robust for this assessment. Journey time and queue data shows that there are delays in the AM on the eastbound approach to the A422/Wildmere Road/Ermont Way roundabout, and so it is likely that queuing occurred on this ATC tube and has affected the count.

10.26 The AM and PM now pass at ATC Site 2 WB. This ATC value is higher on the singular day compared to the 2-week average in both the AM and PM, and so demonstrates that the model is robust in using higher flows.

11.0 Summary & Conclusion

11.1 SLR Consulting Ltd (SLR) has been commissioned by David Tucker Associates (DTA) to develop a VISSIM model for the area surrounding M40 Junction 11, located east of Banbury, Oxfordshire, in support of a live planning application for the construction of up to 140,000 sq m of employment floorspace, along with the associated infrastructure and access arrangements.

11.2 This Local Model Validation Report sets out the methodology for developing the Base model and presents the results from the Base model calibration and validation exercise.

11.3 Results show that the model achieves a pass rate of 100% for MCC turn count calibration, and journey times demonstrate a very close correlation to the observed which exceeds the requisite industry standards for calibration and validation as defined in WebTAG. Hence this suggests that the model matches observed data and observed on-street traffic behaviour and is a suitable and robust Baseline upon which to confidently begin development testing.

Appendix A ANPR Distributions

Local Model Validation Report

Huscote Farm VISSIM

David Tucker Associates

SLR Project No.: 431.000006.00000

13 February 2024

AM Peak (07:30-08:30)

LIGHTS

Distribution using raw ANPR

	1	2	3	4	5	6	7	8	9	10	11	Total
1	0%	5%	38%	2%	6%	18%	19%	0%	2%	4%	6%	100%
2	2%	0%	9%	30%	2%	18%	18%	1%	5%	12%	3%	100%
3	19%	3%	0%	7%	4%	14%	25%	1%	4%	13%	10%	100%
4	1%	12%	10%	0%	5%	19%	18%	1%	7%	16%	13%	100%
5	13%	6%	13%	12%	0%	22%	15%	2%	2%	11%	4%	100%
6	11%	7%	16%	15%	5%	0%	6%	1%	3%	21%	15%	100%
7	16%	8%	27%	12%	5%	8%	0%	1%	1%	7%	14%	100%
8	0%	7%	3%	10%	3%	14%	24%	0%	0%	24%	14%	100%
9	4%	2%	6%	7%	3%	5%	1%	0%	0%	27%	45%	100%
10	4%	3%	19%	18%	6%	18%	8%	1%	8%	0%	14%	100%
11	1%	0%	11%	15%	3%	12%	15%	1%	22%	19%	0%	100%

Distribution in VISSIM Matrices

	1	2	3	4	5	6	7	8	9	10	11	Total
1	0%	5%	38%	0%	6%	18%	19%	0%	4%	4%	6%	100%
2	3%	0%	8%	32%	2%	19%	16%	1%	6%	10%	3%	100%
3	18%	5%	0%	7%	4%	13%	24%	2%	5%	13%	9%	100%
4	0%	12%	10%	0%	5%	19%	17%	1%	8%	16%	12%	100%
5	13%	6%	13%	12%	0%	22%	15%	2%	2%	11%	4%	100%
6	12%	3%	22%	16%	4%	0%	6%	1%	3%	19%	14%	100%
7	15%	7%	28%	11%	5%	11%	0%	1%	1%	7%	12%	100%
8	0%	7%	3%	10%	3%	14%	24%	0%	0%	24%	14%	100%
9	4%	2%	6%	7%	3%	9%	1%	0%	0%	26%	43%	100%
10	4%	2%	19%	18%	5%	18%	8%	1%	12%	1%	13%	100%
11	1%	0%	11%	15%	3%	12%	15%	1%	22%	19%	0%	100%

Difference

	1	2	3	4	5	6	7	8	9	10	11	Total
1	0%	0%	0%	-2%	0%	0%	0%	0%	1%	0%	0%	0%
2	1%	0%	0%	2%	0%	1%	-2%	0%	1%	-1%	0%	0%
3	-1%	2%	0%	0%	0%	-1%	0%	1%	1%	-1%	-1%	0%
4	-1%	0%	0%	0%	0%	0%	0%	0%	1%	0%	0%	0%
5	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
6	2%	-3%	5%	0%	0%	0%	0%	0%	0%	-2%	-1%	0%
7	0%	-2%	1%	0%	0%	3%	0%	0%	0%	0%	-3%	0%
8	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
9	0%	0%	0%	0%	0%	4%	0%	0%	0%	-1%	-2%	0%
10	0%	-1%	-1%	0%	0%	0%	0%	0%	4%	1%	-1%	0%
11	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

HEAVIES

Distribution using raw ANPR

	1	2	3	4	5	6	7	8	9	10	11	Total
1	0%	8%	38%	1%	9%	16%	12%	1%	5%	3%	8%	100%
2	11%	0%	4%	37%	0%	11%	7%	7%	15%	4%	4%	100%
3	14%	6%	0%	6%	2%	22%	14%	10%	4%	12%	8%	100%
4	0%	17%	7%	2%	7%	25%	2%	0%	8%	8%	25%	100%
5	9%	9%	9%	27%	0%	18%	9%	9%	0%	0%	9%	100%
6	30%	8%	11%	30%	3%	0%	3%	0%	2%	5%	9%	100%
7	18%	12%	6%	12%	0%	24%	0%	6%	0%	12%	12%	100%
8	7%	60%	13%	0%	0%	0%	13%	0%	7%	0%	0%	100%
9	6%	45%	3%	16%	6%	6%	3%	0%	0%	6%	6%	100%
10	17%	8%	8%	29%	8%	8%	4%	0%	4%	0%	13%	100%
11	11%	2%	5%	14%	5%	5%	0%	25%	18%	16%	0%	100%

Distribution in VISSIM Matrices

	1	2	3	4	5	6	7	8	9	10	11	Total
1	0%	8%	38%	0%	9%	16%	12%	1%	5%	3%	8%	100%
2	10%	0%	3%	45%	0%	10%	6%	6%	13%	3%	3%	100%
3	14%	6%	0%	6%	2%	22%	14%	10%	4%	12%	8%	100%
4	0%	17%	7%	2%	7%	25%	2%	0%	8%	8%	25%	100%
5	9%	9%	9%	27%	0%	18%	9%	9%	0%	0%	9%	100%
6	27%	9%	9%	37%	2%	0%	4%	0%	1%	4%	7%	100%
7	18%	12%	6%	12%	0%	24%	0%	6%	0%	12%	12%	100%
8	8%	54%	15%	0%	0%	0%	15%	0%	8%	0%	0%	100%
9	6%	45%	3%	16%	6%	6%	3%	0%	0%	6%	6%	100%
10	17%	8%	8%	29%	8%	8%	4%	0%	4%	0%	13%	100%
11	11%	2%	5%	14%	5%	5%	0%	25%	18%	16%	0%	100%

Difference

	1	2	3	4	5	6	7	8	9	10	11	Total
1	0%	0%	0%	-1%	0%	0%	0%	0%	0%	0%	0%	0%
2	-1%	0%	0%	8%	0%	-1%	-1%	-1%	-2%	0%	0%	0%
3	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
4	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
5	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
6	-3%	1%	-2%	7%	-1%	0%	1%	0%	0%	-1%	-2%	0%
7	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
8	1%	-6%	2%	0%	0%	0%	2%	0%	1%	0%	0%	0%
9	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
10	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
11	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

PM Peak (16:30-17:30)

LIGHTS

Distribution using raw ANPR

	1	2	3	4	5	6	7	8	9	10	11	Total
1	0%	3%	39%	1%	6%	11%	21%	0%	3%	11%	5%	100%
2	8%	0%	12%	24%	6%	11%	24%	0%	3%	11%	1%	100%
3	22%	4%	0%	8%	4%	10%	21%	1%	3%	17%	9%	100%
4	1%	36%	7%	0%	5%	8%	11%	0%	2%	13%	17%	100%
5	9%	10%	12%	7%	0%	11%	21%	0%	3%	16%	11%	100%
6	11%	8%	10%	8%	8%	0%	15%	1%	4%	23%	11%	100%
7	11%	11%	30%	9%	10%	4%	0%	1%	1%	10%	13%	100%
8	0%	0%	21%	6%	0%	6%	29%	0%	0%	21%	18%	100%
9	4%	6%	10%	4%	3%	5%	3%	0%	0%	26%	38%	100%
10	4%	8%	18%	8%	7%	11%	11%	1%	11%	0%	21%	100%
11	4%	2%	12%	11%	4%	7%	21%	0%	19%	20%	0%	100%

Distribution in VISSIM Matrices

	1	2	3	4	5	6	7	8	9	10	11	Total
1	0%	3%	38%	0%	5%	11%	21%	0%	7%	11%	5%	100%
2	11%	0%	12%	23%	5%	11%	24%	0%	3%	10%	1%	100%
3	20%	11%	0%	8%	4%	10%	20%	1%	3%	14%	9%	100%
4	0%	38%	7%	0%	5%	8%	10%	0%	2%	12%	17%	100%
5	12%	3%	15%	7%	0%	11%	21%	0%	3%	16%	11%	100%
6	12%	6%	14%	9%	9%	0%	16%	1%	5%	21%	7%	100%
7	11%	9%	32%	9%	10%	4%	0%	1%	1%	10%	13%	100%
8	0%	0%	21%	6%	0%	6%	29%	0%	0%	21%	18%	100%
9	3%	5%	13%	4%	3%	8%	3%	1%	0%	27%	32%	100%
10	4%	6%	18%	9%	7%	11%	11%	0%	16%	0%	19%	100%
11	4%	2%	12%	11%	4%	7%	21%	0%	19%	20%	0%	100%

Difference

	1	2	3	4	5	6	7	8	9	10	11	Total
1	0%	0%	-1%	-1%	0%	0%	-1%	0%	4%	0%	0%	0%
2	2%	0%	0%	-1%	0%	0%	-1%	0%	0%	0%	0%	0%
3	-2%	7%	0%	0%	0%	0%	-1%	0%	0%	-2%	0%	0%
4	-1%	3%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
5	3%	-7%	3%	0%	0%	0%	0%	0%	0%	0%	0%	0%
6	1%	-2%	4%	1%	1%	0%	1%	0%	1%	-2%	-4%	0%
7	0%	-2%	2%	0%	0%	0%	0%	0%	0%	0%	0%	0%
8	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
9	-1%	-1%	3%	-1%	0%	3%	0%	1%	0%	1%	-5%	0%
10	0%	-1%	-1%	1%	0%	0%	0%	-1%	5%	0%	-2%	0%
11	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

HEAVIES

Distribution using raw ANPR

	1	2	3	4	5	6	7	8	9	10	11	Total
1	0%	7%	30%	0%	0%	19%	11%	4%	7%	0%	22%	100%
2	33%	0%	0%	33%	0%	11%	0%	0%	0%	0%	22%	100%
3	46%	0%	0%	0%	4%	19%	8%	0%	12%	8%	4%	100%
4	2%	23%	6%	0%	2%	36%	6%	0%	0%	4%	23%	100%
5	17%	0%	25%	25%	8%	17%	0%	0%	0%	0%	8%	100%
6	28%	13%	15%	15%	5%	0%	3%	0%	8%	5%	8%	100%
7	18%	18%	0%	9%	0%	36%	0%	0%	0%	0%	18%	100%
8	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	100%
9	13%	13%	38%	0%	0%	0%	0%	0%	0%	13%	25%	100%
10	13%	0%	25%	25%	0%	0%	13%	0%	13%	0%	13%	100%
11	26%	11%	7%	15%	0%	11%	4%	0%	19%	7%	0%	100%

Distribution in VISSIM Matrices

	1	2	3	4	5	6	7	8	9	10	11	Total
1	0%	7%	30%	0%	0%	19%	11%	4%	7%	0%	22%	100%
2	33%	0%	0%	33%	0%	11%	0%	0%	0%	0%	22%	100%
3	46%	0%	0%	0%	4%	19%	8%	0%	12%	8%	4%	100%
4	0%	16%	10%	0%	2%	38%	6%	0%	0%	4%	25%	100%
5	17%	0%	25%	25%	8%	17%	0%	0%	0%	0%	8%	100%
6	23%	14%	17%	17%	3%	0%	3%	0%	9%	6%	9%	100%
7	18%	18%	0%	9%	0%	36%	0%	0%	0%	0%	18%	100%
8	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	100%
9	13%	13%	33%	0%	0%	0%	0%	0%	0%	13%	27%	100%
10	13%	0%	25%	25%	0%	0%	13%	0%	13%	0%	13%	100%
11	26%	11%	7%	15%	0%	11%	4%	0%	19%	7%	0%	100%

Difference

	1	2	3	4	5	6	7	8	9	10	11	Total
1	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
2	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
3	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
4	-2%	-7%	4%	0%	0%	2%	0%	0%	0%	0%	2%	0%
5	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
6	-5%	1%	2%	2%	-2%	0%	0%	0%	1%	1%	1%	0%
7	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
8	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
9	1%	1%	-4%	0%	0%	0%	0%	0%	0%	1%	2%	0%
10	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
11	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

Appendix B Turn Count Calibration Results

Local Model Validation Report

Huscote Farm VISSIM

David Tucker Associates

SLR Project No.: 431.000006.00000

13 February 2024

AM Turn Counts

Junction Number	Junction Name	From	To	07:30-08:30 Total Lights					07:30-08:30 Total Heavies				
				Observed	Modelled	Difference	%	GEH	Observed	Modelled	Difference	%	GEH
1	M40 J11	M40 North	A361	27	31	4	15%	0.7	6	6	0	0%	0.0
			A422 East	268	244	-24	-9%	1.5	38	30	-8	-21%	1.4
			M40 South	2083	2104	21	1%	0.5	280	285	5	2%	0.3
			A422 West	407	406	-1	0%	0.0	35	44	9	26%	1.4
			M40 North	0	0	0	0%	0.0	0	0	0	0%	0.0
		A361	A422 East	47	45	-2	-4%	0.3	1	1	0	0%	0.0
			M40 South	154	179	25	16%	1.9	14	14	0	0%	0.0
			A422 West	351	358	7	2%	0.4	9	11	2	22%	0.6
			M40 North	20	18	-2	-10%	0.5	2	3	1	50%	0.6
			A361	0	0	0	0%	0.0	0	0	0	0%	0.0
		A422 East	M40 South	62	73	11	18%	1.3	1	3	2	200%	1.4
			A422 West	813	812	-1	0%	0.0	40	33	-7	-18%	1.2
			M40 North	205	201	-4	-2%	0.3	8	6	-2	-25%	0.8
			A361	74	52	-22	-30%	2.8	5	3	-2	-40%	1.0
			A422 East	0	0	0	0%	0.0	0	0	0	0%	0.0
		M40 South	A422 West	460	446	-14	-3%	0.7	50	49	-1	-2%	0.1
			M40 North	1585	1580	-5	0%	0.1	238	242	4	2%	0.2
			A361	62	65	3	5%	0.4	12	11	-1	-8%	0.3
			A422 East	53	55	2	4%	0.3	1	4	3	300%	1.9
			M40 South	0	0	0	0%	0.0	1	1	0	0%	0.0
		A422 West	M40 North	230	247	17	7%	1.1	38	40	2	5%	0.3
			A361	80	101	21	26%	2.2	33	31	-2	-6%	0.4
			A422 East	590	606	16	3%	0.7	13	15	2	15%	0.5
			M40 South	480	485	5	1%	0.2	50	54	4	8%	0.6
			A422 West	0	0	0	0%	0.0	0	0	0	0%	0.0
2	A422 / Wildmere Rd / Ermont Way Roundabout	Wildmere Rd	A422 East	74	80	6	8%	0.7	14	14	0	0%	0.0
			Ermont Way	56	53	-3	-5%	0.4	2	3	1	50%	0.6
			A422 West	79	74	-5	-6%	0.6	8	6	-2	-25%	0.8
			Wildmere Rd	0	0	0	0%	0.0	0	0	0	0%	0.0
		A422 East	Ermont Way	488	455	-33	-7%	1.5	38	40	2	5%	0.3
			A422 West	1267	1260	-7	-1%	0.2	81	79	-2	-2%	0.2
			Wildmere Rd	267	304	37	14%	2.2	18	18	0	0%	0.0
			A422 East	0	0	0	0%	0.0	0	0	0	0%	0.0
		Ermont Way	A422 West	218	243	25	11%	1.6	9	13	4	44%	1.2
			Wildmere Rd	69	69	0	0%	0.0	3	3	0	0%	0.0
			A422 East	280	302	22	8%	1.3	54	63	9	17%	1.2
			Ermont Way	5	2	-3	-60%	1.6	2	0	-2	-100%	2.0
		A422 West	Wildmere Rd	299	296	-3	-1%	0.2	9	8	-1	-11%	0.3
			A422 East	1029	1059	30	3%	0.9	67	64	-3	-4%	0.4
			Ermont Way	373	356	-17	-5%	0.9	11	10	-1	-9%	0.3
			A422 West	0	0	0	0%	0.0	0	0	0	0%	0.0
3	Concord Roundabout	Grimsbury Green	A422 East	11	10	-1	-9%	0.3	13	10	-3	-23%	0.9
			A4260 Concord Ave	10	7	-3	-30%	1.0	2	2	0	0%	0.0
			A422 West	9	11	2	22%	0.6	1	1	0	0%	0.0
			Grimsbury Green	0	0	0	0%	0.0	0	0	0	0%	0.0
		A422 East	A4260 Concord Ave	602	622	20	3%	0.8	27	26	-1	-4%	0.2
			A422 West	928	921	-7	-1%	0.2	62	66	4	6%	0.5
			Grimsbury Green	31	24	-7	-23%	1.3	9	6	-3	-33%	1.1
			A422 East	1	0	-1	-100%	1.4	0	0	0	0%	0.0
		A4260 Concord Ave	A422 West	139	136	-3	-2%	0.3	5	4	-1	-20%	0.5
			Grimsbury Green	8	10	2	25%	0.7	1	1	0	0%	0.0
			A422 East	603	602	-1	0%	0.0	12	12	0	0%	0.0
			A4260 Concord Ave	0	1	1	0%	1.4	0	0	0	0%	0.0
		A422 West	Grimsbury Green	9	17	8	89%	2.2	10	11	1	10%	0.3
			A422 East	1137	1125	-12	-1%	0.4	73	65	-8	-11%	1.0
			A4260 Concord Ave	214	200	-14	-7%	1.0	2	2	0	0%	0.0
			A422 West	0	0	0	0%	0.0	0	0	0	0%	0.0
4	A422 / Southam Rd Roundabout	Southam Rd North	A422 East	553	548	-5	-1%	0.2	31	30	-1	-3%	0.2
			Southam Rd South	208	186	-22	-11%	1.6	10	8	-2	-20%	0.7
			A422 West	169	163	-6	-4%	0.5	5	7	2	40%	0.8
			Southam Rd North	0	0	0	0%	0.0	0	0	0	0%	0.0
		A422 East	Southam Rd South	199	179	-20	-10%	1.5	15	16	1	7%	0.3
			A422 West	498	499	1	0%	0.0	25	21	-4	-16%	0.8
			Southam Rd North	388	386	-2	-1%	0.1	35	36	1	3%	0.2
			A422 East	0	0	0	0%	0.0	0	0	0	0%	0.0
		Southam Rd South	A422 West	102	93	-9	-9%	0.9	2	2	0	0%	0.0
			Southam Rd North	176	152	-24	-14%	1.9	8	2	-6	-75%	2.7
			A422 East	122	123	1	1%	0.1	27	28	1	4%	0.2
			Southam Rd South	0	1	1	0%	1.4	0	0	0	0%	0.0
		A422 West	Southam Rd North	107	107	0	0%	0.0	3	3	0	0%	0.0
			A422 East	682	671	-11	-2%	0.4	20	21	1	5%	0.2
			Southam Rd South	108	98	-10	-9%	1.0	1	1	0	0%	0.0
			A422 West	15	9	-6	-40%	1.7	1	0	-1	-100%	1.4
5	Southam Rd / Beaumont Rd	Southam Rd North	Southam Rd South	885	865	-20	-2%	0.7	48	38	-10	-21%	1.5
			Beaumont Rd	72	71	-1	-1%	0.1	1	1	0	0%	0.0
		Southam Rd South	Beaumont Rd	156	162	6	4%	0.5	15	14	-1	-7%	0.3
			Southam Rd North	479	477	-2	0%	0.1	27	28	1	4%	0.2
		Beaumont Rd	Southam Rd North	74	75	1	1%	0.1	1	1	0	0%	0.0
			Southam Rd South	41	33	-8	-20%	1.3	11	6	-5	-45%	1.7
6	Wildmere Rd Junction	Wildmere Rd North	Brookhill Way	9	9	0	0%	0.0	1	1	0	0%	0.0
			Wildmere Rd South	96	114	18	19%	1.8	17	11	-6	-35%	1.6
			Wildmere Rd West	0	0	0	0%	0.0	0	0	0	0%	0.0
		Brookhill Way	Wildmere Rd South	15	11	-4	-27%	1.1	3	2	-1	-33%	0.6
			Wildmere Rd West	0	0	0	0%	0.0	0	0	0	0%	0.0
			Wildmere Rd North	2	2	0	0%	0.0	0	0	0	0%	0.0
		Wildmere Rd South	Wildmere Rd West	284	281	-3	-1%	0.2	17	8	-9	-53%	2.5
			Wildmere Rd North	243	256	13	5%	0.8	18	19	1	6%	0.2
			Brookhill Way	138	133	-5	-4%	0.4	3	0	-3	-100%	2.4
		Wildmere Rd West	Wildmere Rd North	4	4	0	0%	0.0	0	0	0	0%	0.0
			Brookhill Way	0	0	0	0%	0.0	0	0	0	0%	0.0
			Wildmere Rd South	88	86	-2	-2%	0.2	12	10	-2	-17%	0.6
7	A422 / B4525 / Mansion Hill Roundabout	B4525 Banbury Lane	Mansion Hill	10	10	0	0%	0.0	1	1	0	0%	0.0
			A422 East	43	42	-1	-2%	0.2	0	0	0	0%	0.0
			Unnamed Rd South	43	43	0	0%	0.0	2	2	0	0%	0.0
			A422 West	457	448	-9	-2%	0.4	26	31	5	19%	0.9
			B4525 Banbury Lane	0	0	0	0%	0.0	2	2	0	0%	0.0
		Mansion Hill	A422 East	1	1	0	0%	0.0	0	0	0	0%	0.0
			Unnamed Rd South	15	15	0	0%	0.0	0	0	0	0%	0.0
			A422 West	220	214	-6	-3%	0.4	2	0	-2	-100%	2.0
			B4525 Banbury Lane	5	5	0	0%	0.0	0	0	0	0%	0.0
			Mansion Hill	0	0	0	0%	0.0	0	0	0	0%	0.0
		A422 East	Unnamed Rd South	30	29	-1	-3%	0.2	1	1	0	0%	0.0
			A422 West	453	457	4	1%	0.2	20	17	-3	-15%	0.7
			B4525 Banbury Lane	21	21	0	0%	0.0	1	1	0	0%	0.0
			Mansion Hill	0	0	0	0%	0.0	0	0	0	0%	0.0
			A422 East	0	0	0	0%	0.0	0	0	0	0%	0.0
		Unnamed Rd South	A422 West	29	34	5	17%	0.9	1	0	-1	-100%	1.4
			B4525 Banbury Lane	66	65	-1	-2%	0.1	0	0	0	0%	0.0
			Mansion Hill	6	6	0	0%	0.0	0	0	0	0%	0.0
			A422 East	26	26	0	0%	0.0	1	1	0	0%	0.0
			Unnamed Rd South	0	0	0	0%	0.0	0	0	0	0%	0.0
		A422 West	B4525 Banbury Lane	402	427	25	6%	1.2	34	35	1	3%	0.2
			Mansion Hill	84	88	4	5%	0.4	5	3	-2	-40%	1.0
			A422 East	369	368	-1	0%	0.1	10	6	-4	-40%	1.4
			Unnamed Rd South	58	62	4	7%	0.5	4	3	-1	-25%	0.5
			A422 West	0	0	0	0%	0.0	0	0	0	0%	0.0

PM Turn Counts

Junction Number	Junction Name	From	To	16:30-17:30 Total Lights Observed	Modelled	Difference	%	GEH	16:30-17:30 Total Heavies Observed	Modelled	Difference	%	GEH
1	M40 J11	M40 North	A361	14	16	2	14%	0.5	2	2	0	0%	0.0
			A422 East	184	190	6	3%	0.4	11	6	-5	-45%	1.7
			M40 South	1992	1997	5	0%	0.1	186	187	1	1%	0.1
			A422 West	316	309	-7	-2%	0.4	17	18	1	6%	0.2
			M40 North	0	0	0	0%	0.0	0	0	0	0%	0.0
		A361	A422 East	39	40	1	3%	0.2	0	0	0	0%	0.0
			M40 South	57	74	17	30%	2.1	4	3	-1	-25%	0.5
			A422 West	197	178	-19	-10%	1.4	4	3	-1	-25%	0.5
			M40 North	40	35	-5	-13%	0.8	2	3	1	50%	0.6
			A361	0	1	1	0%	1.4	0	0	0	0%	0.0
		A422 East	M40 South	72	80	8	11%	0.9	0	0	0	0%	0.0
			A422 West	577	595	18	3%	0.7	8	14	6	75%	1.8
			M40 North	179	191	12	7%	0.9	18	11	-7	-39%	1.8
			A361	136	99	-37	-27%	3.4	1	0	-1	-100%	1.4
			A422 East	0	0	0	0%	0.0	0	0	0	0%	0.0
		M40 South	A422 West	548	544	-4	-1%	0.2	44	38	-6	-14%	0.9
			M40 North	2205	2204	-1	0%	0.0	251	252	1	0%	0.0
			A361	389	376	-13	-3%	0.7	11	10	-1	-9%	0.3
			A422 East	51	68	17	33%	2.2	5	2	-3	-60%	1.6
			M40 South	0	2	2	0%	2.0	0	0	0	0%	0.0
		A422 West	M40 North	351	354	3	1%	0.2	23	24	1	4%	0.2
			A361	236	242	6	3%	0.4	12	11	-1	-8%	0.3
			A422 East	871	837	-34	-4%	1.2	16	9	-7	-44%	2.0
			M40 South	446	414	-32	-7%	1.5	22	22	0	0%	0.0
			A422 West	0	0	0	0%	0.0	0	0	0	0%	0.0
2	A422 / Wildmere Rd / Ermont Way Roundabout	Wildmere Rd	A422 East	335	342	7	2%	0.4	16	17	1	6%	0.2
			Ermont Way	115	117	2	2%	0.2	5	4	-1	-20%	0.5
			A422 West	475	494	19	4%	0.9	4	1	-3	-75%	1.9
			Wildmere Rd	1	0	-1	-100%	1.4	1	0	-1	-100%	1.4
		A422 East	Ermont Way	270	259	-11	-4%	0.7	27	30	3	11%	0.6
			A422 West	1218	1201	-17	-1%	0.5	37	39	2	5%	0.3
			Wildmere Rd	167	158	-9	-5%	0.7	7	4	-3	-43%	1.3
			A422 East	0	0	0	0%	0.0	0	0	0	0%	0.0
		Ermont Way	A422 West	354	350	-4	-1%	0.2	6	9	3	50%	1.1
			Wildmere Rd	64	73	9	14%	1.1	2	3	1	50%	0.6
			A422 East	299	282	-17	-6%	1.0	23	22	-1	-4%	0.2
			Ermont Way	1	4	3	300%	1.9	0	0	0	0%	0.0
		A422 West	Wildmere Rd	226	240	14	6%	0.9	2	2	0	0%	0.0
			A422 East	1258	1234	-24	-2%	0.7	38	26	-12	-32%	2.1
			Ermont Way	254	231	-23	-9%	1.5	8	7	-1	-13%	0.4
			A422 West	0	0	0	0%	0.0	0	0	0	0%	0.0
3	Concord Roundabout	Grimsbury Green	A422 East	9	9	0	0%	0.0	2	0	-2	-100%	2.0
			A4260 Concord Ave	5	10	5	100%	1.8	0	0	0	0%	0.0
			A422 West	18	13	-5	-28%	1.3	1	1	0	0%	0.0
			Grimsbury Green	0	0	0	0%	0.0	0	0	0	0%	0.0
		A422 East	A4260 Concord Ave	778	783	5	1%	0.2	6	9	3	50%	1.1
			A422 West	1236	1251	15	1%	0.4	41	39	-2	-5%	0.3
			Grimsbury Green	21	13	-8	-38%	1.9	1	1	0	0%	0.0
			A422 East	0	0	0	0%	0.0	0	0	0	0%	0.0
		A4260 Concord Ave	A422 West	200	203	3	2%	0.2	2	2	0	0%	0.0
			Grimsbury Green	3	5	2	67%	1.0	0	0	0	0%	0.0
			A422 East	649	656	7	1%	0.3	10	9	-1	-10%	0.3
			A4260 Concord Ave	0	0	0	0%	0.0	0	0	0	0%	0.0
		A422 West	Grimsbury Green	9	15	6	67%	1.7	0	0	0	0%	0.0
			A422 East	1045	1033	-12	-1%	0.4	34	25	-9	-26%	1.7
			A4260 Concord Ave	293	278	-15	-5%	0.9	2	2	0	0%	0.0
			A422 West	0	0	0	0%	0.0	0	0	0	0%	0.0
4	A422 / Southam Rd Roundabout	Southam Rd North	A422 East	514	515	1	0%	0.0	23	19	-4	-17%	0.9
			Southam Rd South	170	160	-10	-6%	0.8	4	5	1	25%	0.5
			A422 West	168	163	-5	-3%	0.4	1	2	1	100%	0.8
			Southam Rd North	1	0	-1	-100%	1.4	0	0	0	0%	0.0
		A422 East	Southam Rd South	163	176	13	8%	1.0	8	8	0	0%	0.0
			A422 West	715	740	25	3%	0.9	7	8	1	14%	0.4
			Southam Rd North	568	554	-14	-2%	0.6	26	28	2	8%	0.4
			A422 East	1	0	-1	-100%	1.4	0	0	0	0%	0.0
		Southam Rd South	A422 West	169	148	-21	-12%	1.7	1	1	0	0%	0.0
			Southam Rd North	178	176	-2	-1%	0.2	2	2	0	0%	0.0
			A422 East	252	224	-28	-11%	1.8	5	4	-1	-20%	0.5
			Southam Rd South	0	3	3	0%	2.4	0	0	0	0%	0.0
		A422 West	Southam Rd North	184	166	-18	-10%	1.4	1	1	0	0%	0.0
			A422 East	580	592	12	2%	0.5	6	4	-2	-33%	0.9
			Southam Rd South	137	143	6	4%	0.5	1	1	0	0%	0.0
			A422 West	7	3	-4	-57%	1.8	0	0	0	0%	0.0
5	Southam Rd / Beaumont Rd	Southam Rd North	Southam Rd South	655	649	-6	-1%	0.2	11	19	8	73%	2.1
			Beaumont Rd	32	32	0	0%	0.0	0	0	0	0%	0.0
		Southam Rd South	Beaumont Rd	39	38	-1	-3%	0.2	3	7	4	133%	1.8
			Southam Rd North	847	862	15	2%	0.5	24	25	1	4%	0.2
		Beaumont Rd	Southam Rd North	166	166	0	0%	0.0	0	0	0	0%	0.0
			Southam Rd South	205	195	-10	-5%	0.7	5	6	1	20%	0.4
6	Wildmere Rd Junction	Wildmere Rd North	Brookhill Way	3	3	0	0%	0.0	0	0	0	0%	0.0
			Wildmere Rd South	563	526	-37	-7%	1.6	6	8	2	33%	0.8
			Wildmere Rd West	0	0	0	0%	0.0	0	0	0	0%	0.0
		Brookhill Way	Wildmere Rd South	130	127	-3	-2%	0.3	5	5	0	0%	0.0
			Wildmere Rd West	0	0	0	0%	0.0	0	0	0	0%	0.0
			Wildmere Rd North	5	5	0	0%	0.0	0	0	0	0%	0.0
		Wildmere Rd South	Wildmere Rd West	72	75	3	4%	0.3	8	6	-2	-25%	0.8
			Wildmere Rd North	328	380	52	16%	2.8	10	3	-7	-70%	2.7
			Brookhill Way	20	15	-5	-25%	1.2	2	1	-1	-50%	0.8
		Wildmere Rd West	Wildmere Rd North	6	6	0	0%	0.0	0	0	0	0%	0.0
			Brookhill Way	0	0	0	0%	0.0	0	0	0	0%	0.0
			Wildmere Rd South	323	305	-18	-6%	1.0	9	8	-1	-11%	0.3
7	A422 / B4525 / Mansion Hill Roundabout	B4525 Banbury Lane	Mansion Hill	11	11	0	0%	0.0	0	0	0	0%	0.0
			A422 East	20	19	-1	-5%	0.2	0	0	0	0%	0.0
			Unnamed Rd South	33	32	-1	-3%	0.2	0	0	0	0%	0.0
			A422 West	393	419	26	7%	1.3	4	1	-3	-75%	1.9
			B4525 Banbury Lane	0	0	0	0%	0.0	0	0	0	0%	0.0
		Mansion Hill	A422 East	4	4	0	0%	0.0	0	0	0	0%	0.0
			Unnamed Rd South	9	9	0	0%	0.0	0	0	0	0%	0.0
			A422 West	136	152	16	12%	1.3	1	0	-1	-100%	1.4
			B4525 Banbury Lane	1	1	0	0%	0.0	0	0	0	0%	0.0
			Mansion Hill	0	0	0	0%	0.0	0	0	0	0%	0.0
		A422 East	Unnamed Rd South	14	14	0	0%	0.0	0	0	0	0%	0.0
			A422 West	335	362	27	8%	1.4	20	22	2	10%	0.4
			B4525 Banbury Lane	10	10	0	0%	0.0	0	0	0	0%	0.0
			Mansion Hill	2	2	0	0%	0.0	0	0	0	0%	0.0
			A422 East	0	0	0	0%	0.0	0	0	0	0%	0.0
		Unnamed Rd South	A422 West	41	46	5	12%	0.8	1	0	-1	-100%	1.4
			B4525 Banbury Lane	112	112	0	0%	0.0	0	0	0	0%	0.0
			Mansion Hill	41	41	0	0%	0.0	0	0	0	0%	0.0
			A422 East	50	50	0	0%	0.0	2	2	0	0%	0.0
			Unnamed Rd South	0	0	0	0%	0.0	0	0	0	0%	0.0
		A422 West	B4525 Banbury Lane	358	373	15	4%	0.8	14	9	-5	-36%	1.5
			Mansion Hill	195	212	17	9%	1.2	0	0	0	0%	0.0
			A422 East	490	501	11	2%	0.5	14	8	-6	-43%	1.8
			Unnamed Rd South	52	49	-3	-6%	0.4	1	0	-1	-100%	1.4
			A422 West	0	0	0	0%	0.0	0	0	0	0%	0.0

Appendix C Journey Time Validation Results

Local Model Validation Report

Huscote Farm VISSIM

David Tucker Associates

SLR Project No.: 431.000006.00000

13 February 2024

1 NB
1 SB
2 NB
2 SB
3 NB
3 SB
4 SB
4 NB
5 NB
5 SB
6 EB
6 WB
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28-4 SB
28-5 SB
28-6 SB
28-7 WB
28-8 WB
28-9 NB
28-10 NB
29-1-EB
29-2-EB
29-3 SB
29-4 SB
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29-6 WB
29-7 WB
29-8 WB
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29-10 NB
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30-2-EB
30-3-SB
30-4-SB
30-5-WB
30-6-WB
30-7-NB
30-8-EB
30-9-EB
30-10-SB
31-1-EB
31-2-EB
31-3-SB
31-4-SB
31-5-WB
31-6-WB
31-7-NB
31-8-NB
32-1-EB
32-2-EB
32-3-SB
32-4-SB
32-5-WB
32-6-WB
32-7-NB
32-8-EB

AM Journey Time (Seconds)

No.	Description	Journey Time					
		Peak Hour 07:30-08:30					
		Observed	Modelled	Difference	% Difference	Pass?	Pass 15%?
1	1 NB	73	81	8	11%	Pass	Pass
2	1 SB	79	88	10	12%	Pass	Pass
3	2 NB	38	42	4	11%	Pass	Pass
4	2 SB	36	40	4	11%	Pass	Pass
5	3 NB	73	83	10	14%	Pass	Pass
6	3 SB	74	83	9	12%	Pass	Pass
7	4 NB	28	26	-3	-9%	Pass	Pass
8	4 SB	45	38	-6	-14%	Pass	Pass
9	5 NB	43	46	3	7%	Pass	Pass
10	5 SB	26	25	-2	-6%	Pass	Pass
11	6 EB	21	23	1	6%	Pass	Pass
12	6 WB	15	17	1	8%	Pass	Pass
13	7 EB	85	59	-26	-30%	Pass	Fail
14	7 WB	34	38	5	14%	Pass	Pass
15	8 EB	151	144	-7	-5%	Pass	Pass
16	8 WB	45	51	5	11%	Pass	Pass
17	9 EB	29	29	-1	-2%	Pass	Pass
18	9 WB	27	25	-2	-7%	Pass	Pass
19	10 EB	72	69	-3	-4%	Pass	Pass
20	10 WB	93	79	-13	-15%	Pass	Pass
21	11 EB	84	96	12	14%	Pass	Pass
22	11 WB	90	95	5	5%	Pass	Pass
23	12 NB	44	40	-3	-7%	Pass	Pass
24	12 SB	63	48	-15	-24%	Pass	Fail
25	13 EB	58	49	-8	-14%	Pass	Pass
26	13 WB	51	57	6	12%	Pass	Pass
27	14 NB	30	30	-1	-3%	Pass	Pass
28	14 SB	41	43	2	4%	Pass	Pass
29	15 NB	29	32	3	9%	Pass	Pass
30	15 SB	25	28	3	10%	Pass	Pass
31	16 NB	42	40	-2	-5%	Pass	Pass
32	16 SB	34	34	0	0%	Pass	Pass
33	17 NB	13	8	-5	-41%	Pass	Fail
34	17 SB	23	25	2	10%	Pass	Pass
35	18 NB	26	24	-3	-11%	Pass	Pass
36	18 SB	28	23	-6	-20%	Pass	Fail
37	19 EB	20	18	-1	-6%	Pass	Pass
38	19 WB	23	28	5	21%	Pass	Fail
39	20 NB	6	6	0	1%	Pass	Pass
40	20 SB	9	12	3	40%	Pass	Fail
41	21 EB	47	50	3	7%	Pass	Pass
42	21 WB	41	45	4	9%	Pass	Pass
43	22 NB	8	8	0	-3%	Pass	Pass
44	22 SB	13	14	0	3%	Pass	Pass
45	23 NB	76	57	-19	-25%	Pass	Fail
46	23 SB	38	30	-7	-20%	Pass	Fail
47	24 NB	68	68	0	0%	Pass	Pass
48	24 SB	127	151	25	19%	Pass	Fail
49	25 NB	62	56	-5	-8%	Pass	Pass
50	25 SB	64	68	4	7%	Pass	Pass
51	26 EB	62	64	1	2%	Pass	Pass
52	26 WB	65	74	9	14%	Pass	Pass
53	27 NB	33	28	-5	-15%	Pass	Fail
54	27 SB	27	24	-3	-10%	Pass	Pass
55	28-1 EB	17	25	8	45%	Pass	Fail
56	28-2 EB	2	2	0	-10%	Pass	Pass
57	28-3 SB	6	6	-1	-11%	Pass	Pass
58	28-4 SB	3	3	0	19%	Pass	Fail
59	28-5 SB	8	19	11	138%	Pass	Fail
60	28-6 SB	2	2	0	9%	Pass	Pass
61	28-7 WB	18	20	2	12%	Pass	Pass
62	28-8 WB	4	4	0	-2%	Pass	Pass
63	28-9 NB	7	20	13	184%	Pass	Fail
64	28-10 NB	2	4	1	69%	Pass	Fail
65	29-1 EB	4	3	-1	-15%	Pass	Pass
66	29-2 EB	1	1	0	9%	Pass	Pass
67	29-3 SB	3	3	1	23%	Pass	Fail
68	29-4 SB	1	1	0	34%	Pass	Fail
69	29-5 SB	3	4	0	9%	Pass	Pass
70	29-6 WB	0	1	0	4%	Pass	Pass
71	29-7 WB	3	4	0	15%	Pass	Pass
72	29-8 WB	1	1	0	13%	Pass	Pass
73	29-9 NB	4	5	1	26%	Pass	Fail
74	29-10 NB	1	2	1	47%	Pass	Fail
75	30-1 EB	3	3	0	10%	Pass	Pass
76	30-2 EB	1	1	0	55%	Pass	Fail
77	30-3 SB	3	4	1	21%	Pass	Fail
78	30-4 SB	2	2	0	-8%	Pass	Pass
79	30-5 WB	2	2	0	8%	Pass	Pass
80	30-6 WB	2	2	0	7%	Pass	Pass
81	30-7 NB	3	3	0	-3%	Pass	Pass
82	30-8 EB	2	2	0	-7%	Pass	Pass
83	30-9 EB	11	9	-3	-25%	Pass	Fail
84	30-10 SB	13	14	1	6%	Pass	Pass
85	31-1 EB	3	2	-1	-22%	Pass	Fail
86	31-2 EB	2	1	-1	-62%	Pass	Fail
87	31-3 SB	2	3	1	28%	Pass	Fail
88	31-4 SB	1	2	1	50%	Pass	Fail
89	31-5 WB	2	3	1	24%	Pass	Fail
90	31-6 WB	1	1	0	-7%	Pass	Pass
91	31-7 NB	4	3	0	-9%	Pass	Pass
92	31-8 NB	2	2	0	-3%	Pass	Pass
93	32-1 EB	2	2	0	4%	Pass	Pass
94	32-2 EB	2	2	0	-12%	Pass	Pass
95	32-3 SB	3	3	0	0%	Pass	Pass
96	32-4 SB	1	1	-1	-36%	Pass	Fail
97	32-5 WB	2	2	0	7%	Pass	Pass
98	32-6 WB	2	2	-1	-31%	Pass	Fail
99	32-7 NB	3	3	0	2%	Pass	Pass
100	32-8 EB	2	2	0	-10%	Pass	Pass

PM Journey Time (Seconds)

No.	Description	Journey Time					
		Peak Hour 16:30-17:30					
		Observed	Modelled	Difference	% Difference	Pass?	Pass 15%?
1	1 NB	74	83	9	12%	Pass	Pass
2	1 SB	75	86	11	14%	Pass	Pass
3	2 NB	38	42	4	11%	Pass	Pass
4	2 SB	35	39	4	11%	Pass	Pass
5	3 NB	75	86	11	14%	Pass	Pass
6	3 SB	73	81	8	11%	Pass	Pass
7	4 NB	28	26	-2	-8%	Pass	Pass
8	4 SB	45	42	-3	-7%	Pass	Pass
9	5 NB	39	43	4	10%	Pass	Pass
10	5 SB	25	24	-1	-5%	Pass	Pass
11	6 EB	29	31	2	9%	Pass	Pass
12	6 WB	42	49	8	18%	Pass	Fail
13	7 EB	34	45	10	30%	Pass	Fail
14	7 WB	64	42	-22	-34%	Pass	Fail
15	8 EB	63	56	-7	-11%	Pass	Pass
16	8 WB	50	58	7	14%	Pass	Pass
17	9 EB	28	40	12	43%	Pass	Fail
18	9 WB	29	27	-2	-9%	Pass	Pass
19	10 EB	70	70	0	0%	Pass	Pass
20	10 WB	85	73	-12	-14%	Pass	Pass
21	11 EB	83	97	14	17%	Pass	Fail
22	11 WB	85	93	8	9%	Pass	Pass
23	12 NB	48	43	-5	-11%	Pass	Pass
24	12 SB	54	51	-3	-5%	Pass	Pass
25	13 EB	59	62	3	5%	Pass	Pass
26	13 WB	55	55	0	0%	Pass	Pass
27	14 NB	37	39	2	5%	Pass	Pass
28	14 SB	36	39	2	6%	Pass	Pass
29	15 NB	45	39	-7	-15%	Pass	Fail
30	15 SB	26	28	1	5%	Pass	Pass
31	16 NB	51	48	-2	-5%	Pass	Pass
32	16 SB	34	34	0	1%	Pass	Pass
33	17 NB	10	8	-3	-25%	Pass	Fail
34	17 SB	24	14	-11	-44%	Pass	Fail
35	18 NB	27	25	-2	-7%	Pass	Pass
36	18 SB	44	30	-14	-32%	Pass	Fail
37	19 EB	17	18	0	2%	Pass	Pass
38	19 WB	47	35	-12	-25%	Pass	Fail
39	20 NB	7	11	4	67%	Pass	Fail
40	20 SB	18	20	2	9%	Pass	Pass
41	21 EB	93	71	-22	-24%	Pass	Fail
42	21 WB	41	43	2	5%	Pass	Pass
43	22 NB	9	11	3	30%	Pass	Fail
44	22 SB	21	26	6	28%	Pass	Fail
45	23 NB	137	138	1	1%	Pass	Pass
46	23 SB	35	29	-5	-15%	Pass	Pass
47	24 NB	67	72	5	8%	Pass	Pass
48	24 SB	77	89	11	15%	Pass	Pass
49	25 NB	58	53	-4	-7%	Pass	Pass
50	25 SB	62	69	7	12%	Pass	Pass
51	26 EB	60	67	6	10%	Pass	Pass
52	26 WB	64	72	8	12%	Pass	Pass
53	27 NB	30	29	-1	-3%	Pass	Pass
54	27 SB	27	24	-3	-10%	Pass	Pass
55	28-1 EB	16	26	10	64%	Pass	Fail
56	28-2 EB	2	2	0	-4%	Pass	Pass
57	28-3 SB	6	5	-1	-11%	Pass	Pass
58	28-4 SB	2	2	0	-10%	Pass	Pass
59	28-5 SB	6	17	11	174%	Pass	Fail
60	28-6 SB	1	2	0	25%	Pass	Fail
61	28-7 WB	15	25	10	65%	Pass	Fail
62	28-8 WB	5	5	0	2%	Pass	Pass
63	28-9 NB	7	23	16	243%	Pass	Fail
64	28-10 NB	2	4	2	111%	Pass	Fail
65	29-1 EB	3	3	0	-8%	Pass	Pass
66	29-2 EB	1	1	0	21%	Pass	Fail
67	29-3 SB	3	3	1	25%	Pass	Fail
68	29-4 SB	1	1	0	35%	Pass	Fail
69	29-5 SB	3	4	0	5%	Pass	Pass
70	29-6 WB	0	0	0	3%	Pass	Pass
71	29-7 WB	3	4	1	16%	Pass	Fail
72	29-8 WB	1	1	0	14%	Pass	Pass
73	29-9 NB	4	5	1	36%	Pass	Fail
74	29-10 NB	1	2	1	57%	Pass	Fail
75	30-1 EB	3	3	0	14%	Pass	Pass
76	30-2 EB	1	1	0	54%	Pass	Fail
77	30-3 SB	3	4	0	2%	Pass	Pass
78	30-4 SB	2	2	0	-5%	Pass	Pass
79	30-5 WB	2	2	0	20%	Pass	Fail
80	30-6 WB	2	2	0	1%	Pass	Pass
81	30-7 NB	3	3	0	0%	Pass	Pass
82	30-8 EB	2	2	0	-2%	Pass	Pass
83	30-9 EB	13	9	-3	-26%	Pass	Fail
84	30-10 SB	13	12	0	-4%	Pass	Pass
85	31-1 EB	2	2	0	17%	Pass	Fail
86	31-2 EB	1	1	0	-36%	Pass	Fail
87	31-3 SB	2	3	1	33%	Pass	Fail
88	31-4 SB	1	2	0	39%	Pass	Fail
89	31-5 WB	3	3	0	11%	Pass	Pass
90	31-6 WB	1	1	0	-17%	Pass	Fail
91	31-7 NB	3	3	0	11%	Pass	Pass
92	31-8 NB	1	2	1	36%	Pass	Fail
93	32-1 EB	2	2	0	12%	Pass	Pass
94	32-2 EB	2	2	0	-3%	Pass	Pass
95	32-3 SB	3	3	0	-3%	Pass	Pass
96	32-4 SB	2	1	-1	-46%	Pass	Fail
97	32-5 WB	3	3	0	-1%	Pass	Pass
98	32-6 WB	3	2	-1	-40%	Pass	Fail
99	32-7 NB	3	3	0	3%	Pass	Pass
100	32-8 EB	2	2	0	-6%	Pass	Pass

Appendix D Queue Length Validation Results

Local Model Validation Report

Huscote Farm VISSIM

David Tucker Associates

SLR Project No.: 431.000006.00000

13 February 2024

AM Max Queue Lengths (Vehicles)

Junction Number	Junction Name	No.	From	07:30 - 07:35			07:35 - 07:40			07:40 - 07:45			07:45 - 07:50		
				Observed	Modelled	Difference	Observed	Modelled	Difference	Observed	Modelled	Difference	Observed	Modelled	Difference
1	M40 J11	1	M40 North	8	8	0	10	8	-2	10	9	0	8	8	0
		2	Internal Queue 1	8	18	10	8	21	13	11	20	9	10	19	10
		3	A361	22	13	-9	24	25	0	30	24	-6	15	32	17
		4	A422 East	8	11	3	12	14	2	23	12	-11	21	13	-8
		5	Internal Queue 2	10	13	3	13	15	2	11	18	7	19	19	-1
		6	M40 South	4	6	2	6	8	2	8	8	1	6	8	2
		7	Internal Queue 3	2	13	11	8	16	9	7	18	11	7	16	9
		8	A422 West	10	12	2	13	12	-1	24	15	-9	11	14	2
		9	Internal Queue 4	9	7	-2	9	6	-3	13	6	-7	16	6	-9
2	A422 / Wildmere Rd / Ermont Way Roundabout	1	Wildmere Rd	2	3	2	3	2	-1	2	2	1	2	2	0
		2	A422 East	10	4	-6	4	6	1	7	9	2	6	8	2
		3	Ermont Way	11	10	-2	6	9	3	5	9	4	5	11	6
		4	A422 West	17	39	23	28	59	31	62	64	3	90	69	-20
3	Concord Roundabout	1	Grimsbury Green	2	3	1	2	3	1	3	3	0	2	4	2
		2	A422 East	3	3	1	2	4	3	3	6	4	3	4	2
		3	A4260 Concord Ave	3	3	0	7	3	-4	14	5	-9	13	5	-8
		4	A422 West	6	23	17	7	28	21	14	30	16	33	27	-6
4	A422 / Southam Rd Roundabout	1	Southam Rd North	10	12	1	4	19	15	6	21	15	5	9	3
		2	A422 East	5	6	1	5	8	2	5	10	5	4	8	4
		3	Southam Rd South	3	2	0	3	3	-1	2	2	1	8	4	-4
		4	A422 West	4	4	0	3	7	4	7	6	-1	11	5	-6
5	Southam Rd / Beaumont Rd	1	Southam Rd North	14	15	1	44	22	-22	37	15	-21	37	23	-14
		2	Southam Rd South	6	2	-4	6	4	-2	3	4	0	4	4	0
		3	Beaumont Rd LT	0	1	1	1	1	1	0	1	1	0	1	1
		4	Beaumont Rd RT	3	2	0	2	3	1	3	3	-1	3	2	-1
6	Wildmere Rd Junction	1	Wildmere Rd North	2	0	-2	0	1	1	2	1	-1	0	0	0
		2	Brookhill Way	0	0	0	0	1	1	1	0	-1	1	1	0
		3	Internal Queue NB	1	0	-1	2	1	-1	2	0	-1	0	2	2
		4	Internal Queue SB	3	3	0	2	2	0	2	3	1	2	2	0
		5	Wildmere Rd South	2	6	5	3	5	1	2	5	3	5	4	-1
		6	Wildmere Rd West	3	4	1	3	2	-1	2	3	1	3	3	0
7	A422 / B4525 / Mansion Hill Roundabout	1	B4525 Banbury Lane	7	8	1	4	7	3	4	10	6	9	10	2
		2	Mansion Hill	1	3	2	3	3	0	3	3	0	3	3	0
		3	A422 East	5	2	-3	3	3	0	4	3	-1	3	3	0
		4	Unnamed Rd South	2	1	-1	4	1	-3	1	1	0	2	2	0
		5	A422 West	0	1	1	0	2	2	2	3	1	2	2	0

Junction Number	Junction Name	No.	From	07:50 - 07:55			07:55 - 08:00			08:00-08:05			08:05-08:10		
				Observed	Modelled	Difference	Observed	Modelled	Difference	Observed	Modelled	Difference	Observed	Modelled	Difference
1	M40 J11	1	M40 North	11	11	0	9	8	-1	5	8	3	12	7	-5
		2	Internal Queue 1	14	20	6	9	20	11	6	17	11	10	18	9
		3	A361	17	39	23	10	34	25	6	33	27	9	30	21
		4	A422 East	23	14	-8	15	13	-2	17	14	-3	7	12	5
		5	Internal Queue 2	20	17	-3	15	18	3	19	16	-4	17	13	-3
		6	M40 South	8	7	-1	3	8	5	5	7	2	10	8	-2
		7	Internal Queue 3	6	17	11	6	19	13	3	23	20	5	14	8
		8	A422 West	17	12	-5	7	12	5	16	11	-4	10	12	2
		9	Internal Queue 4	10	5	-5	10	6	-3	10	6	-5	16	5	-11
2	A422 / Wildmere Rd / Ermont Way Roundabout	1	Wildmere Rd	3	3	0	3	2	-2	3	2	0	4	2	-2
		2	A422 East	23	9	-13	10	8	-2	3	8	5	5	8	2
		3	Ermont Way	19	14	-5	10	11	1	4	21	17	7	21	14
		4	A422 West	93	60	-33	93	66	-27	96	79	-16	89	86	-3
3	Concord Roundabout	1	Grimsbury Green	2	2	1	2	3	2	1	3	2	3	3	0
		2	A422 East	3	9	6	8	7	-1	3	8	6	3	7	4
		3	A4260 Concord Ave	15	5	-10	6	7	1	6	7	1	7	7	0
		4	A422 West	42	28	-13	43	19	-24	30	18	-11	37	13	-24
4	A422 / Southam Rd Roundabout	1	Southam Rd North	5	7	1	20	6	-14	4	7	2	7	11	4
		2	A422 East	10	12	2	10	13	4	6	9	3	10	12	2
		3	Southam Rd South	9	5	-4	7	4	-2	3	5	2	4	5	1
		4	A422 West	6	7	1	3	8	5	5	8	3	3	6	3
5	Southam Rd / Beaumont Rd	1	Southam Rd North	19	25	6	37	22	-14	11	17	6	17	22	4
		2	Southam Rd South	6	7	1	14	8	-6	15	5	-9	7	5	-2
		3	Beaumont Rd LT	1	1	0	2	1	-1	1	1	0	2	1	-1
		4	Beaumont Rd RT	2	4	2	3	2	0	2	2	0	3	3	0
6	Wildmere Rd Junction	1	Wildmere Rd North	0	0	0	0	0	0	0	0	0	1	0	-1
		2	Brookhill Way	1	1	0	1	1	0	0	0	0	1	1	0
		3	Internal Queue NB	2	2	0	1	1	0	0	0	0	3	1	-2
		4	Internal Queue SB	1	2	1	2	2	0	1	2	1	2	2	1
		5	Wildmere Rd South	5	5	0	5	5	0	4	5	1	4	5	1
		6	Wildmere Rd West	1	3	2	2	3	1	2	3	2	2	2	0
7	A422 / B4525 / Mansion Hill Roundabout	1	B4525 Banbury Lane	3	13	11	6	13	7	13	13	0	2	10	8
		2	Mansion Hill	2	4	3	3	4	1	3	5	2	3	3	0
		3	A422 East	6	3	-3	1	3	2	3	3	0	4	3	-2
		4	Unnamed Rd South	2	2	0	1	2	1	3	2	-1	3	3	-1
		5	A422 West	1	5	4	1	6	5	1	5	4	3	4	2

Junction Number	Junction Name	No.	From	08:10-08:15			08:15-08:20			08:20-08:25			08:25-08:30			Peak Hour 07:30-08:30		
				Observed	Modelled	Difference	Observed	Modelled	Difference	Observed	Modelled	Difference	Observed	Modelled	Difference	Average Observed	Average Modelled	Difference
1	M40 J11	1	M40 North	9	9	0	10	7	-3	6	6	0	7	7	0	9	8	-1
		2	Internal Queue 1	10	19	10	11	17	6	11	20	9	10	17	7	10	19	9
		3	A361	20	32	12	6	29	23	20	29	9	23	31	8	17	29	12
		4	A422 East	18	10	-8	15	15	0	17	14	-4	9	17	8	15	13	-2
		5	Internal Queue 2	23	14	-8	18	17	-2	20	16	-4	17	17	0	17	16	-1
		6	M40 South	11	8	-3	5	8	3	10	10	0	12	9	-4	7	8	0
		7	Internal Queue 3	4	15	10	5	18	12	4	25	21	6	22	16	5	18	13
		8	A422 West	8	11	3	12	12	0	11	9	-2	17	10	-6	13	12	-1
		9	Internal Queue 4	14	5	-9	9	7	-2	8	5	-2	8	5	-3	11	6	-5
2	A422 / Wildmere Rd / Ermont Way Roundabout	1	Wildmere Rd	2	2	0	2	2	0	3	2	-1	3	2	-1	3	2	0
		2	A422 East	13	7	-6	8	8	0	12	12	0	7	9	2	9	8	-1
		3	Ermont Way	9	12	3	10	11	1	22	13	-8	10	21	12	10	14	4
		4	A422 West	94	80	-14	96	81	-15	96	75	-20	95	75	-19	79	70	-9
3	Concord Roundabout	1	Grimsbury Green	1	4	3	2	4	2	2	3	1	2	2	0	2	3	1
		2	A422 East	3	9	7	4	8	3	3	5	3	10	6	-3	4	6	3
		3	A4260 Concord Ave	4	5	1	10	5	-6	16	6	-10	15	7	-8	10	5	-4
		4	A422 West	32	24	-8	34	23	-11	31	16	-15	29	16	-12	28	22	-6
4	A422 / Southam Rd Roundabout	1	Southam Rd North	5	18	13	3	7	4	3	4	1	4	5	0	7	10	4
		2	A422 East	9	13	5	4	11	7	8	12	4	10	13	4	7	11	4
		3	Southam Rd South	3	4	0	2	3	2	3	3	-1	3	4	2	4	4	0
		4	A422 West	3	7	3	3	4	1	4	5	0	3	4	1	5	6	1
5	Southam Rd / Beaumont Rd	1	Southam Rd North	6	13	7	8	7	-1	23	8	-14	14	7	-7	22	16	-6
		2	Southam Rd South	3	6	3	3	3	-1	4	6	2	7	3	-4	7	5	-2
		3	Beaumont Rd LT	1	1	0	2	1	-1	2	1	-1	2	1	-1	1	1	0
		4	Beaumont Rd RT	1	2	1	2	1	-1	1	1	0	2	1	-1	2	2	0
6	Wildmere Rd Junction	1	Wildmere Rd North	0	0	0	1	1	0	3	2	-1	1	2	1	1	1	0
		2	Brookhill Way	0	1	1	3	1	-2	2	3	1	1	2	1	1	1	0
		3	Internal Queue NB	0	1	1	3	2	-1	4	3	-1	0	2	2	1	1	0
		4	Internal Queue SB	2	2	0	5	3	-2	3	3	0	1	2	2	2	2	0
		5	Wildmere Rd South	3	5	2	3	8	4	6	5	-1	3	5	2	4	5	1
		6	Wildmere Rd West	2	3	1	2	3	1	3	2	0	2	3	1	2	3	1
7	A422 / B4525 / Mansion Hill Roundabout	1	B4525 Banbury Lane	10	12	2	6	15	9	10	12	2	8	6	-1	7	11	4
		2	Mansion Hill	3	4	1	3	3	1	4	4	0	7	2	-5	3	3	0
		3	A422 East	5	2	-3	5	3	-2	3	5	1	7	4	-3	4	3	-1
		4	Unnamed Rd South	3	2	-1	2	3	1	1	3	2	2	3	1	2	2	0
		5	A422 West	2	4	2	1	5	4	0	3	3	3	3	1	1	4	2

PM Max Queue Lengths (Vehicles)

Junction Number	Junction Name	No.	From	16:30 - 16:35			16:35 - 16:40			16:40 - 16:45			16:45 - 16:50			16:50 - 16:55			16:55 - 17:00			17:00 - 17:05		
				Observed	Modelled	Difference	Observed	Modelled	Difference	Observed	Modelled	Difference	Observed	Modelled	Difference	Observed	Modelled	Difference	Observed	Modelled	Difference	Observed	Modelled	Difference
1	M40 J11	1	M40 North	4	6	2	5	6	1	5	6	1	8	6	-1	8	6	-1	4	6	1	5	5	0
		2	Internal Queue 1	5	26	21	6	28	21	10	31	22	8	31	23	8	24	16	6	24	18	4	29	25
		3	A361	4	4	0	3	3	1	5	5	0	5	4	-1	5	5	0	4	5	1	3	4	0
		4	A422 East	12	6	-6	10	6	-4	13	8	-5	13	7	-6	9	8	-1	9	7	-2	9	8	-1
		5	Internal Queue 2	7	7	0	10	8	-1	10	9	-1	7	9	2	12	9	-4	8	8	0	7	8	2
		6	M40 South	8	11	3	10	12	1	10	13	3	12	13	1	10	11	1	11	12	1	10	12	2
		7	Internal Queue 3	4	12	7	13	12	-1	6	14	8	7	14	7	3	13	10	8	14	6	4	14	9
		8	A422 West	28	15	-13	11	24	13	29	23	-6	18	28	9	28	17	-11	15	19	4	17	18	1
		9	Internal Queue 4	12	11	-1	7	10	3	10	13	3	8	13	5	15	13	-2	9	14	5	13	14	1
2	A422 / Wildmere Rd / Ermont Way Roundabout	1	Wildmere Rd	9	7	-1	12	9	-3	13	11	-2	12	11	-1	11	9	-2	10	8	-2	13	9	-4
		2	A422 East	9	6	-3	8	7	-1	8	8	0	12	12	-1	7	8	1	8	6	-2	4	7	2
		3	Ermont Way	15	27	12	10	33	23	21	39	18	15	37	22	15	37	22	14	33	19	8	29	22
		4	A422 West	28	12	-16	14	9	-5	8	10	2	29	8	-21	14	13	-1	29	17	-12	11	16	4
3	Concord Roundabout	1	Grimsbury Green	1	2	1	1	1	1	3	2	-1	1	1	0	2	1	-1	3	1	-1	2	1	0
		2	A422 East	3	9	6	5	16	10	8	13	5	3	17	14	4	15	11	3	13	10	4	12	7
		3	A4260 Concord Ave	6	8	2	3	15	11	9	12	3	10	13	3	10	10	0	9	10	2	3	11	7
		4	A422 West	8	11	3	11	15	4	11	21	10	4	18	14	10	13	2	10	11	1	11	11	-1
4	A422 / Southam Rd Roundabout	1	Southam Rd North	4	5	1	4	7	2	17	6	-10	3	8	6	5	4	-1	10	4	-5	9	7	-2
		2	A422 East	7	13	6	10	12	2	9	13	4	13	17	4	15	17	3	16	13	-2	14	13	-1
		3	Southam Rd South	6	5	-1	11	4	-7	10	4	-6	5	5	-1	8	5	-3	4	7	3	6	9	3
		4	A422 West	18	6	-12	18	8	-10	17	7	-11	19	6	-13	20	11	-9	17	7	-9	14	5	-8
5	Southam Rd / Beaumont Rd	1	Southam Rd North	16	10	-5	21	13	-8	21	15	-6	6	13	7	9	8	0	6	9	3	9	16	7
		2	Southam Rd South	14	15	1	37	17	-20	24	19	-6	10	18	7	4	25	21	15	19	5	11	16	4
		3	Beaumont Rd LT	1	3	2	0	5	5	2	3	2	3	2	-1	2	3	1	3	2	-1	3	3	-1
		4	Beaumont Rd RT	12	7	-5	18	9	-9	11	7	-5	4	7	2	3	6	3	8	7	-1	5	8	2
6	Wildmere Rd Junction	1	Wildmere Rd North	5	5	0	14	6	-8	10	9	-2	4	6	2	3	6	2	4	6	2	34	6	-28
		2	Brookhill Way	3	4	2	6	4	-2	4	4	0	2	3	1	1	3	2	3	2	0	3	4	1
		3	Internal Queue NB	5	7	2	3	7	4	3	7	3	4	7	3	3	7	3	3	6	3	4	8	4
		4	Internal Queue SB	6	6	0	6	6	0	5	7	2	5	7	1	3	6	3	5	7	2	6	7	1
		5	Wildmere Rd South	3	10	7	4	7	2	5	7	2	8	8	1	3	11	8	3	11	8	4	7	3
		6	Wildmere Rd West	14	6	-8	20	7	-13	18	9	-9	3	7	4	3	5	2	43	6	-37	50	11	-39
7	A422 / B4525 / Mansion Hill Roundabout	1	B4525 Banbury Lane	5	5	0	6	7	1	4	10	6	10	8	-2	9	9	0	6	8	2	6	10	4
		2	Mansion Hill	1	2	1	2	3	1	3	2	-2	3	3	0	1	2	2	3	2	-1	2	2	1
		3	A422 East	3	2	0	2	2	1	1	2	1	3	3	0	4	3	-2	1	3	2	9	3	-6
		4	Unnamed Rd South	1	2	1	3	3	0	1	2	1	2	3	1	2	3	1	2	2	1	1	4	3
		5	A422 West	1	3	2	3	5	3	0	6	6	0	6	6	1	7	7	3	5	2	1	7	6

Junction Number	Junction Name	No.	From	17:05 - 17:10			17:10 - 17:15			17:15 - 17:20			17:20 - 17:25			17:25 - 17:30			Peak Hour 16:30-17:30		
				Observed	Modelled	Difference	Observed	Modelled	Difference	Observed	Modelled	Difference	Observed	Modelled	Difference	Observed	Modelled	Difference	Average Observed	Average Modelled	Difference
1	M40 J11	1	M40 North	5	5	0	7	6	-1	6	6	0	6	5	-1	11	6	-6	6	6	0
		2	Internal Queue 1	6	30	24	8	30	22	9	30	21	4	30	26	4	26	21	7	28	22
		3	A361	4	5	1	12	4	-9	5	6	1	5	6	1	10	4	-5	6	5	-1
		4	A422 East	13	10	-3	11	9	-2	15	9	-6	15	8	-6	11	8	-3	12	8	-4
		5	Internal Queue 2	11	10	-1	20	10	-10	17	10	-6	10	12	2	20	8	-12	12	9	-2
		6	M40 South	12	12	0	10	12	1	10	11	2	14	12	-2	14	13	-1	11	12	1
		7	Internal Queue 3	11	16	5	10	18	7	8	18	10	11	17	5	9	18	9	8	15	7
		8	A422 West	14	23	9	29	28	-1	30	30	0	30	24	-6	24	18	-7	23	22	0
		9	Internal Queue 4	7	16	9	13	16	3	14	17	3	8	11	3	11	15	3	11	14	3
2	A422 / Wildmere Rd / Ermont Way Roundabout	1	Wildmere Rd	12	15	3	13	15	2	13	15	2	12	11	-2	13	10	-3	12	11	-1
		2	A422 East	10	8	-2	11	6	-5	16	9	-7	10	14	4	11	14	3	9	9	-1
		3	Ermont Way	25	55	30	49	78	29	52	77	24	53	65	12	55	45	-9	28	46	19
		4	A422 West	12	18	6	14	21	7	8	16	9	19	11	-8	19	18	-1	17	14	-3
3	Concord Roundabout	1	Grimsbury Green	1	1	0	1	1	0	1	1	0	2	1	-1	1	1	0	1	1	0
		2	A422 East	5	12	7	6	22	15	6	22	16	12	20	7	8	17	9	6	16	10
		3	A4260 Concord Ave	10	7	-3	4	8	4	17	9	-9	32	9	-23	26	9	-17	12	10	-2
		4	A422 West	9	13	5	8	15	8	9	13	4	13	10	-3	4	12	8	9	14	4
4	A422 / Southam Rd Roundabout	1	Southam Rd North	4	6	2	3	8	5	3	10	6	5	5	0	3	5	1	6	6	0
		2	A422 East	16	17	2	41	15	-26	43	19	-24	45	17	-28	43	14	-29	22	15	-7
		3	Southam Rd South	8	6	-2	23	5	-17	12	5	-7	7	6	-1	4	5	1	9	5	-3
		4	A422 West	9	10	1	6	7	1	14	7	-7	13	6	-7	18	12	-7	15	8	-8
5	Southam Rd / Beaumont Rd	1	Southam Rd North	40	14	-26	39	14	-25	23	12	-10	12	11	-1	7	10	3	17	12	-5
		2	Southam Rd South	14	25	11	22	20	-2	17	17	0	20	17	-3	17	15	-2	17	19	1
		3	Beaumont Rd LT	3	4	2	3	6	4	2	4	2	3	3	0	3	3	0	2	3	1
		4	Beaumont Rd RT	15	9	-6	9	11	2	3	8	6	4	6	2	4	5	1	8	8	-1
6	Wildmere Rd Junction	1	Wildmere Rd North	36	6	-30	23	7	-16	10	11	0	6	9	3	1	10	9	13	7	-5
		2	Brookhill Way	11	5	-6	10	6	-4	3	5	1	5	4	-1	3	3	1	4	4	-1
		3	Internal Queue NB	2	6	4	5	7	1	5	8	3	1	8	7	3	8	6	3	7	4
		4	Internal Queue SB	5	8	3	7	8	1	6	9	3	4	8	4	4	8	4	5	7	2
		5	Wildmere Rd South	6	7	0	8	8	0	3	9	6	1	10	9	3	10	6	4	9	4
		6	Wildmere Rd West	51	16	-35	54	21	-33	10	16	6	6	5	-1	4	5	1	23	9	-14
7	A422 / B4525 / Mansion Hill Roundabout	1	B4525 Banbury Lane	5	10	5	10	15	5	10	11	1	3	12	9	3	9	6	6	10	3
		2	Mansion Hill	2	3	1	3	3	0	3	3	-1	2	3	1	2	3	1	2	3	0
		3	A422 East	3	3	0	2	3	1	3	3	0	4	3	-2	3	2	0	3	3	0
		4	Unnamed Rd South	5	5	0	4	5	0	3	4	0	5	4	-2	3	4	0	3	3	1
		5	A422 West	1	6	5	3	5	3	4	8	3	3	7	5	3	5	2	2	6	4

Making Sustainability Happen

SLR Consulting Limited

David Tucker Associates

Huscote Farm VISSIM

SLR Project No.: 431.000006.00000

26 February 2024

Revision: 01

RE: SIGNAL TIMINGS AND SATURATION FLOW SUMMARY

1.0 Introduction

1.1 SLR Consulting Ltd (SLR) has been commissioned by David Tucker Associates (DTA) to develop a VISSIM model in support of the Huscote Farm planning application.

1.2 SLR submitted the first draft of models in October 2023. Following a review by AECOM on behalf of National Highways in December 23/January 24, SLR resubmitted a set of revised models along with an Audit Response Note[1] in early February 2024.

1.3 Following a meeting between SLR, DTA, AECOM and Oxfordshire County Council (OCC) on 9th February 2024, AECOM requested evidence that the signal timings in the model were reflective of the observed on-street, and also requested confirmation of the saturation flows at M40 J11. This Note sets out amendments made to the model to satisfy these requests.

2.0 M40 J11 Signal Timings

Average Green Times

2.1 The Base model includes signals using VISVAP; a PTV software product which simulates the demand-responsive nature of adaptable signal controllers on street. Whilst MOVA is present on street, the PC-MOVA connection with VISSIM can cause issues with multi-running where model crashes are relatively frequent.

2.2 For the purposes of this base model development VISVAP is preferred, with output timings from the VISSIM model compared with the timings provided via on-street surveys carried out on 23rd June 2023. The results are tabulated below:

[1] VM230598.R004 Huscote Farm Audit Response

Table 1: Average Survey and VISSIM Green Times

	AM PEAK HOUR							
	A	B	C	D	E	F	G	H
Survey Average Green Time	33	18	33	18	13	38	29	22
VISSIM Average Green Time	22	30	34	31	14	41	27	13
Difference	-11	12	1	13	1	3	-2	-9
	PM PEAK HOUR							
	A	B	C	D	E	F	G	H
Survey Average Green Time	30	26	30	25	20	36	36	21
VISSIM Average Green Time	16	38	22	17	23	32	36	26
Difference	-14	12	-8	-8	3	-4	0	5

2.3 The corresponding A-H signalised stop-lines are represented in the image below:

Figure A: Signalised Stop-Lines

2.4 On the whole, results demonstrate that modelled and observed average green times show a strong correlation, with the exception of the M40 southbound off-slip and corresponding circulatory signals, and the A422 East. Whilst every attempt has been made to correlate the modelled and observed green times at these locations across both peak periods, it has not been possible to revise further without compromising the calibration and validation results.

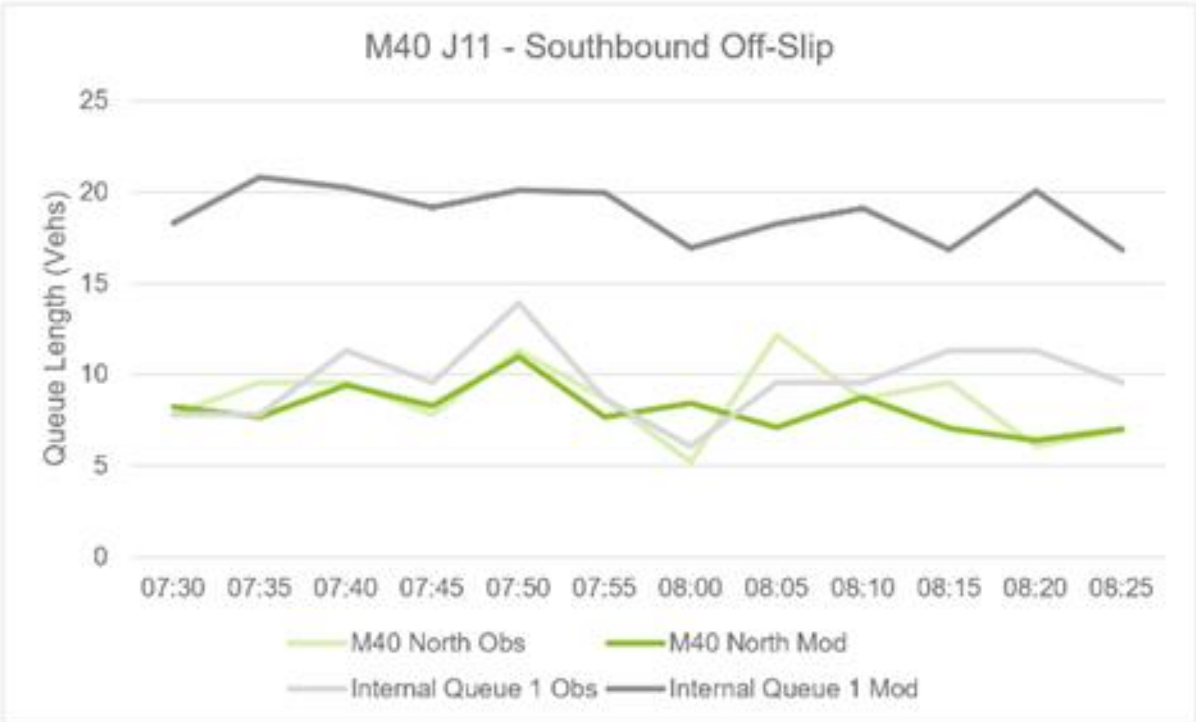
2.5 While the signal outputs suggest the modelled green time on the southbound off-slip during the AM peak is lower than surveyed, providing more green time results in extended queues on the circulatory that do not align with the queue and journey time data used to evidence model validation.

2.6 Journey time data for the southbound slip and the eastbound circulatory section before the signal head shows a good correlation, with modelled slip journey times slightly fast and circulatory times slightly slow.

2.7 Queue data, as provided in the Figure below, shows that the modelled slip queues are almost identical to observed, while modelled circulatory queues are slightly high. This highlights that while we have endeavoured to reduce the difference between modelled and observed green times at this location, validation data sources do not allow further revisions due to the impact a lower circulatory green time would have on validation.

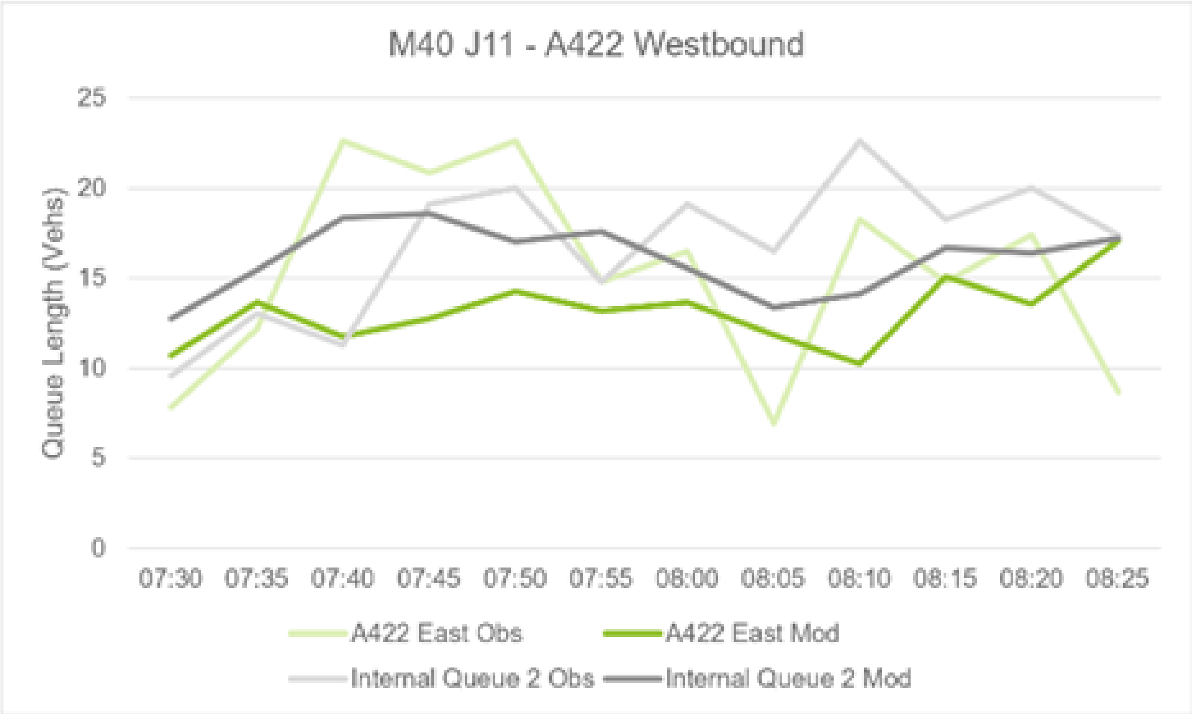
2.8 Furthermore, considering the saturation flow analysis shows all lanes within ~5% of the observed, we can be confident the model is not significantly under or over-representing the flow rate over the stop-lines.

Figure B: Queue Profile || M40 J11 Southbound Slip Signalised Node || AM Peak



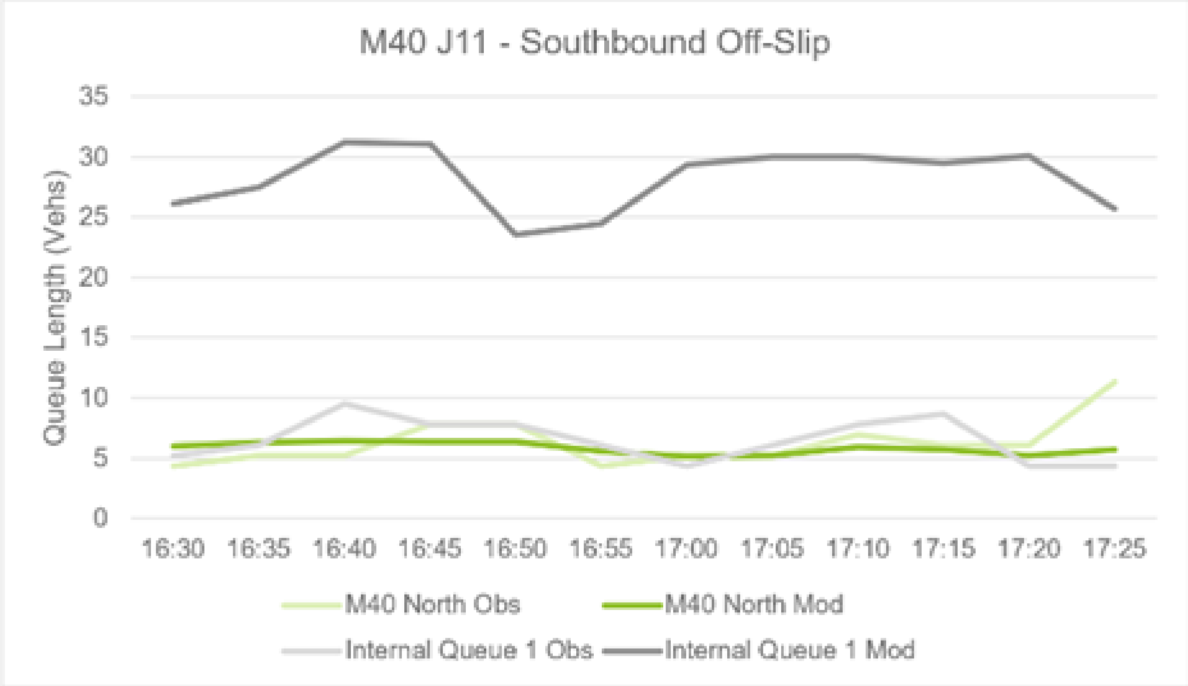
2.9 A similar exercise has been carried out for the A422 westbound/circulatory signalised node to evidence that the modelled queue lengths are consistent with observed; see Figure below.

Figure C: Queue Profile || M40 J11 A422 Westbound Signalised Node || AM Peak



2.10 In the PM, the southbound off-slip and circulatory signals also show differences exceeding 10s for the modelled vs observed average green times. The southbound off-slip has a modelled green time that is lower than the observed, whereas the internal queue has a modelled green time that is higher than the observed. The Figure below shows the queue profiles for southbound off-slip/circulatory signal approaches in the PM:

Figure D: Queue Profile || M40 J11 Southbound Slip Signalised Node || PM Peak



2.11 The graph shows that as per the AM, the modelled internal queue length is higher than the observed and therefore decreasing the green time here to better fit the signal data will result in a larger disparity between queue lengths. Modelled journey times on the approach to the circulatory signals are also slightly higher than the observed, again determining that further reductions in modelled green time are not possible without a significant detriment to the level of validation and the model performance.

2.12 In each case observed signal green times have been surveyed manually on a single day, meaning that signal timings recorded on a different day may well show a closer correlation. Considering journey time data has been sourced from a month of data, the differences in survey dates is likely to be contributing to the differences in green times.

2.13 Elsewhere across the junction however the modelled green times match well, and the model more generally shows a very high level of queue calibration and journey time validation. It is our view that the model is fit for purpose in testing the forecast impact of this development.

Saturation Flows

2.14 The Table below provides a comparison of observed and modelled saturation flows for all signalised stop-lines.

Table 2: Saturation Flows (PCU/Hour)

LOCATION	MVMNT	SIG	NO.	WIDTH	RADIUS	OBS	AM		PM	
							MOD	%	MOD	%
M40 J11 North	Left	28	1	3.5	55	1913	1933	1%	1814	-5%
	Middle	30	2	3.5	55	1913	2044	6%	2038	6%
	Right	29	3	3.5	55	1913	1827	-5%	1885	-1%
	Left	32	4	3.5	70	1924	1821	-6%	1834	-5%
	Right	31	5	3.5	70	1924	1894	-2%	1946	1%
M40 J11 East	Left	34	6	3.5	50	1908	-	-	-	-
	Middle	36	7	3.5	50	1908	1718	-11%	1728	-10%
	Right	35	7	3.5	50	1908	1792	-6%	1690	-13%
	Left	37	8	3.5	90	1933	1831	-6%	1801	-7%
	Middle	39	9	3.5	90	1933	1783	-8%	1823	-6%
	Right	38	9	3.5	90	1933	1846	-5%	1761	-10%
M40 J11 South	Left	41	10	3.5	80	1929	1911	-1%	2005	4%
	Middle	42	11	3.5	80	1929	1811	-7%	1842	-5%
	Right	40	12	3.5	80	1929	1808	-7%	1983	3%
	Left	44	13	3.5	75	1926	1859	-4%	1846	-4%
	Right	43	14	3.5	75	1926	1867	-3%	1838	-5%
M40 J11 West	Right	45	15	3.5	50	1908	1885	-1%	1915	0%
	Left	46	16	3.5	50	1908	1812	-5%	1897	-1%
	Right	47	17	3.5	70	1924	1845	-4%	1804	-7%
	Left	48	18	3.5	70	1924	1759	-9%	1804	-7%

2.15 The results show that all but one falls within the 10% difference criteria as suggested by TfL[2].

3.0 Summary

3.1 SLR Consulting Ltd (SLR) has been commissioned by David Tucker Associates (DTA) to develop a VISSIM model in support of the Huscote Farm planning application.

3.2 Following a meeting between SLR, DTA, AECOM and Oxfordshire County Council (OCC) on 9th February 2024, AECOM requested evidence that the signal timings in the model were reflective of the observed on-street, and also requested confirmation of the saturation flows at M40 J11.

3.3 This Note summarises the results of green time and saturation flow rate calibration, and is submitted alongside a revised Base model, LMVR and calibration spreadsheet for review.

3.4 Modelled green times match the observed data well, with some discrepancies that can be explained by the different survey data sources and methods. Furthermore whilst we have improved the green time correlation since the previous reviewed submission, further revisions are not possible due to the knock-on impacts primarily on journey time validation which falls outside of industry standards if green times are matched precisely.

3.5 SLR considers that the model is fit for purpose and capable of reliably informing an assessment of the proposed development.

[2] Traffic Modelling Guidelines Version 4.0, Para 3.5.2.2.

Making Sustainability Happen

Appendix C

M40, J11, Huscote Farm

Uncertainty Log

DTA

Transport Planning Consultants

1. The uncertainty log from the Banbury Traffic Model (BTM) is attached at **Appendix 1**.

2. The principal employment sites are Banbury 6 West of M40, Banbury 15 North East of M40 J11.

3. As reported in Table 10 of the Cherwell Annual Monitoring Report (AMR):

- Banbury 6 is largely built out, 29.1Ha. There is no planning permission in place for the remaining 5.9Ha.
- Banbury 15 is partly built out. There is planning permission for employment the remaining which has been explicitly allowed for as a committed development as agreed in the previous appeal SoCG.

4. TEMPRO growth has been applied in accordance with WebTAG guidance. TEMPRO geography is defined by the middle super output area boundaries. For Cherwell 01-09 the forecast jobs created between 2022-2028 are 1,374 jobs and between 2023-2028 are 1,100 jobs. Proportionate increase is allowed for to the forecast year.

5. As reported in Appendix A of the Cherwell AMR most housing supply in Banbury (2023-2028 1,483 dwellings) will come from strategic allocations including Banbury 17 South of Salt Way, Banbury 18 Drayton Lodge Farm and Banbury 2 Land West of Southam Road.

- Banbury 2 is located to the North of the town. Reserved matters permission has been granted for 90 homes.
- Banbury 17 is located to the South of the town. Outline planning permission has been granted for 1,000 homes. Detailed permission has been granted for 303 homes of which 179 homes were completed by 31/03/23.
- Banbury 18 is located to the West of the town. Outline planning permission has been granted for 320 homes.

6. Banbury 17 and Banbury 18 are not directly related to the proposed development site and therefore their respective demands will have dissipated to no more than the overall trendlines as per TEMPRO. Banbury 2 is being developed by a social housing developer for 90 units. These will load onto Southam Road outside but near to the western end of the modelled area.

The demand related to this development is likely to be of the order of 40 vehicles per hour during the peak hour periods.

7. For Cherwell 01-09 the forecast household formations between 2022-2028 are 1,590 households and between 2023-2028 are 1,311 households. On this basis the household creation projections between TEMPRO and the AMR are aligned. Proportionate increase is allowed for to the forecast year.

8. Contributions towards improvements on the Hennef Way corridor have been provided by developments including some of those cited above. The nature of the works is unclear, and the effect is not reflected within the base or forecast model.

Appendix 1

ID	Development Name	Notes	Location	Dev Type	Total Dev Units/ Area	Complete by Year (Units, 100sqm, beds)				Development Zone	Certainty	WebTAG Sc+
						2021	2026	2031				
Ref_18b	Banbury 8: Bolton Road Development Area	Houses plus Food Store. Chris Thom email: Food store less likely due to Spiceball		A1FoodStore	0	0	0	0		16090	Near Certain	Low,Core,High
Ref_12d	Banbury 1: Canalside	Mixed use site: 26ha (3,186m2 B1a, 10,774 A1, 1,616m2 A3/4)	16074/16076	A1Rpark	107.74	7.7	77.0	107.7		16133	Near Certain	Low,Core,High
Ref_19a	Banbury 9: Spiceball Development Area	Castle Quay 2 Retail (plus hotel and Leisure)		A1Rpark	29.42	29.42	29.42	29.42		16092	Certain	Low,Core,High
Ref_12e	Banbury 1: Canalside	Mixed use site: 26ha (3,186m2 B1a, 10,774 A1, 1,616m2 A3/4)	16074/16076	A3A4	16.16	1.2	11.5	16.2		16133	Near Certain	Low,Core,High
Ref_19b	Banbury 9: Spiceball Development Area	Castle Quay 2 Retail (plus hotel and Leisure)		A3A4	37.9	37.9	37.9	37.9		16092	Certain	Low,Core,High
Ref_17a	Banbury 6: Employment Land West of M40	Mixed Employment: 35Ha (6ha already built) Jobs – approximately 2,500. Assume 10:30:60 B1:B2:B8, 0.35 site area factor from OCC		B1	101.5	33.5	66.99	101.5		16051	Under Construction	Low,Core,High
Ref_21a	Banbury 15: Employment Land North East of Junction 11	B1 B2 B8 (see Local Plan) 13Ha. Assumptions on split/buildout)	West of 16056	B1	45.5	22.75	45.5	45.5		16139	More Than Likely	Core,High
Ref_12c	Banbury 1: Canalside	Mixed use site: 26ha (3,186m2 B1a, 10,774 A1, 1,616m2 A3/4)	16074/16076	B1a	31.86	2.3	22.8	31.86		16133	Near Certain	Low,Core,High
Ref_17b	Banbury 6: Employment Land West of M40	Mixed Employment: 35Ha (6ha already built) Jobs – approximately 2,500. Assume 10:30:60		B2	304.5	100.5	201	304.5		16051	Under Construction	Low,Core,High
Ref_21b	Banbury 15: Employment Land North East of Junction 11	B1 B2 B8 (see Local Plan) 13Ha. Assumptions on split/buildout)	West of 16056	B2	136.5	68.25	136.5	136.5		16139	More Than Likely	Core,High
Ref_17c	Banbury 6: Employment Land West of M40	Mixed Employment: 35Ha (6ha already built) Jobs – approximately 2,500. Assume 10:30:60		B8	609	201	401.9	609		16051	Under Construction	Low,Core,High
Ref_21c	Banbury 15: Employment Land North East of Junction 11	B1 B2 B8 (see Local Plan) 13Ha. Assumptions on split/buildout)	West of 16056	B8	273	136.5	273	273		16139	More Than Likely	Core,High
Ref_19c	Banbury 9: Spiceball Development Area	Castle Quay 2 Retail (plus hotel and Leisure)		C1	42.3	42.3	42.3	42.3		16092	Certain	Low,Core,High
Ref_1	62 64 & land to the rear of 58, 60 Oxford Road	Residential Completion		C3Dwellings	9	9	9	9		16003	Completed	Low,Core,High
Ref_2	Calthorpe House, 60 Calthorpe Street	Residential Completion		C3Dwellings	15	15	15	15		16003	Completed	Low,Core,High
Ref_3	Canalside House, Tramway Road	Residential Completion		C3Dwellings	14	14	14	14		16076	Completed	Low,Core,High
Ref_4	Dashwood School	Residential Completion		C3Dwellings	19	19	19	19		16075	Completed	Low,Core,High
Ref_5	Former allotment, Miller Road	Residential Completion		C3Dwellings	10	10	10	10		16020	Completed	Low,Core,High
Ref_6	Junction of Warwick Road & Foundry Street, 92-94 Warwick Road	Residential Completion		C3Dwellings	22	22	22	22		16070	Completed	Low,Core,High
Ref_7	Land adjoining & north west of 35 Crouch Hill Road	Residential Completion		C3Dwellings	27	27	27	27		16014	Completed	Low,Core,High
Ref_8	Lincoln House, Lincoln Close	Residential Completion		C3Dwellings	18	18	18	18		16021	Completed	Low,Core,High
Ref_9	Old Stanbridge Hall, Banbury School, Ruskin Road	Residential Completion		C3Dwellings	70	70	70	70		16001	Completed	Low,Core,High
Ref_10	Orchard Lodge, Warwick Road	Residential Completion		C3Dwellings	16	16	16	16		16070	Completed	Low,Core,High
Ref_11	Town Centre House. Southam Road	Residential Completion		C3Dwellings	39	39	39	39		16062	Completed	Low,Core,High
Ref_12a	Banbury 1: Canalside	Mixed use site: 26ha 70% Houses, 30% Flats. 700 dwellings from LP	16074/16076	C3Dwellings	490	35	350	490		16132	Near Certain	Low,Core,High
Ref_13a	Banbury 2: Hardwick Farm, Southam Road (east)	no more than 90 homes to the western side of Southam Road	north of 16059	C3Dwellings	510	472	510	510		16135	Certain	Low,Core,High
Ref_13c	Banbury 2: Hardwick Farm, Southam Road (west)	no more than 90 homes	north of 16059	C3Dwellings	90	83	90	90		16134	Certain	Low,Core,High
Ref_14	Banbury 3: West of Bretch Hill			C3Dwellings	400	334	400	400		16019	Certain	Low,Core,High
Ref_15	Banbury 4: Bankside Phase 2			C3Dwellings	600	50	550	600		16120	Near Certain	Low,Core,High
Ref_16a	Banbury 5: North of Hanwell Fields	West	(north of 16017)	C3Dwellings	272	228.5	272	272		16136	Certain	Low,Core,High
Ref_16b	Banbury 5: North of Hanwell Fields	East	(north of 16017)	C3Dwellings	272	228.5	272	272		16137	Certain	Low,Core,High
Ref_22	Banbury 16: South of Salt Way – West		South of 16014	C3Dwellings	350	175	350	350		16130	Certain	Low,Core,High
Ref_23a	Banbury 17: South of Salt Way – East (Land East of Bloxham Road)	This is the consented section (Victoria Park) 12/00080/OUT | OUTLINE - Residential development of up to 145 dwellings with associated access | OS Parcel 5700 South Of Salt Way At Crouch Farm Bloxham Road	North of 29141. Assume 45 already built/occupied	C3Dwellings	100	100	100	100		16131	Under Construction	Low,Core,High
Ref_23b	Banbury 17: South of Salt Way – East	Western section of Site. Assumed build out rate based on OCC numbers minus the eastern 2880	North of 29141	C3Dwellings	1000	255	670	1045		16142	Certain	Low,Core,High
Ref_23d	Banbury 17: South of Salt Way – East	Eastern section of site (max 280 dwellings). Assumed build out rate	North of 29141	C3Dwellings	280	140	280	280		16143	Certain	Low,Core,High
Ref_24	Banbury 18: Land at Drayton Lodge Farm		(north west of 16017)	C3Dwellings	250	125	250	250		16140	Near Certain	Low,Core,High
Ref_25a	Banbury 19: Land at Higham Way	70% houses to 30% flats		C3Dwellings	105	87.5	105	105		16075	Near Certain	Low,Core,High
Ref_26	West of Warwick Road			C3Dwellings	300	300	300	300		16141	Certain	Low,Core,High
Ref_12b	Banbury 1: Canalside	Mixed use site: 26ha 70% Houses, 30% Flats. 700 dwellings from LP	16074/16076	C3Flats	210	15	150	210		16132	Near Certain	Low,Core,High
Ref_25b	Banbury 19: Land at Higham Way	70% houses to 30% flats		C3Flats	45	37.5	45	45		16075	Near Certain	Low,Core,High
Ref_18a	Banbury 8: Bolton Road Development Area	Houses plus Food Store		C3Mixed	200	150	200	200		16090	Near Certain	Low,Core,High
Ref_19d	Banbury 9: Spiceball Development Area	Castle Quay 2 Retail (plus hotel and Leisure: Cinema)		D2Cinema	41.01	41.01	41.01	41.01		16092	Certain	Low,Core,High
Ref_13b	Banbury 2: Hardwick Farm, Southam Road (east)	Primary school	north of 16059	Primary	360	60	180	360		16135	Certain	Low,Core,High
Ref_23c	Banbury 17: South of Salt Way – East	onsite primary school	North of 29141	Primary	360	60	180	360		16142	Certain	Low,Core,High
Ref_20	Banbury 12: Land for the Relocation of Banbury United FC	2ndary school	Does this need to be a new	Secondary	600	0	0	600		16138	Certain	Low,Core,High

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