A10 Ely to Cambridge Strategic Outline Business Case

A10E2C Base Model Update

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Cambridgeshire and Peterborough Combined Authority

CPCA

A10 Ely to Cambridge Strategic Outline Business Case

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Contents

Executive Summary

To undertake an appraisal of transport schemes on the A10 corridor between Cambridge and Ely it was proposed to use the existing A10 Ely to Cambridge (A10E2C) model. This model was reviewed to ascertain its fitness for that purpose. The review found that there were two junctions which warranted a revision to the way they were coded in the model; some of the options for corridor improvements included improvements at these junctions so it was important that they were modelled as accurately as possible.

Correcting the model coding resulted in some changes to the assignment of the A10E2C base model, in terms of traffic flows and delays. However, since it was found that the changes in flows were very small and the only significant changes to delays were outside of the core study area and some distance from the A10 corridor, the existing LMVR for the model continued to be representative even with the network coding revisions.

Therefore, it is recommended that the A10E2C base model be updated with those revisions and that the existing LMVR continues to serve as the document which reports on the base model. The A10E2C model, with the revisions, provides a good representation of traffic conditions in the base year and is a suitable tool for use in appraisal of the proposed A10 corridor improvements. This note should serve as an addendum to the existing LMVR to report on the changes made to the model, and the minimum impact this has had on the base model assignment results.

1. Introduction

On behalf of Cambridgeshire and Peterborough Combined Authority (CPCA), Jacobs is developing a strategic outline business case (SOBC) for potential improvements on the A10 corridor between Cambridge and Ely. The appraisal of the scheme is to be undertaken using the existing A10 Ely to Cambridge (A10E2C) Transport Model, which was previously developed as part of a study of potential interventions along the corridor. A Local Model Validation Report (LMVR) was produced[1]. Upon review of the model and LMVR, Jacobs found that in order to provide a robust evidence base for scheme appraisal, two revisions to the model were required to better reflect the road layout at two key junctions. These junctions, and the revisions required, are set out below:

Junction	Description
A10/A412 Witchford Road	The northeast approach arm of Witchford Road updated to a single lane approach instead of a two-lane approach, and the southwest approach arm updated to a two-lane approach instead of a single lane approach.
A10/A412 Cambridge Road	The northern approach arm of Cambridge Road updated to single lane approach from a two-lane approach and the southern approach arm of A10 updated to a two-lane approach from a single lane approach.

Table 1. Junction coding update description

These revisions were deemed necessary because some of the improvements to be tested in the model include upgrades to these junctions; it's therefore important for the appraisal that the levels of travel time and congestion in the future year do minimum scenario (which will have the same coding at these junctions as in the base year) are as accurate as possible.

The study area as well as the location of the updated junctions are illustrated in Figure 1.

[1] A10 Ely to Cambridge Transport Study, Local Model Validation Report, Atkins for Cambridgeshire County Council, 1 November 2018

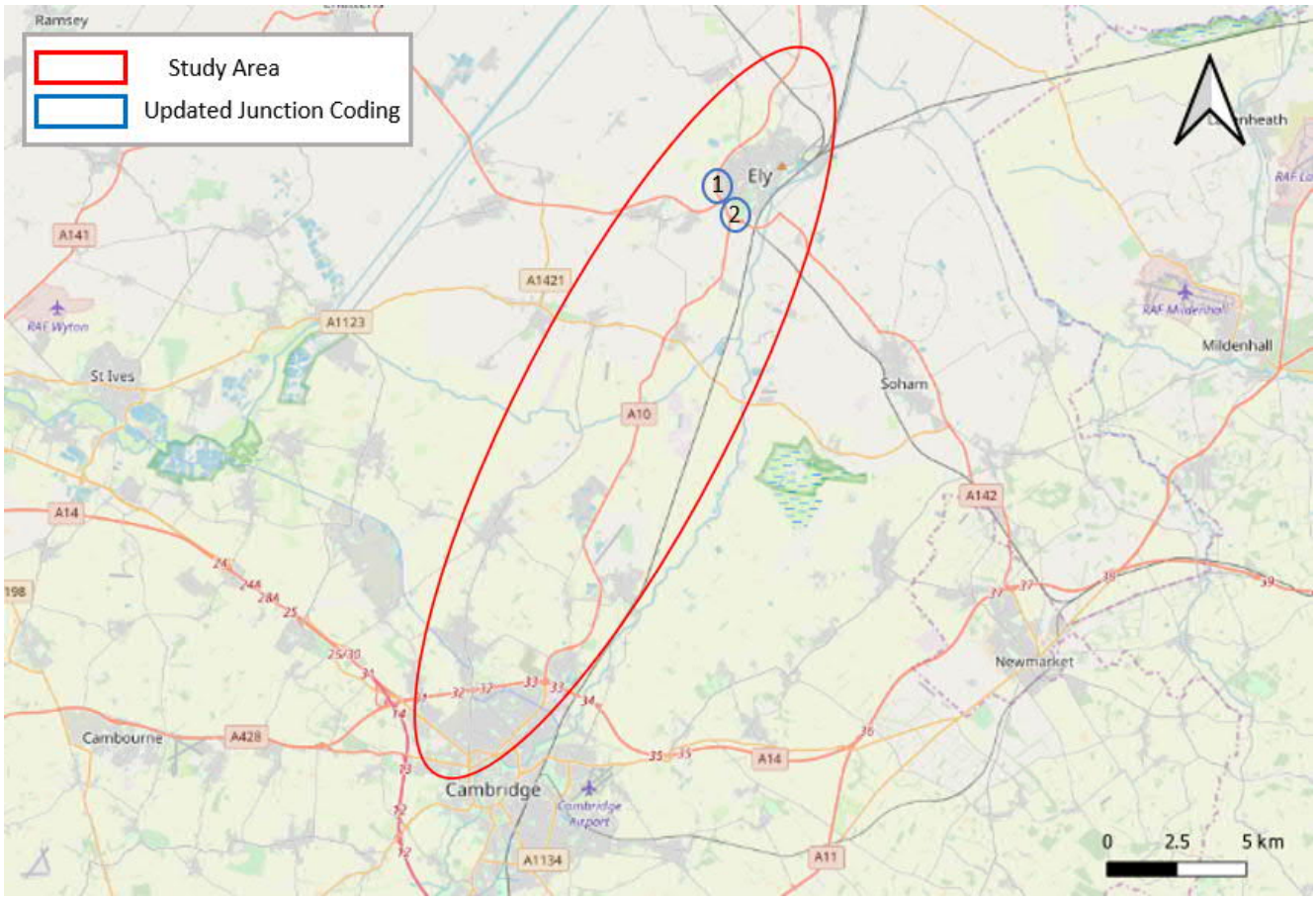


Figure 1. Study area and location of updated junctions

The revisions in the model were limited to the network; there were no changes in the demand matrix (and the trip matrices were not re-estimated). This report sets out the effect of revising the model in terms of changes to modelled flows and the knock-on implications for the quality of the model's validation.

1.1 Report Structure

- Section 2- Provides an overview of the modelling methodology
- Section 3- Describes the results and outputs from the model
- Section 4- Summarises the results and impacts of modelling work

2. Methodology

This section of the report sets out the methodology for the modelling.

2.1 Model background

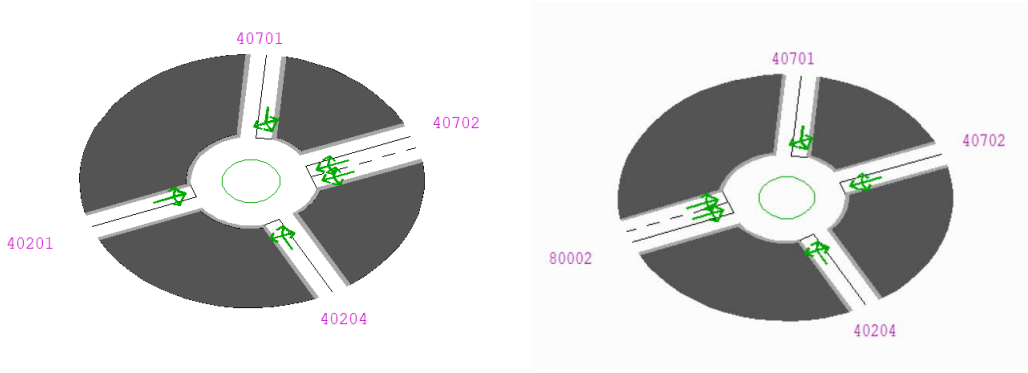
The junction updates were applied in the existing 2018 A10 Ely to Cambridge (A10E2C) base model, initially developed by Cambridge County Council (CCC). The changes made to the junctions were made in the AM peak, Inter-peak and PM peak models using the version 11.4.06D of the SATURN software suite (the same version as used for the development of the base model originally).

2.2 Junction coding updates

The junction coding updates being tested as part of this work are described below.

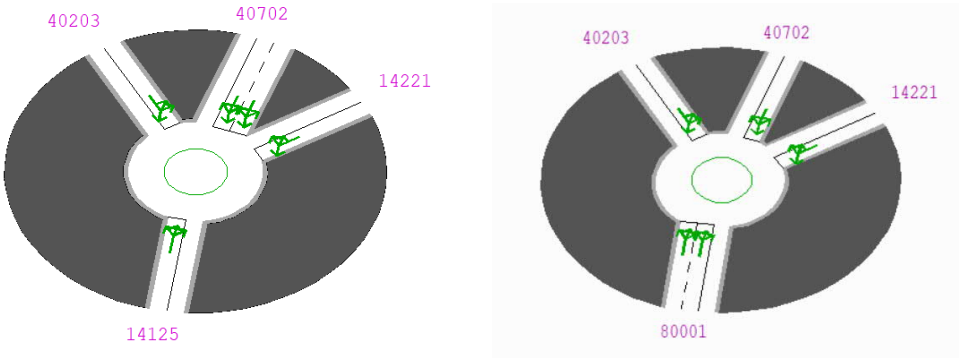
- At the junction of A10/ A142 Witchford Road, the northeast approach arm of Witchford Road was updated to a single lane approach from a two-lane approach and the southwest approach arm was updated to a two-lane approach from a single lane approach, to better reflect the actual layout of the junction. To ensure the correct amount of stacking space on the southwest approach arm, flare from one lane to two lanes was also modelled, through the use of an intermediate node at the point that the road flares.

- At the junction of A10/ A142 Cambridge Road, the northern approach arm of Cambridge Road is updated to single lane approach from two-lane approach and the southern approach arm of A10 is updated to a two-lane approach from a single lane approach. An intermediate node was also added at the point the approach flares from one lane to two.



Before the Update After the Update

Figure 2. Junction Layout before and after the Update for the Junction of A10/A142 Witchford Road



Before the Update After the Update

Figure 3. Junction Layout before and after the Update for the Junction of A10/A142 Cambridge Road

2.3 Scenarios

The junction updates were included as part of a revised base year scenario, the results of which were compared with the results of the original base model. This enables a comparison to be made between the two to identify potential differences along the corridor and the wider strategic effects across the local network.

2.4 Additional model changes

As a flare was introduced at Cambridge Road South and at Witchford Road West, two new nodes were coded into the model. The new nodes were added into the Counts and the Bus Routes files accordingly allowing the smooth operation of the model.

3. Outputs and Results

The results of the comparison between the updated and original base models are summarised in this section.

3.1.1 Actual Flow

The differences in actual flow between the updated and original base models for the study area are presented in Figure 4

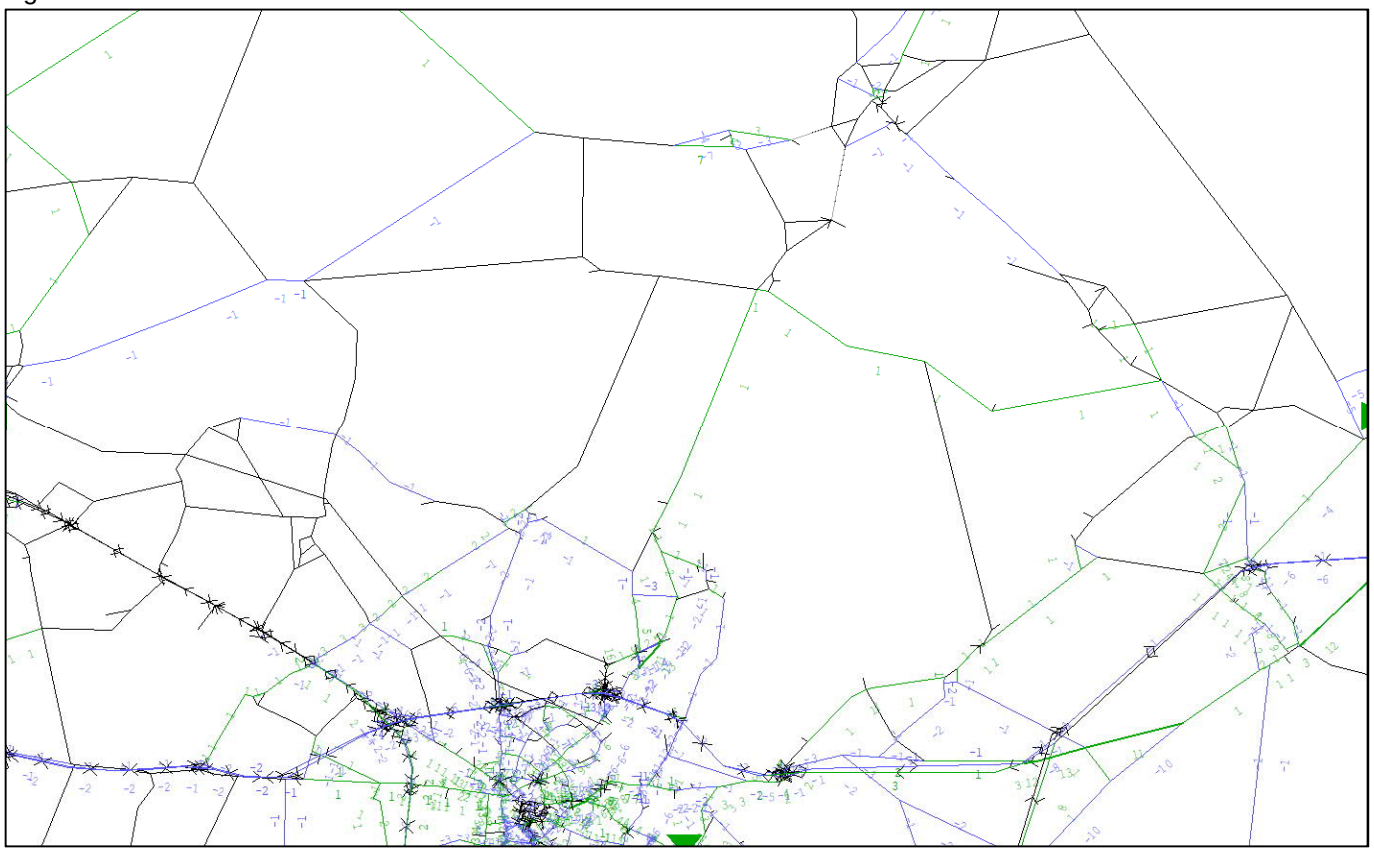


Figure 4: Actual Flow difference between updated and original model in the AM peak

to Figure 6. These show the actual flow difference in Passenger Car Units (PCUs) for the AM peak, Interpeak and PM peak models. The green bandwidths show an increase in flow in the updated model and the blue show a decrease.

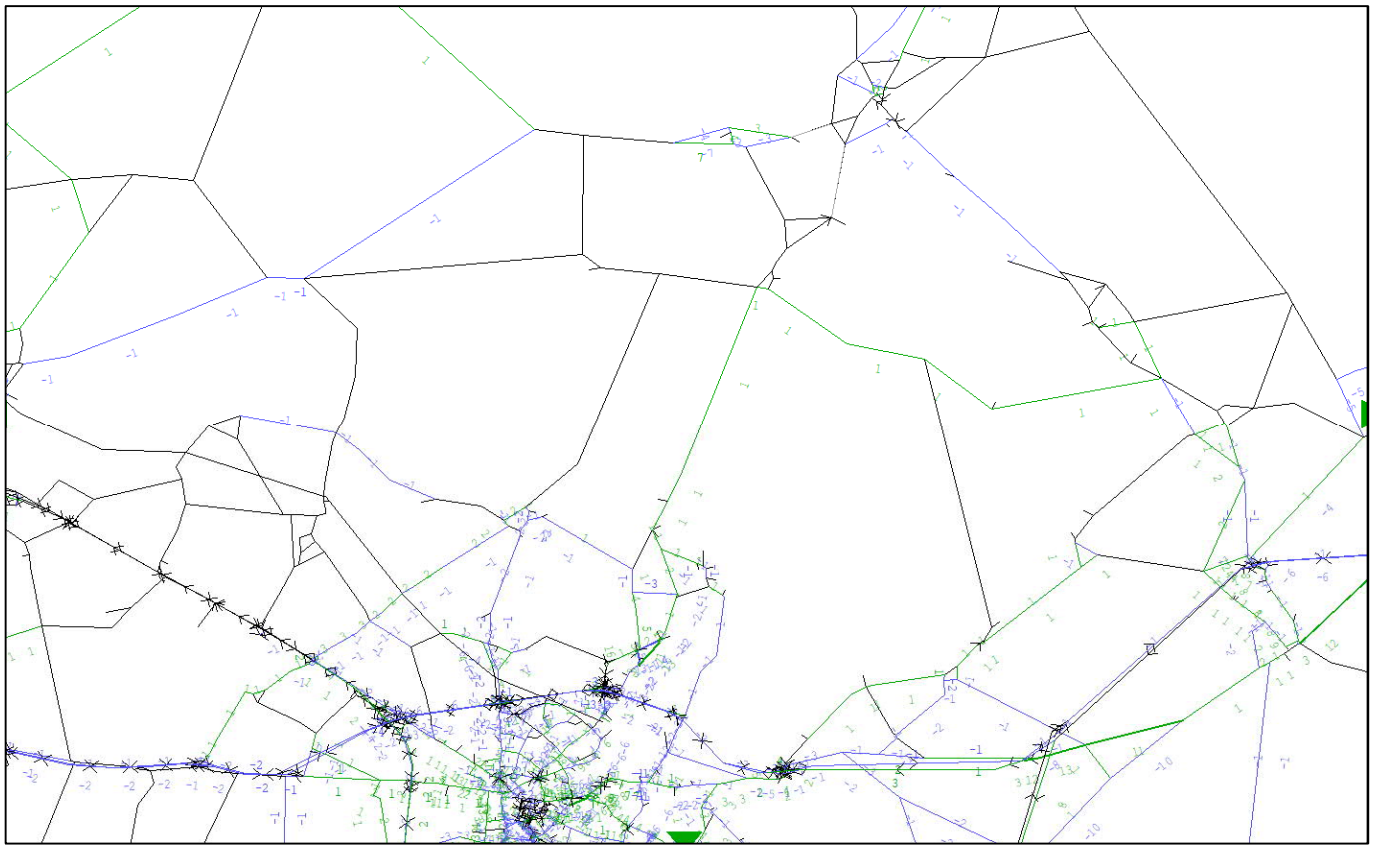


Figure 4: Actual Flow difference between updated and original model in the AM peak

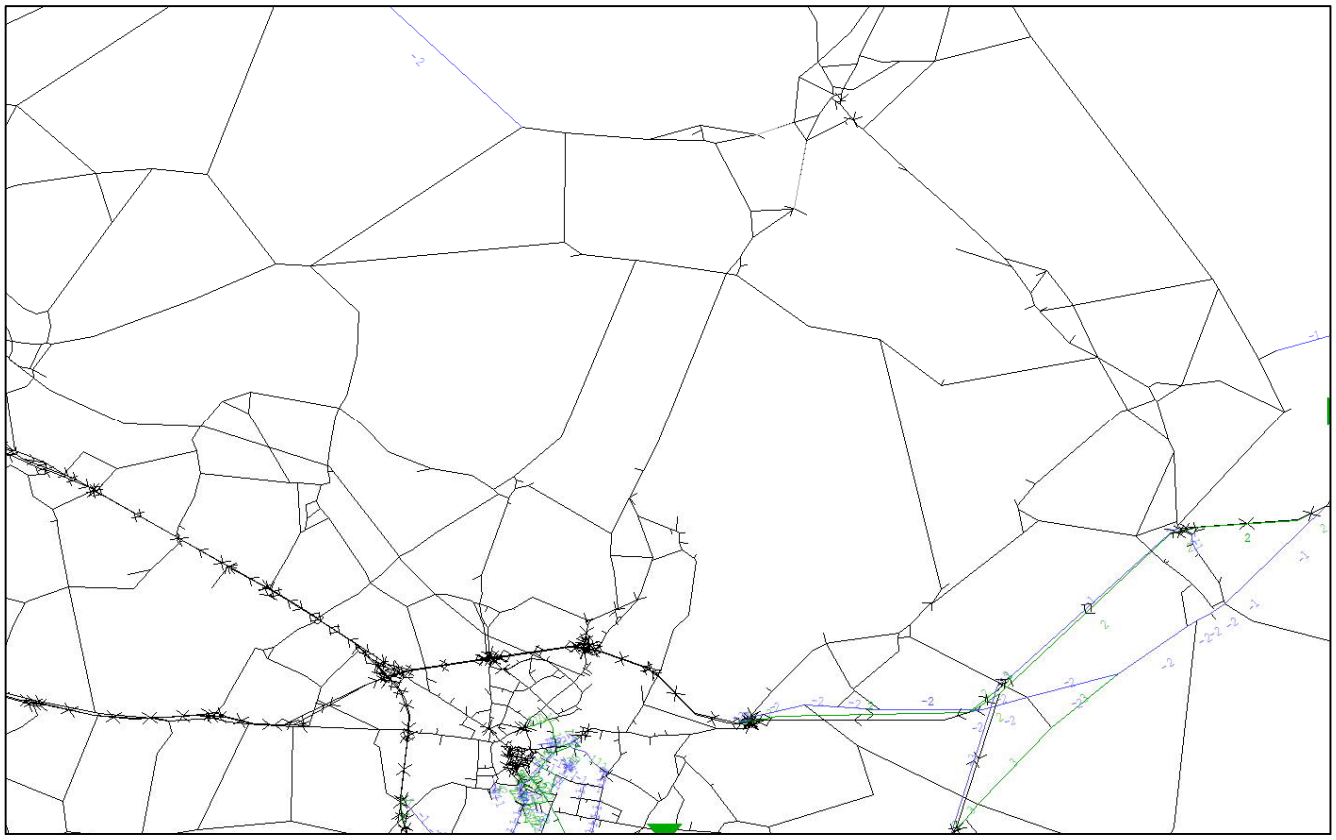


Figure 5. Actual Flow difference between updated and original model in the Interpeak.

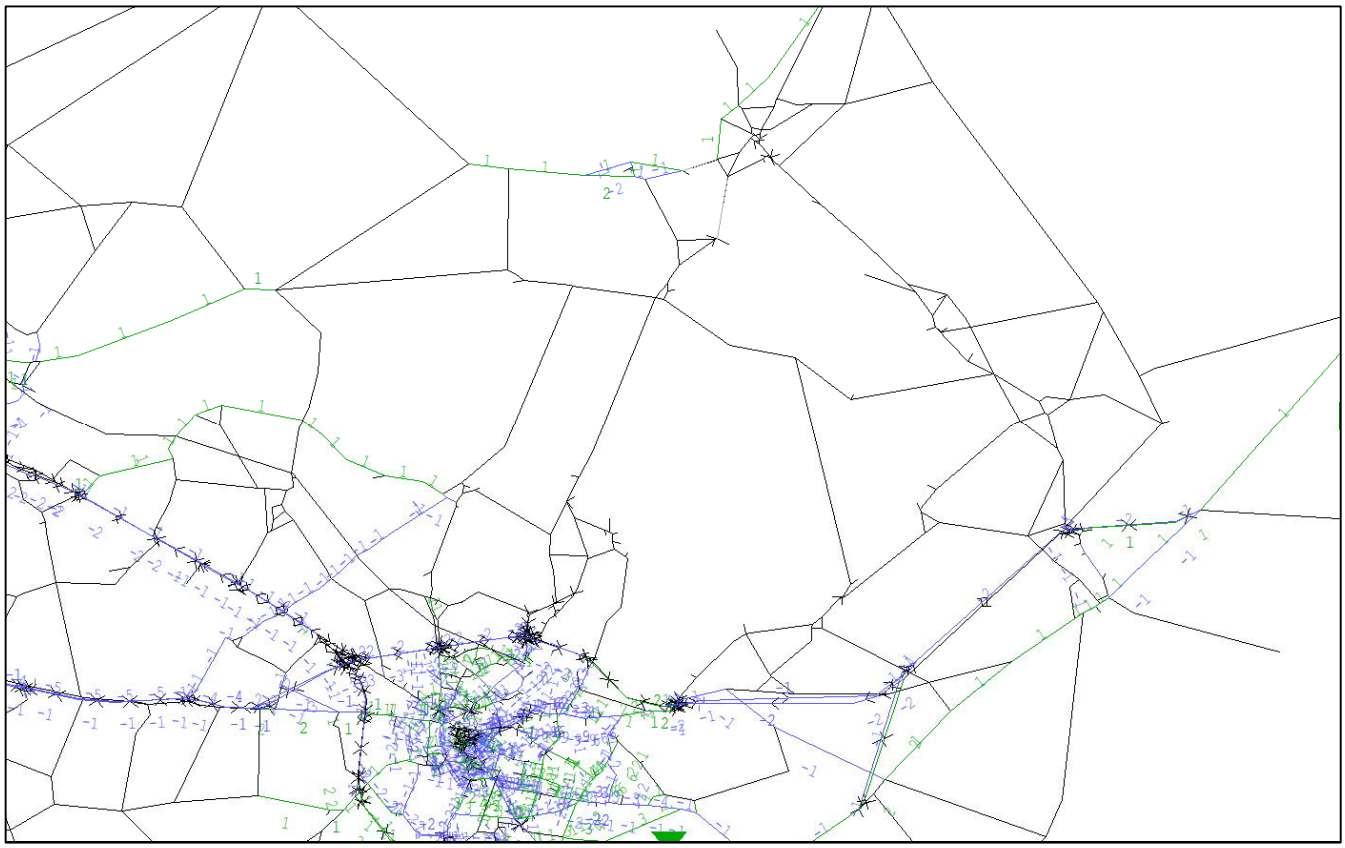


Figure 6. Actual Flow difference between updated and original model in the PM peak

In all time periods, there are minimal changes in flow along the A10 and on the revised junctions. This indicates that the junction coding updates have no significant impact on the A10 corridor. There are also some relatively small changes in flow in the centre of Cambridge: The flow changes range from an increase of 14 PCUs to a decrease of 9 PCUs for the AM peak and from an increase of 4 PCUs to decrease of 9 PCUs in the PM Peak. Given their distance from those junctions which were revised, these changes are considered to be due to background noise in the assignment rather than as a direct result of the changes to the network.

3.1.2 Total Delays

Total delay is calculated based on link delay and turning movement delay. Figure 7 to Figure 9 show the difference in the total delay in seconds between the updated and original base models, for the AM peak, IP and PM peak for the area. The green bandwidths illustrate an increase in total delay in the updated model and the blue show a decrease.

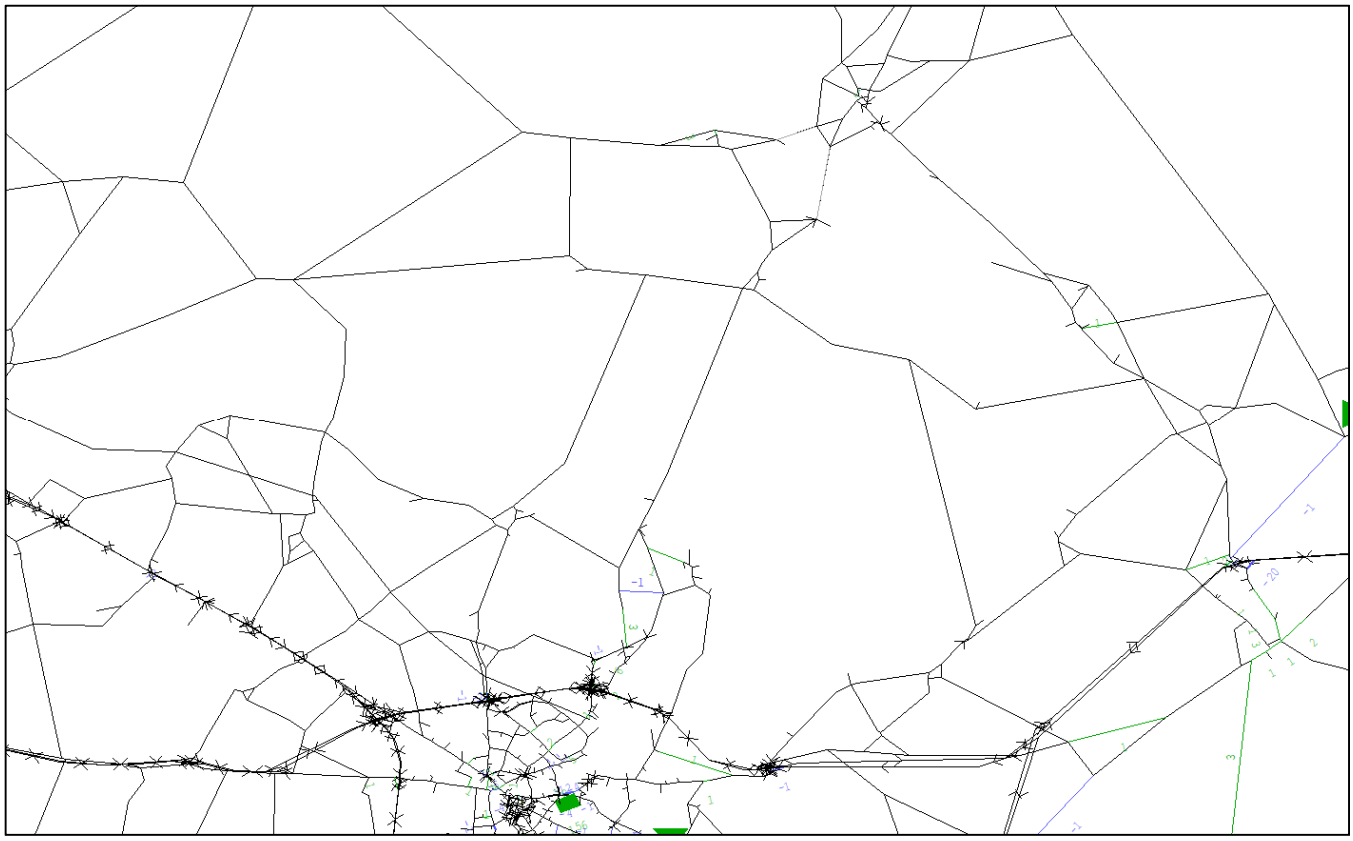


Figure 7. Total delay difference between updated and original model in the AM peak

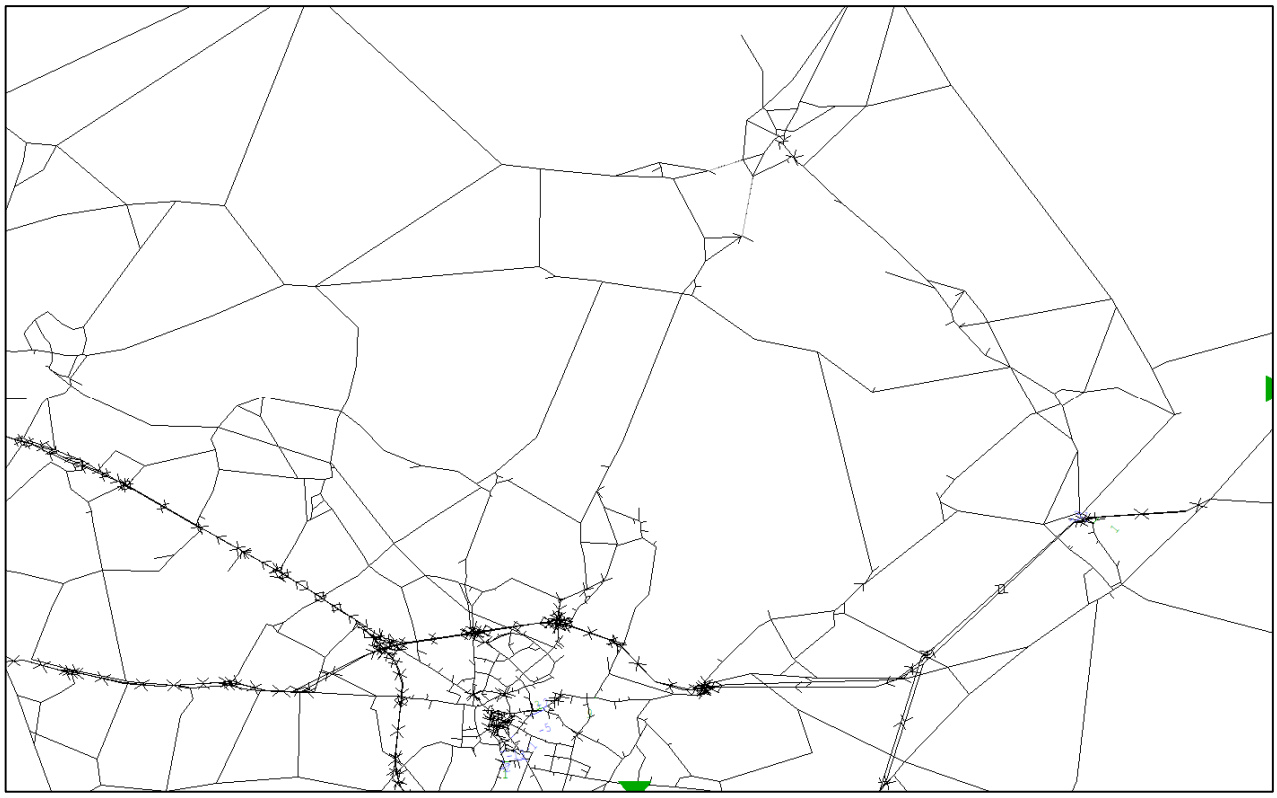


Figure 8. Total delay difference between updated and original model in the interpeak

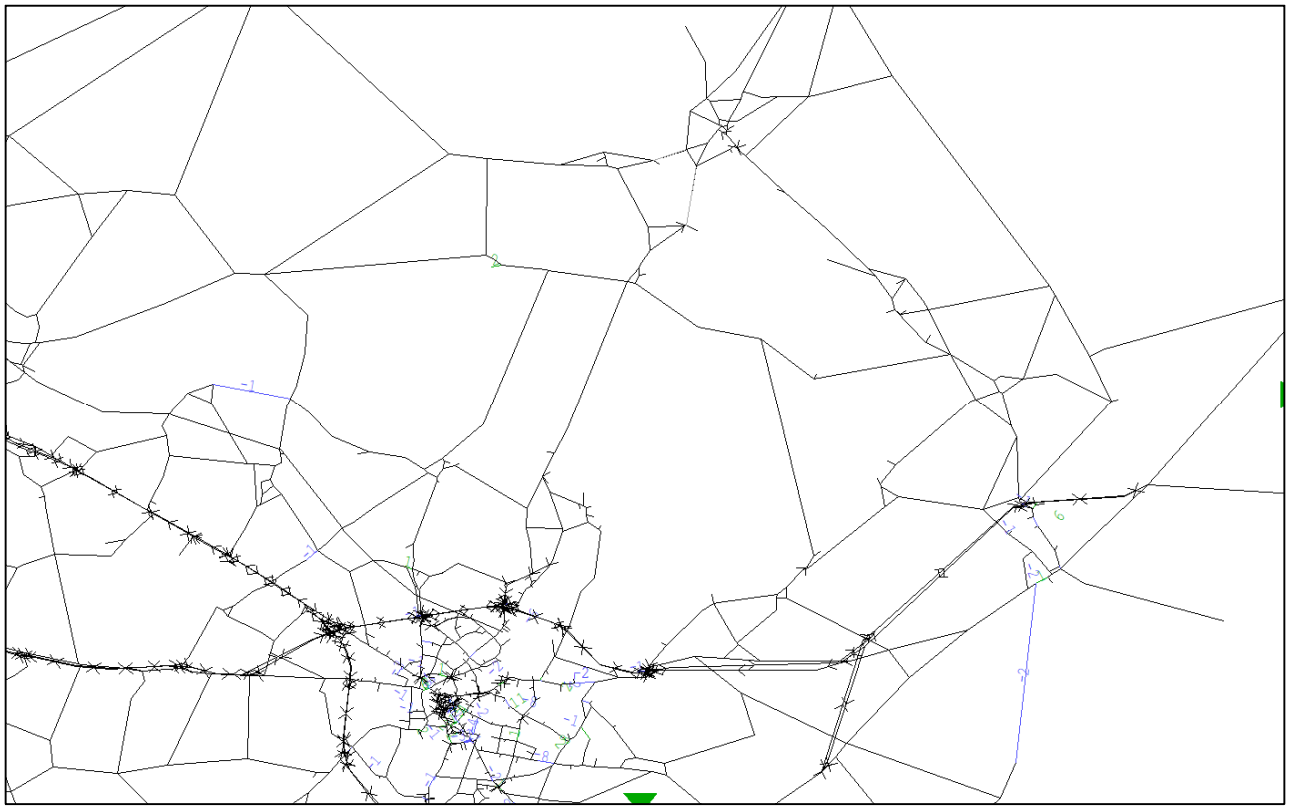


Figure 9. Total delay difference between updated and original model in the PM peak

All time periods show minimal change in delay between the two scenarios along A10 corridor. There are some minor changes in delay in Cambridge for the PM and interpeak, but they are very marginal, to the effect that there is no real difference.

In the AM peak, there were more notable changes inside Cambridge compared to the other two periods, due to the differences in flows noted as a result of model noise in the assignment. The greatest change in AM peak is an increase of around 156 seconds at New Street westbound and this is due to the small flow increase of 14 PCUs on the road. Whilst this is a large change, around the core study area of the A10 corridor, there are no changes.

4. Summary

4.1 Model differences

The comparison of updated and original models shows that for the majority of the modelled area the changes in flows effected by the revisions to the network coding are very small, and only increase to more than one or two PCUs in flow within Cambridge; in all other areas, and particularly along the A10 corridor, there is barely any change. Given how far away it is from the revised junctions, the changes that do occur in Cambridge are considered to be due to model noise rather than a direct effect of the network changes. Whilst it is noted that in the AM peak model there are some very large changes in delays in Cambridge, it should also be noted that these are a significant distance away from the A10 corridor.

4.2 Implications for the A10 SOBC

Given that the changes in link flows as a result of the revisions are so small, the assignment calibration and validation as reported in the A10E2C LMVR continues to be representative of the state of the base model, even with the revisions to the network coding. For that reason, the revised A10E2C base model can be used as the starting point for developing forecast scenarios to be used for the appraisal of schemes along the A10 corridor. It is therefore recommended that the LMVR continue to be used for reporting on the A10E2C model, and that this note be a supplementary addendum to that report.