A428 Black Cat to Caxton Gibbet improvements

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9.102 Results of additional VISSIM modelling at M11 Junction 13

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9.102 Results of additional VISSIM modelling at M11 Junction 13

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1 Introduction

1.1 Task background and purpose

1.1.1 The Stage 3 SATURN model developed to test the impacts of the proposed A428 Black Cat to Caxton Gibbet improvements scheme ('the Scheme'), indicated flow changes at several locations including M11 Junction 13 in Cambridgeshire in the future years (2025 and 2040).

1.1.2 **Figure 1-1** shows the location of the M11 Junction 13 which is situated on the A1303 corridor, which connects to the A428 further west at Madingley Mulch roundabout.

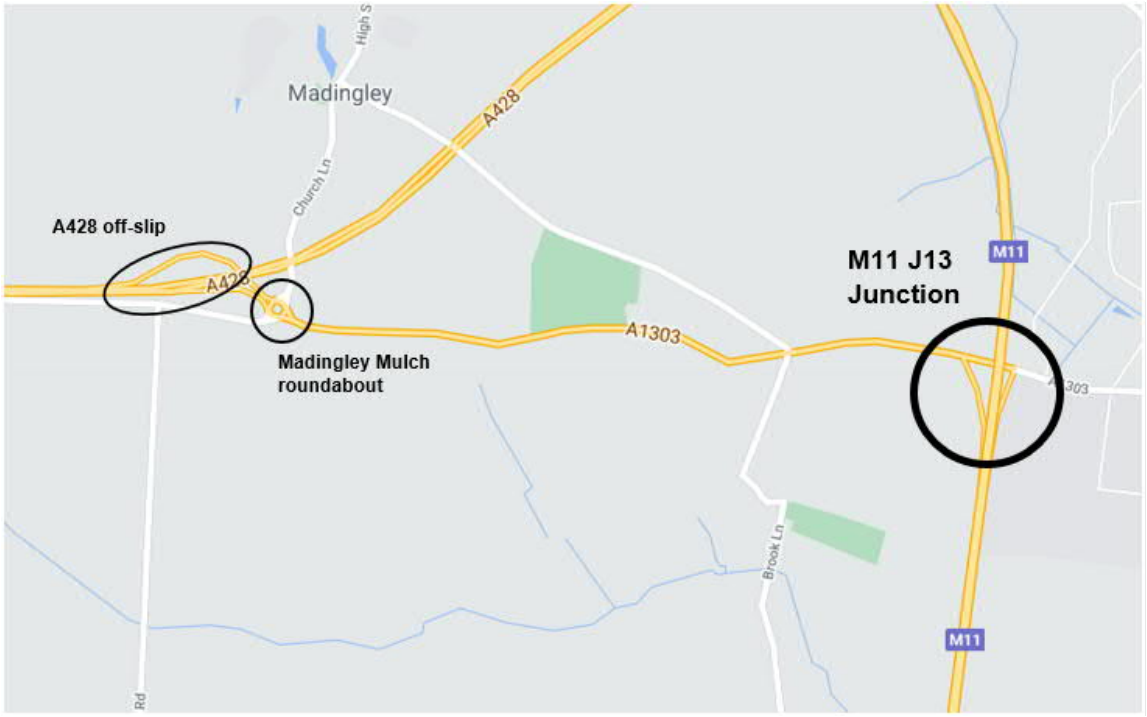

Figure 1-1 – Location of M11 J13, Madingley Mulch Roundabout and A428 off-slip

1.1.3 As a result of the proposed Scheme and other developments, the SATURN model predicts increased flows at the junction, particularly along the eastbound A1303 corridor. To test the localised impacts of the Scheme, AECOM developed Vissim models of M11 Junction 13, which also include the A1303 corridor. The development approach of the base year (2019) and forecast years (2025 and 2040) Vissim models is described in Appendix 2.2 (TN 50) of the DCO document (Ref **[APP-243]**: A428 Black Cat to Caxton Gibbet improvements - Volume 7 - 7.3 Transport Assessment Annex).

1.1.4 Future year traffic growth is predicted to increase traffic flows along the A1303 eastbound corridor which is already congested in the base year (2019) and the Scheme is predicted to increase these flows further. The Vissim Do Something (with Scheme) models predict significant A1303 eastbound queues extending back to the Madingley Mulch roundabout at the A428 slip road approach. The queues are likely to impact the A428 eastbound carriageway which would present potential safety issues. To assess the extent of the queues and the impact on the A428 eastbound, the Vissim models need to be extended, since the diverge from the A428 and eastbound A428 were not previously included in the models.

1.1.5 This Technical Note (TN 80) details the approach followed to develop the extended Vissim models and presents the outputs predicted by the models in the forecast scenarios (2025 and 2040). This note should be read in conjunction with Appendix 2.2 (TN 50) of the DCO document (Ref **[APP-243]**: A428 Black Cat to Caxton Gibbet improvements - Volume 7 - 7.3 Transport Assessment Annex).

1.1.6 The previous, non-extended, models submitted in the DCO were reviewed by Cambridgeshire County Council (CCC). CCC raised concerns regarding the loading of the North West Cambridge development, specifically that the development zone was in the incorrect location. The models have been updated to address this issue, with the development zone accessed via Eddington Avenue.

2 Vissim model development

2.1 Introduction

2.1.1 The M11 Junction 13 Vissim models developed as part of the Stage 3 DCO submission includes all the junctions along the A1303 corridor from the Madingley Mulch roundabout in the west to the JJ Thomson Avenue junction in the east. **Figure 2-1** shows the extent of the Vissim model developed and the key modelled junctions.

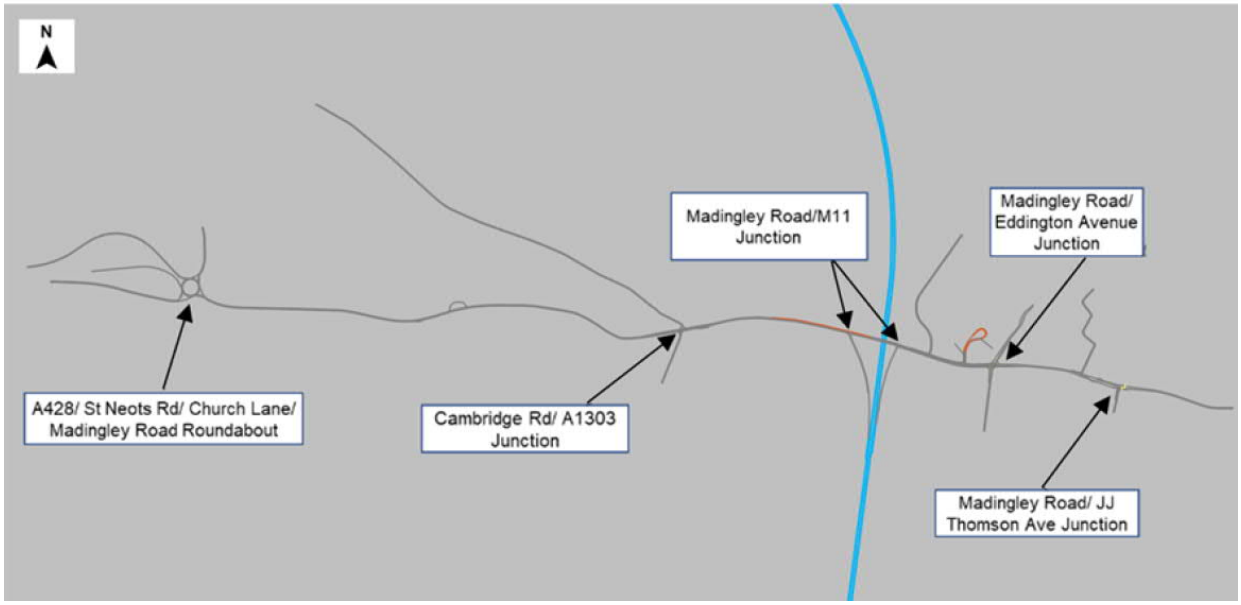

Figure 2-1 – M11 J13 Vissim Model Extent – Stage 3 DCO

2.1.2 To assess the extent of the eastbound queues and the impact on the A428 eastbound carriageway, the Vissim models were extended to include the A428 eastbound link to the Scotland Road/St Neots Road junction. The extended Vissim network extent is shown in **Figure 2-2**.

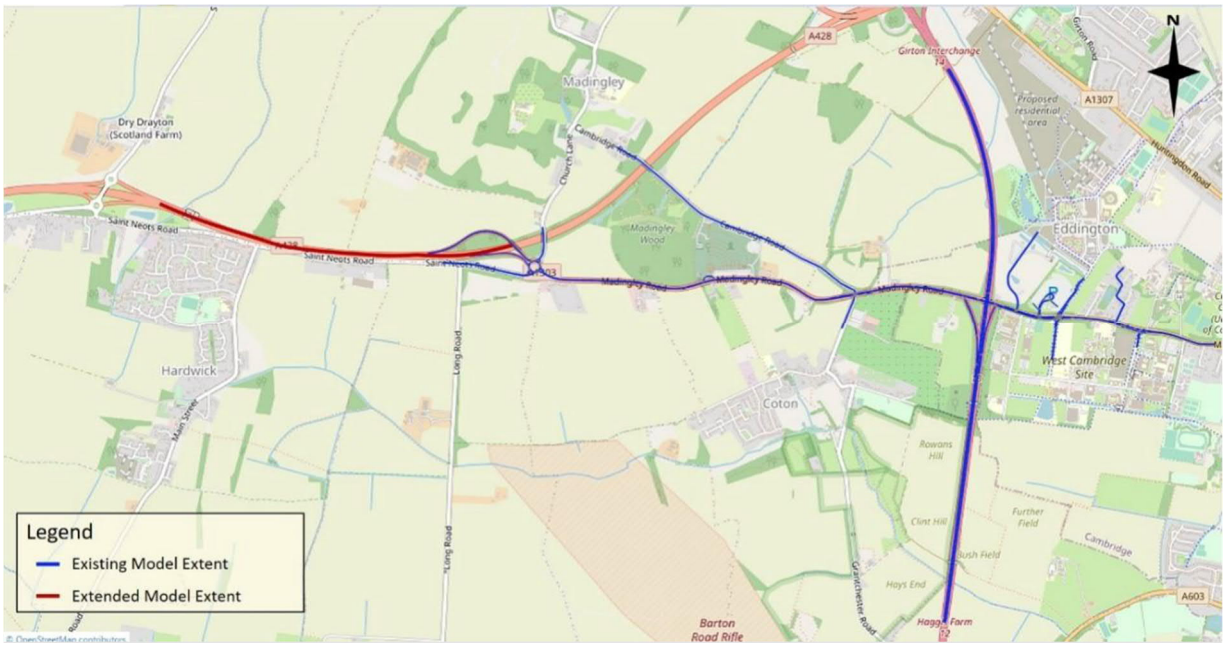

Figure 2-2 – Vissim Model Network Extent (Extended Model)

2.1.3 The following scenarios have been developed to assess the impacts at M11 J13:

a. The Base Year 2019 AM and PM.

b. Forecast Year 2025, Do Minimum Scenario (without A428 Scheme) AM and PM.

c. Forecast Year 2025 Do Something Scenario (with A428 Scheme) AM and PM.

d. Forecast Year 2040 Do Minimum Scenario (without A428 Scheme) AM and PM.

e. Forecast Year 2040 Do Something Scenario (with A428 Scheme) AM and PM.

2.2 Vissim model parameters

2.2.1 The Vissim models developed have consistent characteristics with those previously developed as detailed in **Table 2-1**.

Table 2-1 – Vissim Model Parameters

Model Characteristics	Description
Software Version	Vissim 11-12 (64-bit)
Modelled Years	2019 Base Year, 2025 and 2040 Forecast Years
Model Peaks	AM and PM Peak Periods

Model Characteristics	Description
Simulation Periods	AM Peak: warm-up (0630-0800), peak hour (0800-0900) and cool down (0900-1000) PM Peak: warm-up (1600-1700), peak hour (1700-1800) and cool down (1800-1830)
Model Units	Speed (mph), Distance (kilometres)
Vehicle Types	Cars, Light Good Vehicles (LGVs), Heavy Good Vehicles (HGVs)
Assignment Method	Dynamic Routing Assignment

2.3 Vissim network development

2.3.1 The Vissim network extent is shown in **Figure 2-2** and is consistent between all modelled scenarios. The extended network was coded using the information from Google satellite maps to represent the current layout as accurately as possible.

2.4 Driving behaviours

2.4.1 The following driving behaviours were coded in the extended part of the model:

a. Left Side Rule behaviour (on the A428 main carriageway).

b. Merge behaviour (at A428 diverge location).

2.5 Speed distributions

2.5.1 To ensure the modelled vehicles travel at speeds accurate to reality, desired speed decisions have been coded into the extended Vissim network. Each desired speed decision represents a range of speeds around the speed limit of the road and has a defined proportion of vehicles travelling at each speed. Different speed distributions have been allocated to each vehicle type included in the model depending on the speed limit of each road. The speed profiles used in the Vissim models were consistent with the ones used in the models developed previously.

2.5.2 The vehicles along the A428 mainline carriageway are assumed to have the desired speed consistent with the national speed limit.

2.6 Other coding assumptions

2.6.1 The lane change distance parameters were adjusted along the A428 mainline to produce appropriate driving behaviour. This function in the Vissim model is to encourage vehicles to look to enter into a particular lane a realistic distance ahead of the lane change. The lane change distance was coded as 1,500m back from the A428 off-slip diverge section as the vehicles diverging to the Madingley roundabout are assumed to start to get into lane once the Scotland Road junction has been passed.

3 Vissim demand development

3.1 Introduction

3.1.1 The Vissim model demand was developed for the original M11 J13 models using dynamic (matrix-based) demand assignment in which vehicles choose their route through the network based on calculated 'cost paths'.

3.1.2 Zones in Vissim provide vehicular entry and exit points to and from the network. **Figure 3-1** shows the Vissim model zones for the models developed earlier.

Figure 3-1 – Vissim model zones – DCO Submitted models

3.1.3 For the extended Vissim models, Zone 2 (origin) was moved back to the edge of the network on the A428 eastbound mainline link. An additional Zone (15) was coded as the eastbound destination zone on the A428 past the diverge to the A1303. **Figure 3-2** shows the Vissim model network with these zones included in the extended Vissim models.

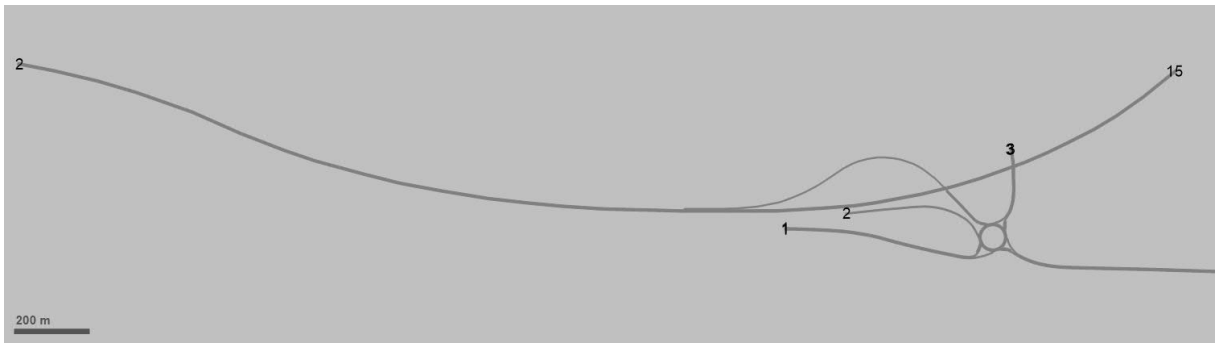

Figure 3-2 – adjusted zoning system in the extended Vissim model

3.1.4 The updated Vissim demand matrices include demand between Zone 2 to Zone 15 (trips travelling eastbound which do not diverge and join the A1303). The remainder of the demand matrices is consistent with the Vissim models developed for the Stage 3 DCO submission.

3.1.5 The demand matrices were developed for three vehicle categories (Cars, LGVs, HGVs). The matrices were profiled in 15-minute intervals in the peak hour, warm-up and cool-down periods, based on the traffic survey data. The periods/matrices developed are summarised as follows:

a. AM period (0630-1000): warm-up (0630-0800), peak hour (0800-0900) and cool down (0900-1000) – 14 matrices each for Cars, LGVs and HGVs.

b. PM period (1600-1830): warm-up (1600-1700), peak hour (1700-1800) and cool down (1800-1830) – 10 matrices each for Cars, LGVs and HGVs.

3.1.6 The previous, non-extended, models submitted in the DCO were reviewed by Cambridgeshire County Council (CCC). CCC raised concerns regarding the loading of the North West Cambridge development, specifically that the development zone was in the incorrect location. The models have been updated to address this issue, with the development zone accessed via Eddington Avenue.

3.2 Base year demand

3.2.1 The DCO submitted models included the demand from Zone 2 (A428 off-slip). Since this zone was moved back to include the eastbound A428 mainline traffic, additional mainline traffic was derived and added to the total Zone 2 demand.

3.2.2 WebTRIS data (Site 6818/2) was used to derive the A428 eastbound demand from November 2019 (consistent with the Vissim base year of the DCO submitted models). The location of the WebTRIS site is shown in **Figure 3-3**.

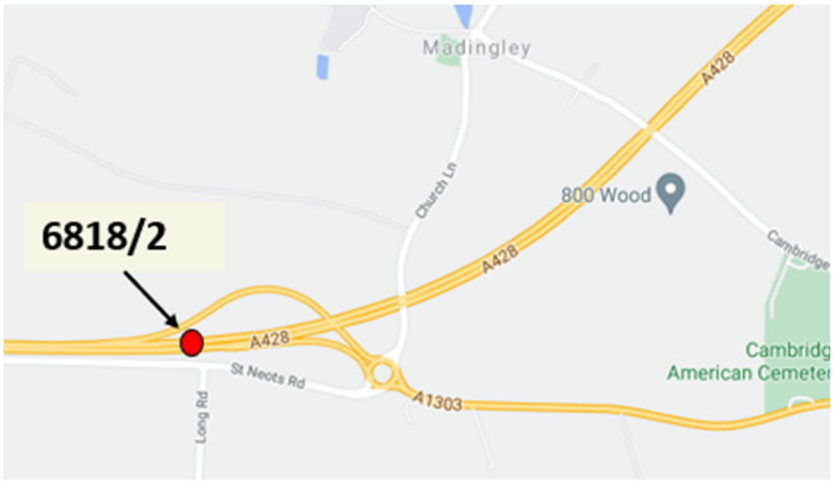

Figure 3-3 – WebTRIS Site

3.2.3 The AM and PM peak hours are consistent with the original models. The 2019 base year demand matrices were developed for cars, LGVs and HGVs for the defined AM and PM peak hours including the pre-peak and post-peak periods profiled in 15-minutes intervals.

3.3 Forecast demand

3.3.1 The forecast year Vissim models were developed using the demand from Stage 3 SATURN models. The Vissim models were developed for two forecast years (2025 – Scheme opening year and 2040 – Design year) for the Do Minimum (without Scheme) and the Do Something (with Scheme) scenarios in AM and PM peaks. The approach to developing the forecast year Vissim demand was consistent with the DCO submitted models as described in Appendix 2.2 (TN 50) of the DCO document (Ref **[APP-243]**: A428 Black Cat to Caxton Gibbet improvements - Volume 7 - 7.3 Transport Assessment Annex).

3.4 Model routing assignment

3.4.1 The models were run for convergence criteria provided by Transport for London (TfL), which are consistent with TAG guidelines for highway assignment models. The following criteria were adopted:

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

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

3.4.2 The Vissim models for all the scenarios achieved the convergence criteria of more than 95% for weighted travel time on paths and volume on paths for four consecutive runs. The convergence is therefore in line with best practice and the models are stable.

4 Base model results

4.1.1 The converged AM and PM base year Vissim models were run for ten random seeds. Random seeds in Vissim replicate the variability in networks in terms of arrival patterns of the vehicles.

4.1.2 The models were evaluated for node and journey time results to derive the turning count and travel time of vehicles respectively. The average results for ten random seeds were used for analysis.

4.1.3 The A428 eastbound traffic flows derived from WebTRIS data were compared against the A428 eastbound modelled flows for AM and PM peaks. **Table 4-1** shows the AM and PM peak hour comparison of traffic flows at A428 mainline carriageway.

Table 4-1 – Model Flow Comparison along A428 mainline

	AM Peak	PM Peak
WebTRIS flows	990	795
Modelled flows	1000	795
GEH	0.3	0.0

4.1.4 As seen in the comparison, the modelled flows match well with the WebTRIS data. It is noted that there was no journey time information available along the A428 carriageway in order to validate the modelled journey times.

4.1.5 The original Vissim models developed for the Stage 3 DCO submission were calibrated and validated according to the TAG criteria. The details about the turning flow calibration results and journey time validation results can be found in Appendix 2.2 (TN 50) of the DCO document (Ref **[APP-243]**: A428 Black Cat to Caxton Gibbet improvements - Volume 7 - 7.3 Transport Assessment Annex). The same results were extracted for the extended models developed for this study and the calibration/validation meets TAG criteria without any notable changes. This check was undertaken to confirm that the extended models still represent observed traffic conditions in the original parts of the model.

4.1.6 It should be noted that the turning flow calibration included the Madingly Mulch roundabout, which is of particular interest to CCC. The turning flows in the extended model are very well matched with the observed turning flows at the Madingly Mulch roundabout (2019 surveys); all comparisons between observed and modelled flows have a GEH value of less than three and for the majority of movements the comparison is very close, with a GEH value of less than one.

5 Vissim forecast model results

5.1 Introduction

5.1.1 The converged forecast year Vissim models were run for the same ten random seeds as for the base year models and results averaged. The models were evaluated to extract average vehicle speeds, queues and journey times during the peak hours.

5.1.2 The Vissim models error logs were reviewed to check that there were no issues with the simulations which would impact results. Vissim error logs report various error types including if there is any latent demand (vehicles unable to enter the network due to congestion) at any of the links in the models.

5.2 Average Speed and Queue Results

5.2.1 This section presents average speeds on modelled links for all forecast scenarios, with results for the base year, also provided for comparison. The colour bands represent the average link speed and are an indication of locations of congestion and queuing in the network. The red/dark red links indicate queuing (speeds are very low); yellow-orange links indicate that queues may be present for some duration of the peak hour or there is slow-moving traffic; and green links indicate free-flow traffic conditions.

5.2.2 Queue results have been extracted (as shown in **Figure 5-1**) for the approach to Madingley Mulch roundabout (queue on the off-slip) and also for the point where traffic diverges onto the A428 off-slip (to show the eastbound queue lengths on the A428) and two results are presented:

a. Average queue length across the peak hour (average of ten runs).

b. Maximum queue length – maximum queue recorded at any point during the peak hour (averaged across ten runs).

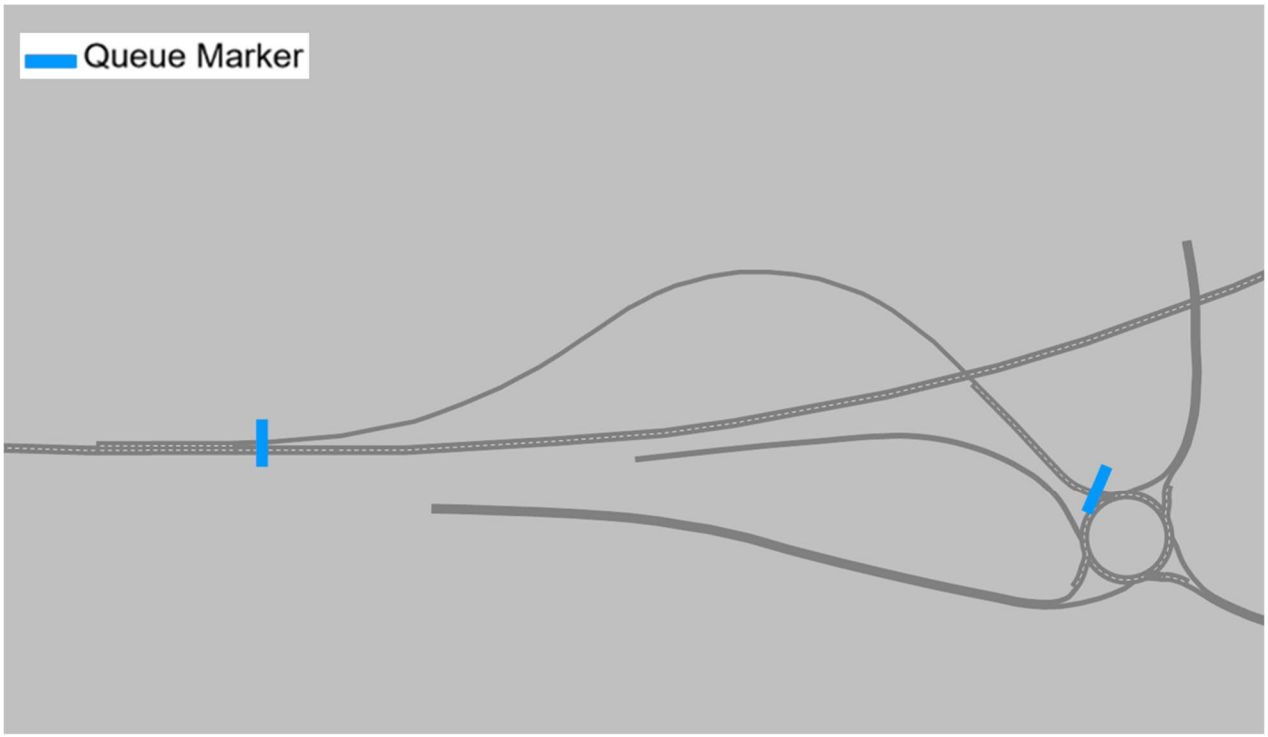

Figure 5-1 – Queue Markers

5.2.3 **Figure 5-2** shows the free-flow speeds in mph coded at each of the links in the model in order to put the average speed results into context.

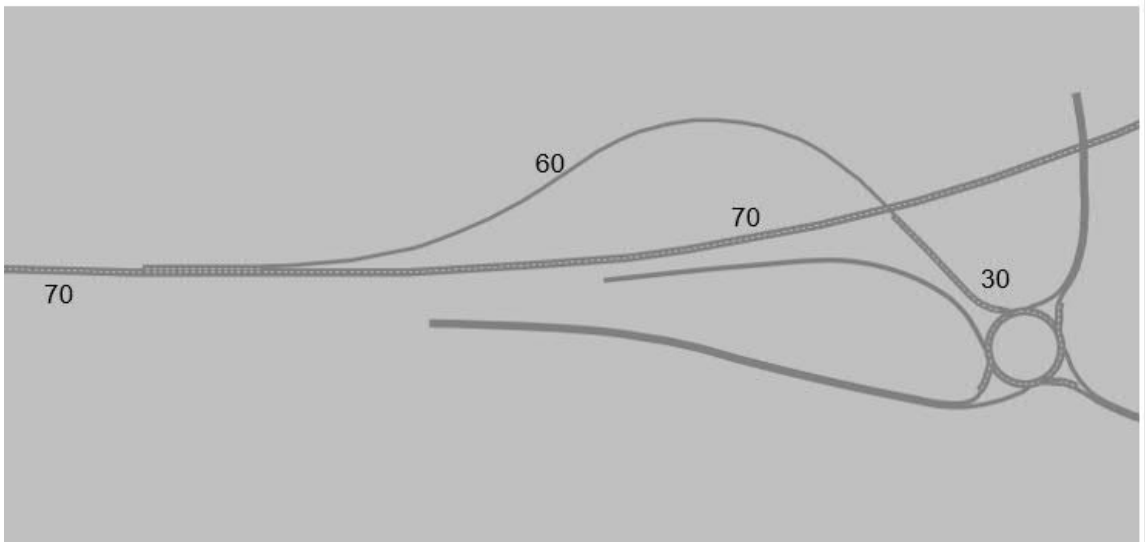

Figure 5-2 – Model Speeds (mph)

AM Base Year

5.2.4 **Figure 5-3** shows the average speed results for the AM peak 2019 base year Vissim model. The base model developed for the Stage 3 DCO indicated significant eastbound congestion along the A1303 corridor. The queues from the A1303/ Eddington Avenue and A1303/Park & Ride junctions extended back up to the Madingley Mulch roundabout during the peak hour. However, the queues in the base model did not impact the A428 off-slip.

5.2.5 The queue results show an average queue of about 67m is formed on the A428 off-slip roundabout approach arm, due to conflicting flows on the roundabout or blocking back from the A1303. The results show a maximum queue of approximately 500m which shows that queues in the model can extend towards the end of the off-slip (780m).

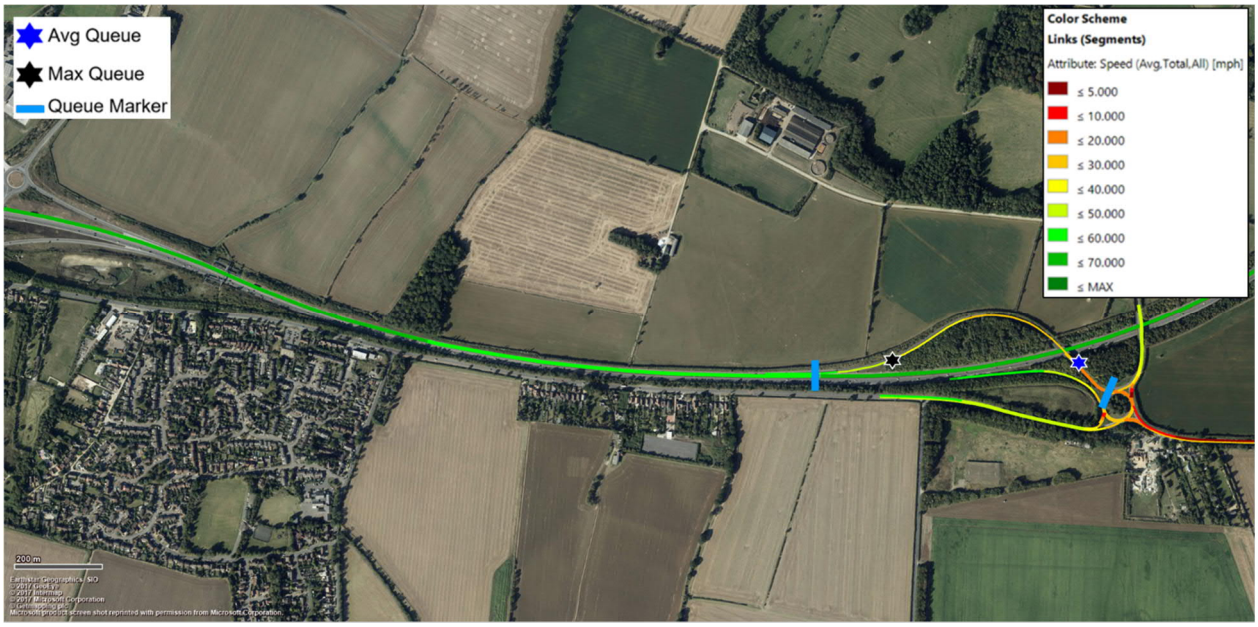

Figure 5-3 – Average Speed and Queue Results – Base Year AM peak

5.2.6 It should be noted that the base year AM peak Vissim model developed for the Stage 3 DCO submission shows a few instances during the peak hour when the eastbound queues extend back and affect the operation of the Madingley Mulch roundabout. The videos captured at the location during the surveys did not indicate any instances of queuing vehicles during the peak hour on the roundabout as seen in the Vissim models. The comparison is shown in **Figure 5-4**. This phenomenon was also observed in the extended version of the models used for the present study. It should be noted that the eastbound journey time route was validated according to the TAG criteria. The comparison indicates that the queues formed in the AM peak models represent a comparatively robust representation of the queues along the A1303.

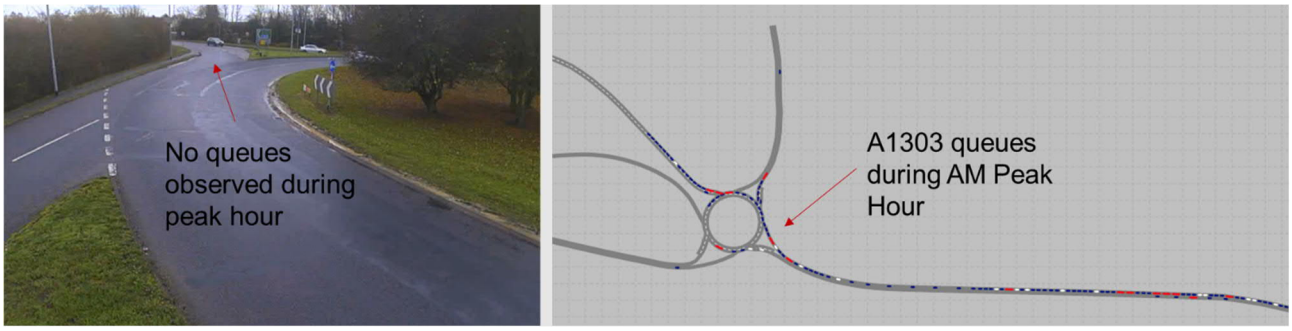

Figure 5-4 – AM Peak Base Model Queues

AM Peak 2025 (Scheme Opening Year)

5.2.7 **Figure 5-5** and **Figure 5-6** show the AM peak average speed results for the 2025 DM and 2025 DS scenarios respectively.

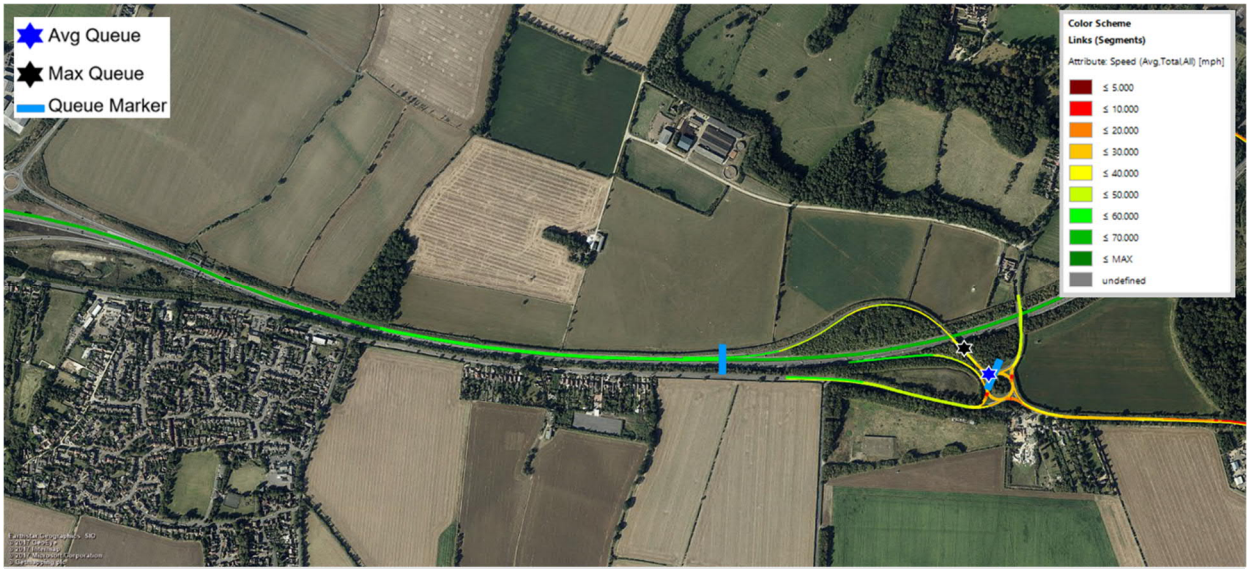

Figure 5-5 – Average Speed and Queue Results – DM AM 2025

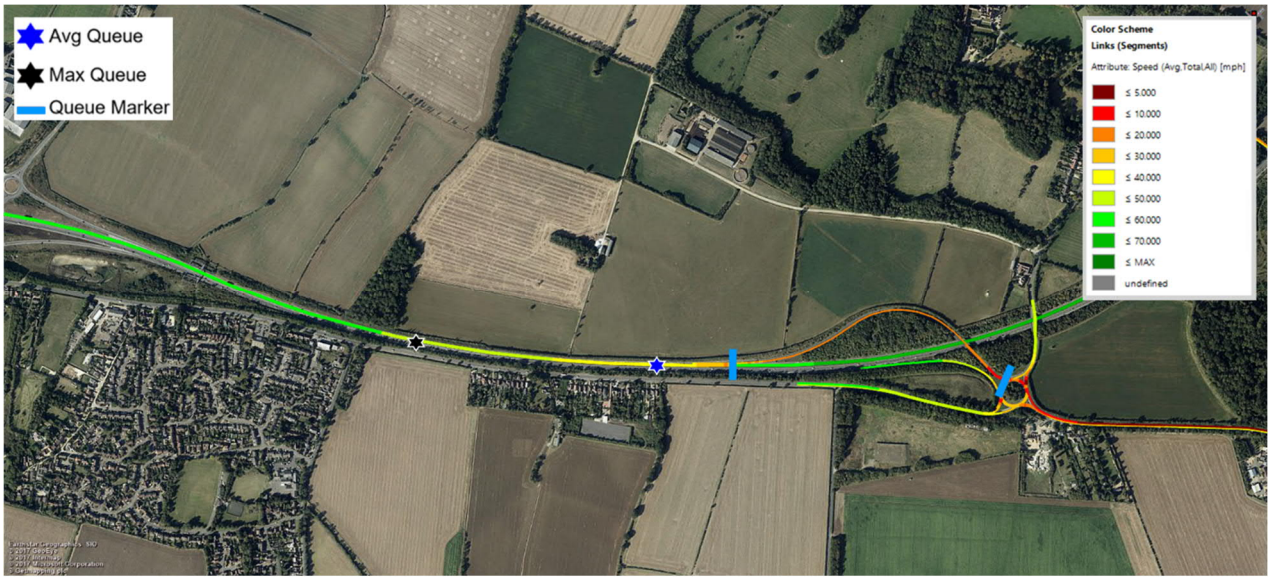

Figure 5-6 – Average Speed and Queue Results – DS AM 2025

5.2.8 The average speed results comparison shows longer queues are extending back along the A428 off-slip due to increased flows resulting from the Scheme (approximately 68 additional vehicles during the peak hour on the off-slip). The DS model average speed plot shows the off-slip is red/amber along the full length, indicating that queues build along the slip road for a proportion of the peak hour and extend to the A428. The queue length measured at the Madingley roundabout approach arm in the DS model reaches past the slip road length, so the queues in **Figure 5-6** are queue results from the diverge point). The queue on the A428 eastbound mainline extends approximately 220m on average and 810m as a maximum from the diverge section. The DM models indicate an overall increase in queue lengths along the off-slip, but the queues are not predicted to reach the main carriageway in 2025.

AM Peak 2040 (Scheme Design Year)

5.2.9 The average speed results for the 2040 AM peak DM and DS scenarios are shown in **Figure 5-7** and

5.2.10 **Figure 5-8** respectively.

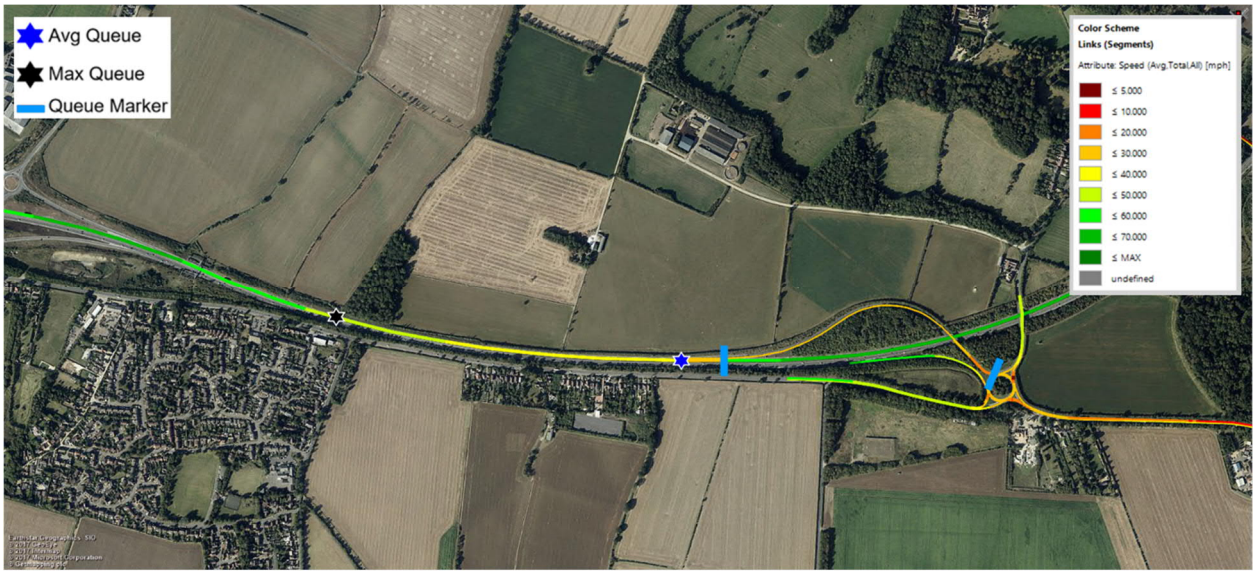

Figure 5-7 – Average Speed and Queue Results – DM AM 2040

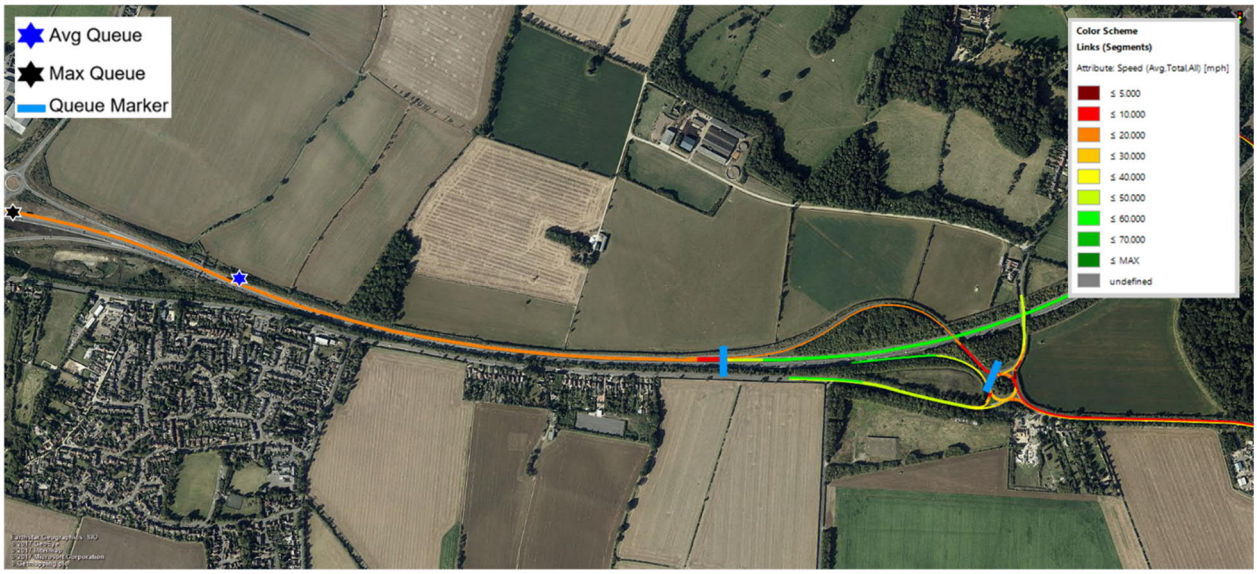

Figure 5-8 – Average Speed and Queue Results – DS AM 2040

5.2.11 The average speed plots show that congestion increases significantly in the 2040 scenarios compared to the 2025 scenarios. The 2040 DM models predict lower speeds along the A428 because of the increase in traffic flows, with an average queue length of 148m and a maximum queue of 1,094m on the A428. The results for the DS scenario show significantly longer queues, as the additional traffic joins the queues which are already predicted in the DM scenario, with speed plots showing low speeds further back along the A428 to the west.

5.2.12 The queues in the 2040 DS scenario extend back to the edge of the network resulting in latent demand which indicates that the eastbound congestion is likely to extend past the edge of the model at the Scotland Road/St Neots Road junction. The latent demand information from the error logs of the DS 2040 Vissim models was reviewed which indicate that the maximum queue lengths will extend back on the A428 by approximately 520m beyond the edge of the model.

PM Base Year

5.2.13 **Figure 5-9** shows the average speed results for the PM peak 2019 base year Vissim model. The A1303 eastbound corridor does not experience congestion in the PM peak as seen during the AM peak. During the PM peak, congestion is higher in the westbound direction and as a result, there are no queues extending along the A428 off-slip.

Figure 5-9 – Average Speed and Queue Results – Base Year PM Peak

PM Peak 2025 (Scheme Opening Year)

5.2.14 **Figure 5-10** and **Figure 5-11** show the PM peak average speed results for the 2025 DM and 2025 DS scenarios respectively.

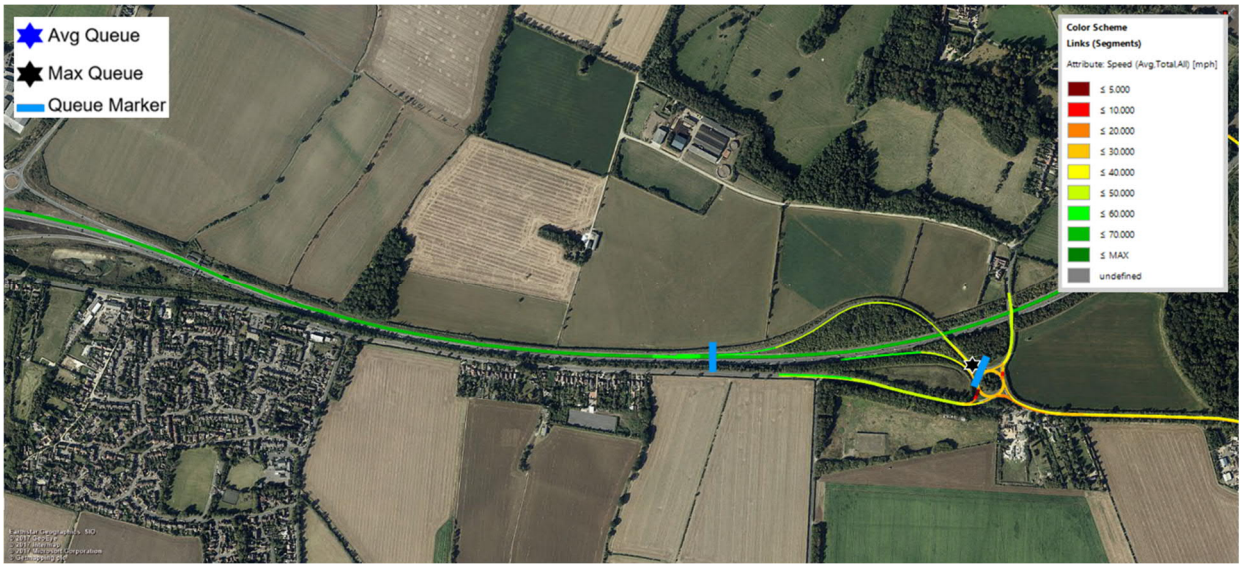

Figure 5-10 – Average Speed and Queue Results – DM PM 2025

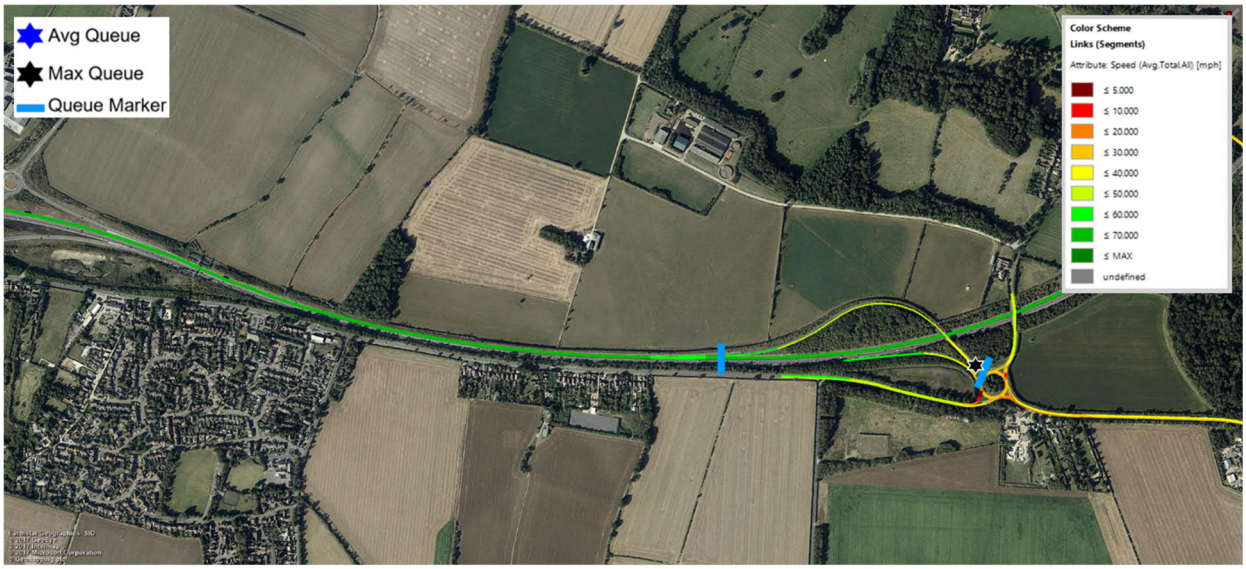

Figure 5-11 – Average Speed and Queue Results – DS PM 2025

5.2.15 The results show there is no notable difference in the speed plots in the DM and DS scenarios. The short maximum queues formed along the A428 eastbound off-slip are due to short queues where vehicles give way at the Madingley Mulch roundabout circulatory.

PM Peak 2040 (Scheme Design Year)

5.2.16 **Figure 5-12** and **Figure 5-13** present the 2040 PM peak average speed results for the DM and DS scenarios respectively.

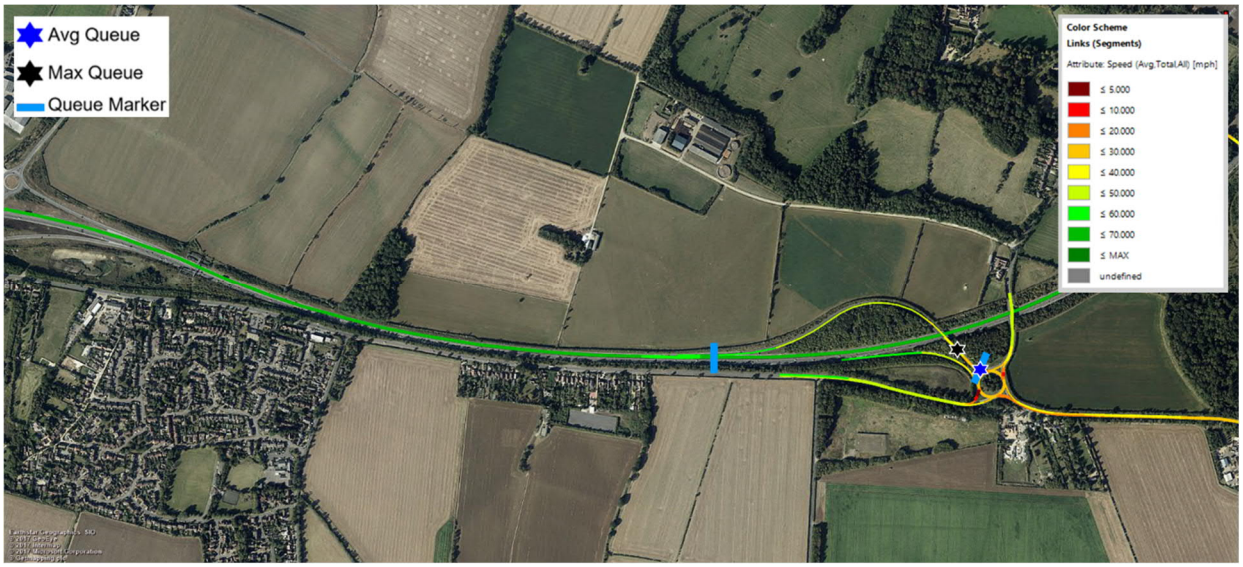

Figure 5-12 – Average Speed and Queue Results – DM PM 2040

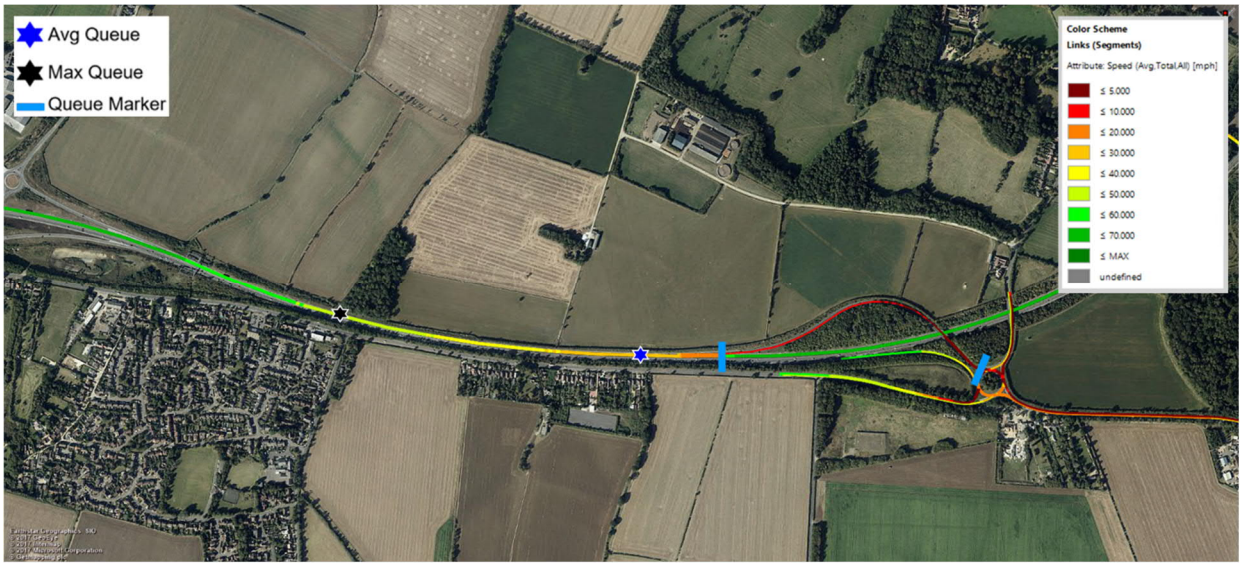

Figure 5-13 – Average Speed and Queue Results – DS PM 2040

5.2.17 The 2040 DM model speed plot does not indicate eastbound queues extend back significantly along the A428 off-slip from the Madingley Mulch roundabout. However, the DS models show an increase in eastbound congestion, which has an impact on the A428 eastbound carriageway for a proportion of the peak hour. The average queue length on the A428 is 222m and the maximum queue length is approximately 1,052m.

5.3 Journey Time Results

5.3.1 Journey time results have been extracted from the Vissim models for the A428 eastbound carriageway from the A428 west to the Madingley Mulch roundabout approach arm (approximately 2.4km route). **Figure 5-14** shows the extent of the journey time route along the A428.

Figure 5-14 – Journey Time Route – A428 Eastbound link

5.3.2 **Figure 5-15** shows the average journey times along the A428 eastbound for the AM peak scenarios.

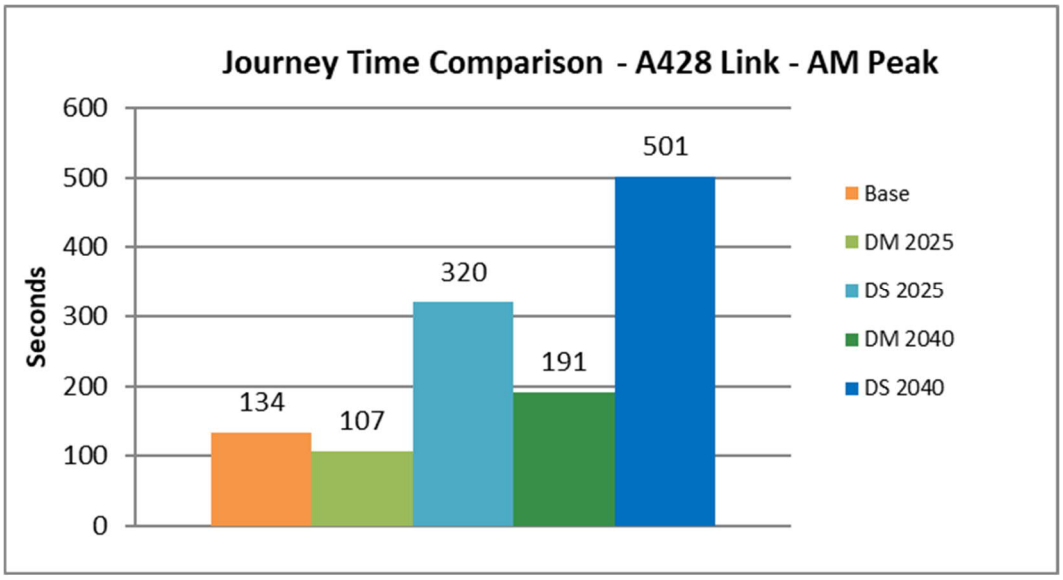

Figure 5-15 – Journey Time Results – AM Peak

5.3.3 The results show the 2025 DM model produces a minor improvement to the eastbound journey time, compared to the base year. This was explained in Section 10.5 of Appendix 2.2 (TN 50) of the DCO document (Ref: A428 Black Cat to Caxton Gibbet improvements - Volume 7 - 7.3 Transport Assessment Annex). This is due to the reduction of flows from M11 off-slip turning right towards Cambridge in the AM peak 2025 DM models compared to the Base models. This allows A1303 traffic to move more quickly towards Cambridge.

5.3.4 The comparison of the 2025 and 2040 AM peak journey time results are in line with the speed and queue results detailed in the previous section. The DS 2025 scenario (with Scheme) shows a significant increase in journey times because of higher congestion along the A428. In 2040, there is an increase in journey times relative to the base year, indicating that queuing on the A428 off-slip impacts the A428 operation and becomes an issue, even without the Scheme in place. There is a further significant increase in eastbound journey times in the 2040 DS and it should be noted that there is latent demand in the AM 2040 DS scenario - therefore the journey time along the A428 corridor is significantly higher than shown.

5.3.5 The journey time results for the PM peak scenarios are presented in **Figure 5-16**.

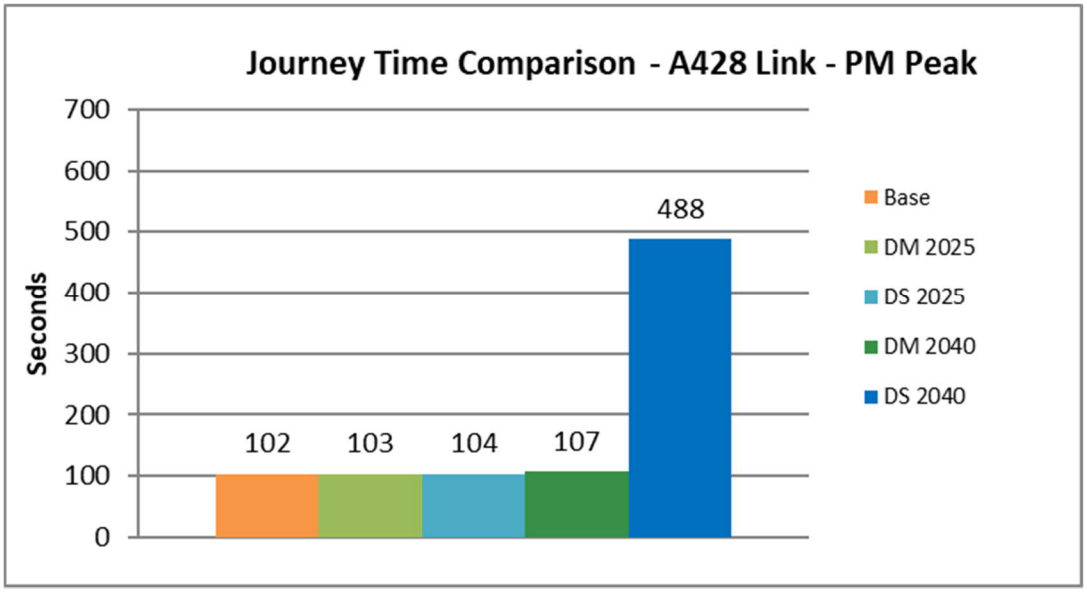

Figure 5-16 – Journey Time Results – PM Peak

5.3.6 The 2025 and 2040 Do Minimum results show similar journey times, which are comparable to the base year results. The 2025 DS model journey time along the A428 is comparable to the DM scenario. However, in 2040, there is a 381 seconds increase (approximately six minutes) due to the additional traffic in the DS scenario. This is in line with the speed plots which show longer queues and congestion along the off-slip, impacting the A428 eastbound, resulting in longer journey times.

6 Factors not considered within the assessment

6.1 Introduction

6.1.1 There are a number of factors which the Applicant considers would alter the results of the of the model and impacts set out in this report. These have not been quantified as part of the assessment undertaken. The most significant of these is the Cambourne to Cambridge (C2C) Better Public Transport project.

6.2 The Cambourne to Cambridge Better Public Transport (C2C) project

6.2.1 The Cambourne to Cambridge Better Public Transport (C2C) project aims to ease congestion along the A1303 corridor and significantly improve the public transport network between Cambourne and Cambridge by providing an off-road bus route from Cambourne to Grange Road, a new Park & Ride facility at Scotland Farm near the A428 Scotland Road (Hardwick) junction, and new high-quality cycling and walking facilities by 2024.

6.2.2 The C2C scheme would complement the A428 Scheme: with the proposed new Park & Ride located to the east of the A428 Scheme providing access from areas such as St Neots; trips using the A428 to travel into/out of Cambridge could access this Park & Ride and avoid the predicted congestion on the A1303 corridor by switching to buses. The Outline Business Case Non-Technical Summary states that as a result of C2C, bus patronage is forecast to more than double following implementation of the C2C project: from 370 average hourly passengers two-way to the east of the Madingley Mulch roundabout in the AM peak, to 863 passengers with the C2C scheme in place.

6.2.3 One of the anticipated benefits listed in the Outline Business Case (Strategic Case) for the C2C scheme is ‘mode shift from private car to public transport along the A428/A1303’ and, as well as absorbing some of the demand from new developments in the corridor, C2C would result in mode shift away from the private car for some existing trips, which will alleviate some of the forecast congestion issues along the A1303. The C2C would present an attractive alternative for the significant number of short- to medium-length trips forecast along the A1303 corridor. This would include trips between Cambourne and Cambridge, but also to longer trips using the A428 to access Cambridge via the new Park & Ride.

6.2.4 The C2C project also provides safe and high-quality cycling facilities which would improve connectivity into Cambridge from areas such as Cambourne, which are a cyclable distance, providing another alternative to private car use.

6.2.5 The C2C scheme has not been included in the modelling for the A428 Black Cat to Caxton Gibbet Scheme because, at the time the Uncertainty Log for the traffic forecasting was compiled, it did not have sufficient certainty associated with it to be included within the modelled Core Scenario. This is consistent with best practice set out in the DfT TAG guidance.

6.2.6 The Applicant has been advised that planning consents for the major developments in the A428 and A1303 corridor between Cambourne and east of the M11 have been linked to the provision of C2C with the quantum of development permitted to be capped at a level which the infrastructure can support until such time as C2C is delivered. By contrast, the Uncertainty Log adopted in the forecasting for the A428 Scheme represents the quantum of development that could proceed if C2C goes ahead.

6.2.7 Therefore, the beneficial impact on traffic flows in the A1303 corridor likely to arise from the C2C scheme has not been accounted for in the Vissim model of M11 Junction 13/A1303. The A1303/M11 Junction 13 Vissim modelling therefore represents a worst-case scenario.

6.2.8 National Highways consider the A428 Scheme and the C2C scheme to be complementary and are committed to working together with Cambridgeshire County Council .

7 SUMMARY

7.1.1 The Stage 3 SATURN model developed to test the impacts of the Scheme, indicated flow changes at several locations including M11 Junction 13 in Cambridgeshire in the future years (2025 and 2040).

7.1.2 AECOM had developed the Vissim models at M11 J13 which include the A1303 corridor as part of the Stage 3 DCO submission. The Vissim Do Something (with scheme) models predicted significant A1303 eastbound queues extending back to the Madingley Mulch roundabout at the A428 slip road approach. To assess the extent of the queues and the impact on the A428 eastbound, the Vissim models were extended to include the A428 eastbound carriageway, up to the Scotland Road/St Neots Road junction merge.

7.1.3 WebTRIS data was used to develop the demand for the A428 eastbound in the 2019 base Vissim models. The Stage 3 SATURN models were used to calculate the forecast demand changes to produce the forecast year (2025 – Scheme opening and 2040 – Scheme Design) Vissim models.

7.1.4 The average speed results, queue results and journey time results were extracted from the Vissim models to compare the DM (without Scheme) and DS (with Scheme) scenarios.

7.1.5 The AM peak hour results for the 2025 DM scenario show that the eastbound congestion on the A1303 is not expected to extend back and impact the A428. However, by the AM 2040, traffic growth is expected to result in queues extending back and impacting the A428 eastbound.

7.1.6 The 2025 and 2040 DS AM peak results indicate an increase in congestion along the A1303 corridor, due to a traffic flow increase caused by the Scheme, which results in queues extending back onto the A428 eastbound carriageway. In the 2025 forecast year, the queues are not extensive and the A428 is predicted to be impacted by queueing traffic only for a proportion of the peak hour. However, in the 2040 DS scenario queues extend west along the A428 to the edge of the model (at the Scotland Road junction) and beyond, as there is a significant level of latent demand.

7.1.7 The PM peak results show that there is no impact to the A428 eastbound in 2025 DM or DS and no impact in the 2040 DM. However, in the 2040 DS scenario, the additional traffic resulting from the Scheme results in queues extending back onto the A428 eastbound carriageway, with some eastbound queueing during a proportion of the peak hour.

7.1.8 The journey time results show an increase in eastbound journey times as a result of the Scheme in AM peak scenarios for both 2025 and 2040 forecast years when compared to the corresponding DM scenarios. In the 2040 DS scenario, this increase is significant due to queues extending for a long distance to the west. The 2040 PM peak scenario also shows a significant increase in journey time as a result of the Scheme, although the queuing on the A428 is only predicted for a proportion of the peak hour.

7.1.9 The queues forming on the A428 off-slip to Madingley Mulch roundabout, due to eastbound congestion on the A1303, are predicted to block back to the A428 eastbound carriageway by 2040 even in the DM scenario. This is a potential safety risk for vehicles travelling eastbound along the A428 carriageway. The additional traffic resulting from the Scheme is expected to extend these queues, which the model predicts will impact the A428 eastbound in the 2025 opening year, with queues forming for a proportion of the AM peak hour. In 2040, the additional traffic is predicted to result in extensive queues along the A428 eastbound.

7.1.10 There are factors which the Applicant considers will reduce the effect of impacts set out in this report. These have not been quantified as part of the assessment undertaken. The results quoted above should therefore be considered as being an extreme ‘worst-case’.