Essex Highways

M11 Junction 8 – Traffic Modelling Report

27/01/2021

RINGWAY JACOBS integrated expertise

Essex County Council

Document Control Sheet

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Report Title	M11 Junction 8 – Traffic Modelling Report
Project Number	B355320A
Status	Draft
Revision	0
Control Date	27/01/2021

Record of Issue

Issue	Status	Author	Date	Check	Date	Review	Date
1	Draft	EC	26/01/21	CY	27/01/21	CY	27/01/21

Approved for Issue By	Date

Distribution

Organisation	Contact	Number of Copies

Contents

Tables

Graphics

1. Introduction

1.1 Purpose

This technical note is to provide a summary of the traffic modelling methodology for the appraisal of an improvement scheme to improve congestion at M11 Junction 8 in Essex. It specifically seeks to:

- Define the scope, methodology and assumptions of the traffic modelling;
- Identify the data and traffic surveys used in the traffic models;
- Demonstrate how economic assessments will be supported by traffic modelling work;
- Detail the forecasting assumptions including demand and network changes; and;
- Discuss the results of the forecast scenarios.

1.2 Scheme Background

Junction 8 of the M11 is currently operating at capacity and already experiences significant delays on some arms at peak periods. Prior to the COVID-19 pandemic, Stansted Airport was growing at an unprecedented rate of 2mppa. This growth, once it returns, combined with committed developments in the area, in particular at Bishop's Stortford, will add to this congestion. Local Plans for East Herts and Uttlesford are being progressed, and this junction is key to these plans being found sound. During discussions around the Uttlesford plan, the issue of M11 J8 was raised. The plan's success through inquiry will need a clear commitment and delivery of the junction improvement to ease congestion.

Previously, a scheme to improve J8 and remove the pinch point, proposed a new junction 8B would be created, linked to and situated just north of Junction 8/8A, together with a new junction on the A120, to provide additional access to Stansted Airport - originally costed at £131 million. Public consultations established that the scheme would be necessary, if airport expansion proceeded. Following the decision not to proceed with expansion, the scheme was dropped in 2010. However, passenger numbers have continued to increase and the need to provide a cost-effective solution to improve the junction is becoming increasingly important.

1.3 Proposed Scheme

The proposed scheme was selected based on earlier study using a LinSig model of the signal-controlled roundabout. The following improvements are proposed and shown in the drawings of Appendix A:

- Expand the M11 J8 northbound off slip to three lanes with the left lane dedicated for the service station **(B355308A-01-01-001 Rev P4)**;
- Reduce the entry from the gyratory to the service station to one lane **(B355308A-01-01-001 Rev P4)**;
- Widen the A120 westbound to three lanes immediately after the exit from the M11 J8 gyratory **(B355308A-02-01-001 Rev P1);**
- Replace the A120/A1250 roundabout with a signalised junction with provision for all movements (excluding U-turns) **(B355308A-02-01-001 Rev P1)**;
- Increase the length of the left-turn lane from the A120 eastbound to the M11 on slip **(B355308A-02-01-001 Rev P1)**; and
- Expand the M11 J8 southbound off slip to five lanes with two lanes dedicated to A120 **(B355308A-03-01-001 Rev P4).**

1.4 Opening and Design Year

The scheme has been assessed in the year of 2021 and a design year of 2036 that are consistent with the assessment undertaken for the previous business case.

2. Traffic Modelling

2.1 Existing Traffic Model

Essex County Council (ECC) has an existing LinSig junction model of M11 J8, as well as the Harlow Transport Model.

2.1.1 M11 J8 LinSig Model

The 2014 base LinSig model covering the AM and PM peak hours was originally acquired from WSP by Essex County Council and has been further fine-tuned to replicate the existing lane use and traffic interaction currently witnessed on-site.

It was originally used in early stages of this project to assess the operation of the current signal controlled roundabout and to assess the various capacity improvement measures that could be made to the junction to provide additional short-term headroom at the junction.

Future years 2021 and 2036 were modelled using traffic flow outputs from the Harlow Transport Model (VISUM), taking into account committed housing, employment and other development.

2.1.2 Harlow Transport Model

The Harlow Transport Model was developed in VISUM for Base Year 2014 and Future Year 2021 and 2036. The future year VISUM model includes known committed developments and Local Plan developments within the model area as known in December 2015 when the model outputs were produced. The development of the VISUM model is described in the following reports:

- Harlow Transport Model LMVR
- Traffic Forecasting Report

The future Do-something scenarios of the Harlow Transport Model also include the proposed M11 Junction 7A scheme which is planned to open in 2021.

The Harlow Transport Model was built for the primary purpose of testing the validity of Junction 7A proposals and for testing the impact of Harlow Local Plan. The output flows for Junction 8 were from within a less well validated area of the model. In light of this, base and future year flows from the VISUM model were produced so that predicted changes in flow over the base could be calculated. These changes in flow were then applied to the base traffic count matrices for use in the junction modelling.

2.2 Methodology Approach

The area around M11 J8 has a number of closely spaced junctions and is heavily congested during peak periods, with queues from the main interchange often extend to upstream junctions. The M11J8 LinSig model is considered insufficient for a more detailed assessment as it does not model the impact that one junction has on others, in terms of queuing and blocking back, and platooning of traffic. Therefore it is considered that a microsimulation model such as VISSIM would best suited to undertake the traffic modelling, as it would better replicate randomness of arrivals, lane distribution, internal queuing and allows the scheme to be quantified in economic terms as well as the operation of the scheme to be viewed in a manner that can be understood by the non-technical audiences.

A calibrated and validated Base VISSIM model was produced for the weekday AM and PM peak hour scenarios. As far as practically possible, the model was built to the standards set out in DfT's Web-based Transport Appraisal Guidance (WebTAG) and in IAN 36/01. These provided details on the acceptable differences between modelled and observed flows and the differences between modelled and observed journey times. Following these would ensure that the model would be suitably robust for assessing the future scenarios.

Each model covered one-hour peak period, with minimum 15 minutes warm up periods to ensure the right level of congestion at the start of the peak hour. The actual peak hours defined in Section 2.5 were determined from the traffic counts collected in July 2014.

The Harlow Transport Model which included growth from specific local developments, expansion of Stansted Airport and committed infrastructure scheme (M11 J7a) were utilised to provide predictions of changes in flows from the base year (2014) to forecast years (2021 and 2036).

2.3 Study Area

The study area covered by the VISSIM model is shown in Graphic 1. It includes all areas of the M11 J8 and J8a interchange, sections of the motorway leading to the interchange and the section of the A120 from the A1250 Dunmow Road/ Birchanger Lane Roundabout to the overbridge at Parsonage Road. The network will be coded using CAD drawings supplemented by aerial/ Street View images from Google Earth.

Graphic 1: Study Area and Model Extent

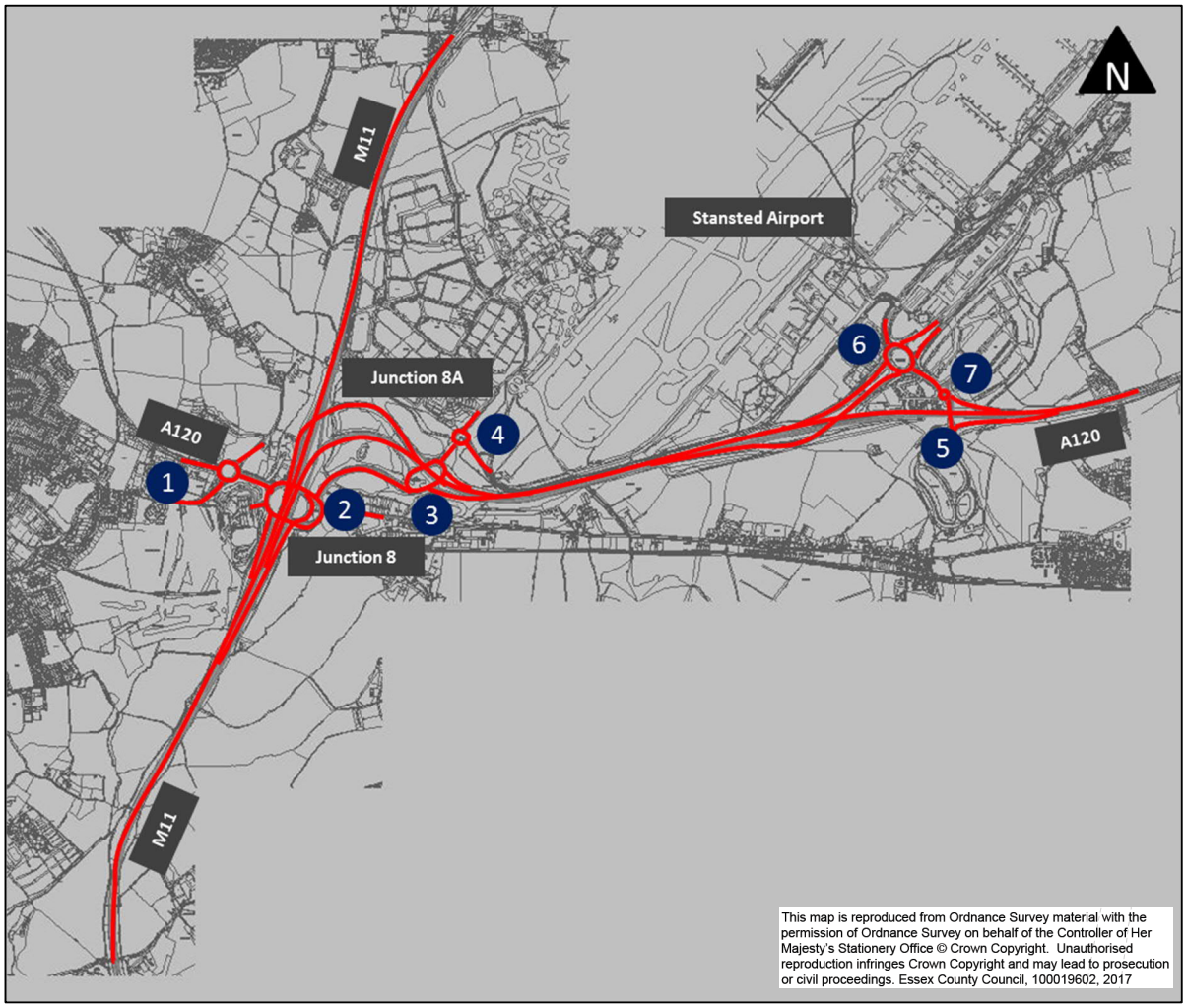


Table 2-1 lists the junctions modelled, their control type and level of validation at each location. Junctions 4, 6 and 7 are located on the boundary outside the core study area and have been included only as proxy junctions to provide some levels of platooning of the traffic flow into the core network.

Table 2-1: M11 J8 Model Junctions

No.	Junction Name	Type	Level of Validation
1	A120/ A1250 Dunmow Road/ Birchanger Lane Roundabout	Priority	Calibration from 2014 traffic data (synthesized from 2011 data)
2	M11 J8 (M11/ A120/ B1256 and motorway service area (MSA))	Signals	Full validation against 2014 traffic data

No.	Junction Name	Type	Level of Validation
3	A120/ Round Coppice Road (Priory Wood) Roundabout	Priority	Full validation against 2014 traffic data
4	Round Coppice Road/ Long Border Road Roundabout	Priority	No validation
5	A120E / Stansted Airport Access Road Junction	Priority	Full validation against 2014 traffic data
7	Bassingbourn Road/ Thremhall Avenue Roundabout	Priority	No validation
6	Stansted Mid-stay Car Park / Southgate Rd Roundabout	Priority	No validation

2.4 Traffic Data

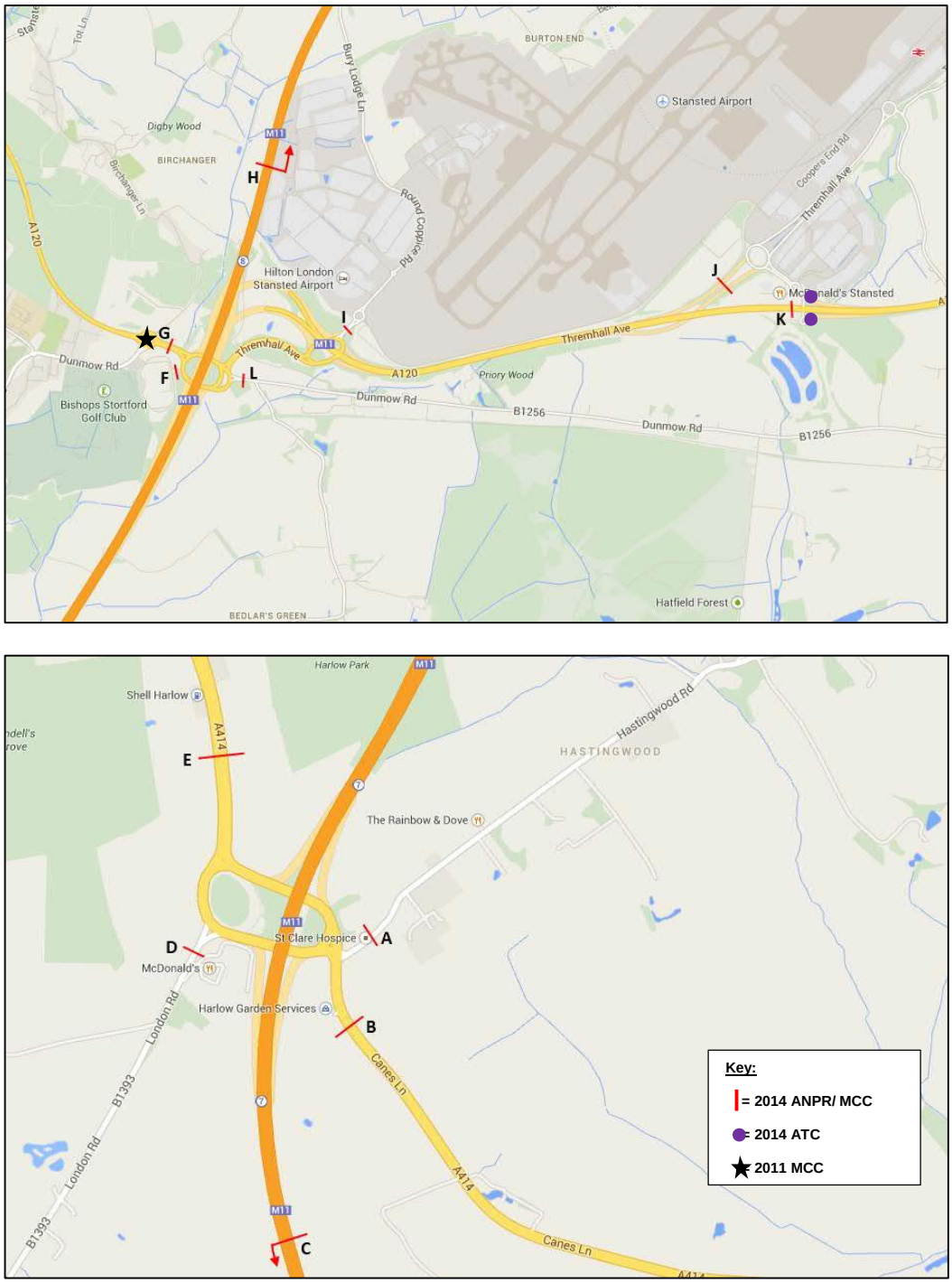
The 2014 base year model was developed using traffic survey data collected in July 2014, which included:

- 12 ANPR survey locations in cordon around M11 J7 and J8 between 05:00 and 21:00 on Tuesday 15th July 2014;
- Manual Classified Counts (MCC) at the cordons of the ANPR survey;
- Automatic Traffic Counts at A120 / Airport Access Road Junction (junction 5).
- Manual Classified Turning Counts from 2011 were available for the A120/ A1250 roundabout. These were uplifted to 2014 based on the volume from the 2014 MCC.

The traffic survey locations are illustrated in Graphic 2. Data from these surveys were used to inform:

- Origin-destination movements across the model cordon;
- Total volume and vehicle composition at the origin and destination;
- Turning movements at the A120/ A1250 Roundabout (junction 1) and A120 / Airport Access Road (junction 5), for expanding the trip matrix;
- The journey time data for model validation were extracted from the latest available TrafficMaster dataset. Data were filtered appropriately to remove data that is not from a neutral time period. A suitably large amount of data for calculating a reliable average were used. The data were aggregated into journey time routes through the area covered by the modelled network for journey time validation.

Graphic 2: Traffic Survey Locations

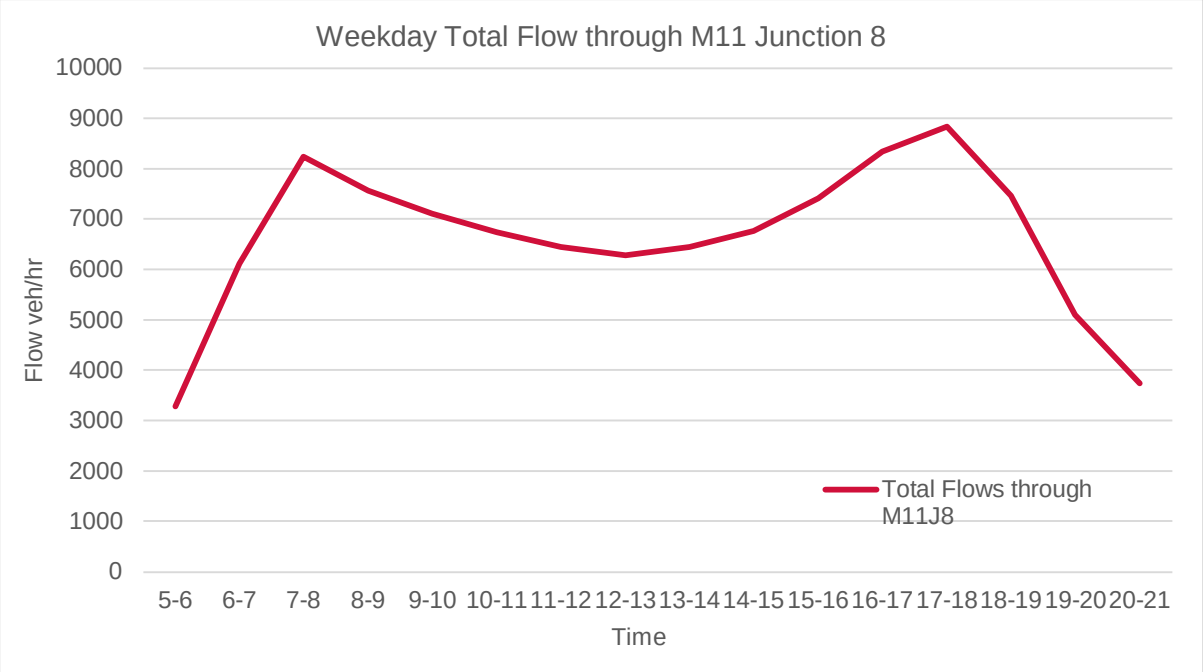


2.5 Time Periods

An analysis of the traffic volume was undertaken to determine the hour with the busiest total traffic flows for each peak period. The weekday profile of the total

flows through the M11 junction 8 is shown in Graphic 3. The analysis showed that the busiest hours were 07:00 to 08:00 for the weekday AM peak and 17:00 to 18:00 for the weekday PM peak.

Graphic 3: Weekday Total Flow



The model simulation start time and simulation periods, selected with reference to the peak traffic volume are shown in Table 2-2.

Table 2-2: Model simulation start time and period

	Simulation Start Time	Simulation period (s)	Model Period
Weekday AM Peak	06:45	5400	07:00 to 08:00
Weekday PM Peak	16:45	5400	17:00 to 18:00

Both modelled periods include a 15-minute warm-up at the beginning to ensure traffic levels within the network are representative at the beginning of the peak period.

2.6 User Classes

The following user classes have been modelled:

- Lights (Car and LGV)
- Heavies (OGV1 and OGV2)

- PSV (Local buses and airport coaches)

2.7 Traffic Flow

Traffic were assigned to the model network using Static Assignment. All vehicle inputs at the origin were be coded in 15 minute intervals based on the flow profile derived from the 2014 MCC at that location.

2.8 Traffic Signals

The M11 J8 is signalised, this has been incorporated into the model initially according to the signal timings from the LinSig models and fine-tuned during calibration. The signal control in VISSIM has been coded using VAP in VISSIM based on signal layout drawings and signal timing plans containing detector locations and green time extension information for VA and MOVA junctions.

2.9 Calibration and Validation

The calibration and validation result of the 2014 Base Model are summarised in the M11 Junction 8 VISSIM Model – LMVR, July 2017. The model has been developed in accordance with WebTAG criteria along with adherence to TfL/ Highways England guidance for microsimulation specific issues.

The model demonstrated excellent calibration and validation to flows for those in close proximity to the M1 J8 as well as around the cordon of the model.

Observation during model simulation indicated the model is generally replicating behaviour well, particularly at the key junctions.

Validation against journey times also demonstrates the model's excellent representation of current traffic condition along A120, M11 and at J8/ J8a.

It is concluded that the model provides a suitably robust platform for undertaking the forecasting of future options.

2.10 Development of Forecast Models

Before the 'with' (DS) scheme forecasts were produced a reference 'without' (DM) scheme forecast was produced for each forecast year considered (2021 and 2036). This essentially involves updating the demand data from the base year to the forecast years. Difference matrices between base and future years were derived from the Harlow Transport Model and applied to the 2014 base VISSIM matrices to form future year matrices.

It is anticipated that there will be significant traffic growth in the study area primarily due to:

- Full permitted growth at Stansted Airport, 35 mppa;
- General background growth (population and car ownership);
- Specific proposed housing & employment developments in the vicinity; and
- Committed infrastructure: M11 J7a.

2.11 Sensitivity tests

In addition, to the Core scenario, sensitivity tests were carried out in accordance with guidance in WebTAG M4 in order to determine the potential range of outputs that could be forecast by the model for differing inputs. Specifically, a high growth (High) and a low growth (Low) sensitivity tests were undertaken. The non-sensitivity test scenarios are referred to as 'Core'. The adjustment factors for the High and Low growth scenarios were calculated using the following formula:

$$Base\ proportion = \pm 2.5\% \times \sqrt{n}$$
$$where\ n = years\ ahead\ of\ the\ base\ year$$

The proportion of each OD in the base matrices was then applied to the core OD matrices as shown in Table 2-3.

Table 2-3: Sensitivity tests

Year	Scenario	Base Proportion	Application
2021	Low	6.6%	$2021\ Core - (2014\ Base\ \times 6.6\%)$
2036	Low	11.7%	$2036\ Core - (2014\ Base\ \times 11.7\%)$
2021	High	6.6%	$2021\ Core + (2014\ Base\ \times 6.6\%)$
2036	High	11.7%	$2036\ Core + (2014\ Base\ \times 11.7\%)$

2.12 Traffic Outputs for Economic Assessment

The Department for Transport's TUBA software will be used to determine economic efficiency costs and benefits due to a scheme intervention. The M11 J8 VISSIM model was run with ten random seeds to reflect the stochastic nature of the model. The weighted average output of these runs was provided for the TUBA economic appraisal.

TUBA economic evaluation will be conducted using the vehicle trip, travel time and distance skims from the VISSIM models, including the DM and DS

scenarios for the opening year 2021 and the forecast year 2036 for the AM and PM peak hour time periods. Outputs were provided for Core, Low and High scenarios resulting in 24 scenarios in total as shown in Table 2-4.

Table 2-4: Scenarios for Economic Assessment

Year	Growth	Do Minimum (DM)		Do Something (DS)	
		AM	PM	AM	PM
2021	Core	2021 Core AM DM	2021 Core PM DM	2021 Core AM DS	2021 Core PM DS
2036	Core	2036 Core AM DM	2036 Core PM DM	2036 Core AM DS	2036 Core PM DS
2021	Low	2021 Low AM DM	2021 Low PM DM	2021 Low AM DS	2021 Low PM DS
2036	Low	2036 Low AM DM	2036 Low PM DM	2036 Low AM DS	2036 Low PM DS
2021	High	2021 High AM DM	2021 High PM DM	2021 High AM DS	2021 High PM DS
2036	High	2036 High AM DM	2036 High PM DM	2036 High AM DS	2036 High PM DS

For the vehicle trips, the DM skim matrices for each user class will be used for both the DM and DS scenarios for each respective forecast year, so as to ensure the matrix trip totals are consistent between the DM and DS.

3. Forecasting Results

3.1 Model Naming Convention

The Economics Assessment investigates one preferred scheme option, the model of which is referenced in this report as the 'Do Something' (DS) scenario.

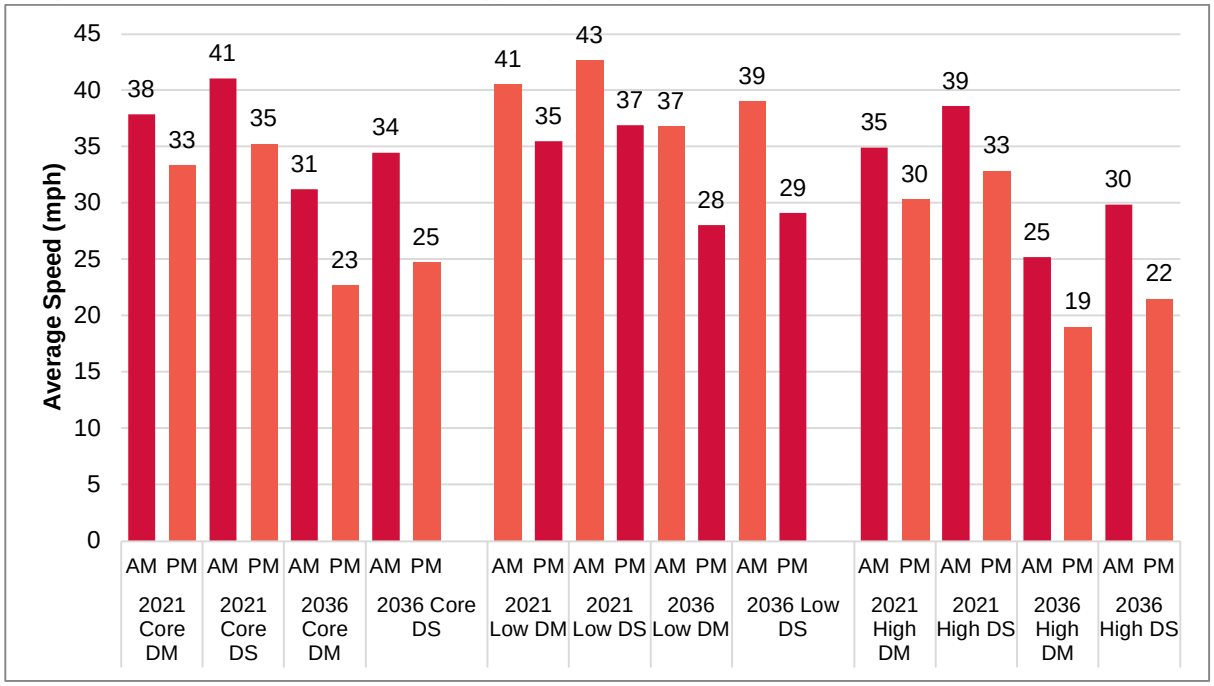
The scheme representing no change except demand growth is referred to in this document as the 'Do Minimum' (DM) scenario. In each forecast demand case, the DM scenario is compared to the DS scenario.

As described in section 2.11, demand is referred to either as Core, or for the sensitivity tests, as Low and High.

3.2 Core Scenario Journey times

As shown in Graphic 4, the DS scenario results in improvements to overall average speeds within the modelled network, and therefore reduced journey times, in both future years and time periods. This section details journey times for routes from key origin and destination zones to illustrate these changes. The routes were selected based on their significance in traffic movement in the area or they cover sections of the network where improvements are proposed.

Graphic 4 : Core Scenarios Average Speeds



The key journey time routes are listed in Table 3-1 and the locations of the zones in the model are shown in Graphic 5.

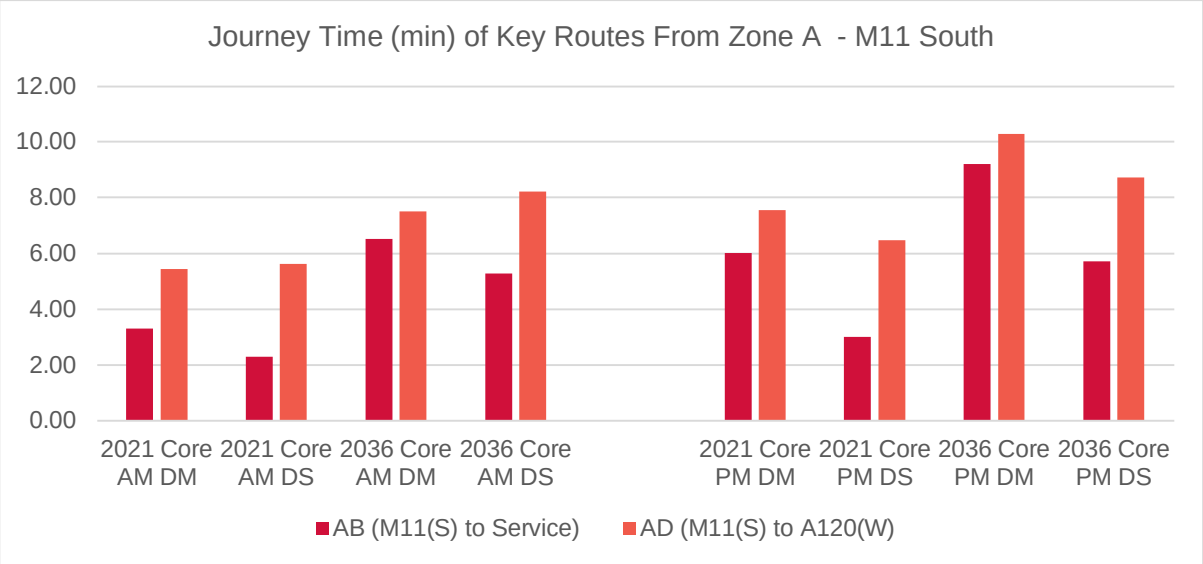
Table 3-1: Journey Time Routes

Route O-D	From	To
AB	M11 South	Service Station
AD	M11 South	A120 West
BD	Service Station	A120 West
BF	Service Station	M11 North
CD	A1250	A120 West
CE	A1250	Birchanger Lane
DA	A120 West	M11 South
DJ	A120 West	A120 East
EA	Birchanger Lane	M11 South
EC	Birchanger Lane	A1250
FC	M11 North	A1250
FK	M11 North	B1256
JE	A120 East	Birchanger Lane
JF	A120 East	M11 North

Graphic 5: M11 J8 Model Zones

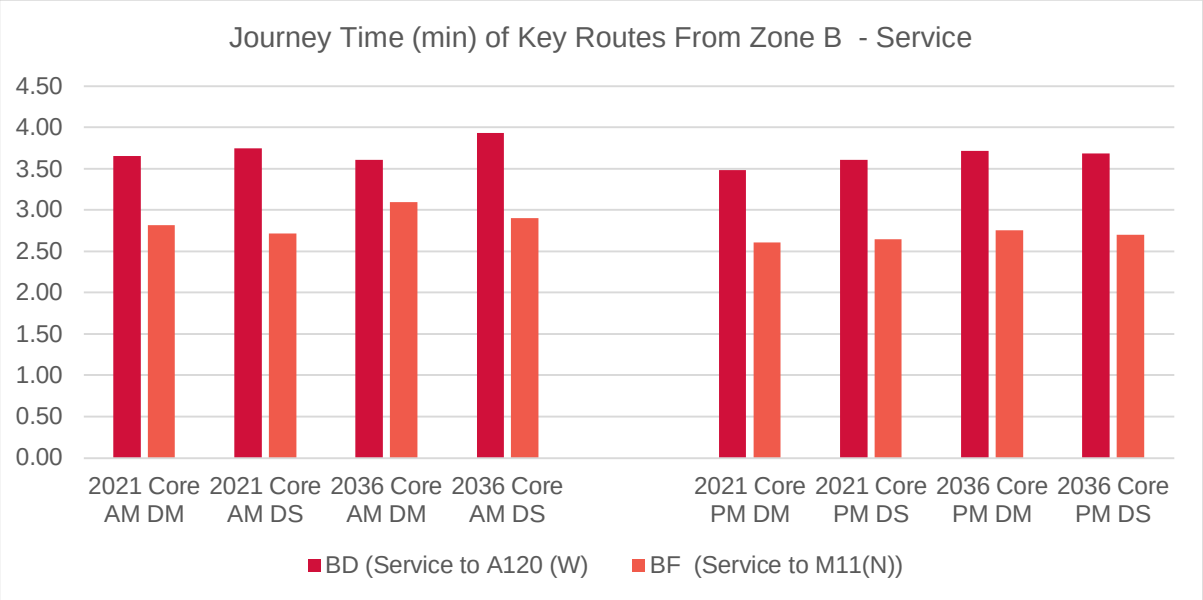
The graphs in Graphic 6 to Graphic 12 illustrate the average journey times within each modelled period and scenario for two key routes from each origin. Generally, there are journey time improvements for routes that travel through the proposed improvements on the M11 northbound and M11 southbound off-slips, however these improvements are sometimes offset by the proposed signalisation of the A120/A1250 junction which typically increases journey times at this location.

Graphic 6 : Comparison of Journey Times on Two Key Routes from A – M11 South



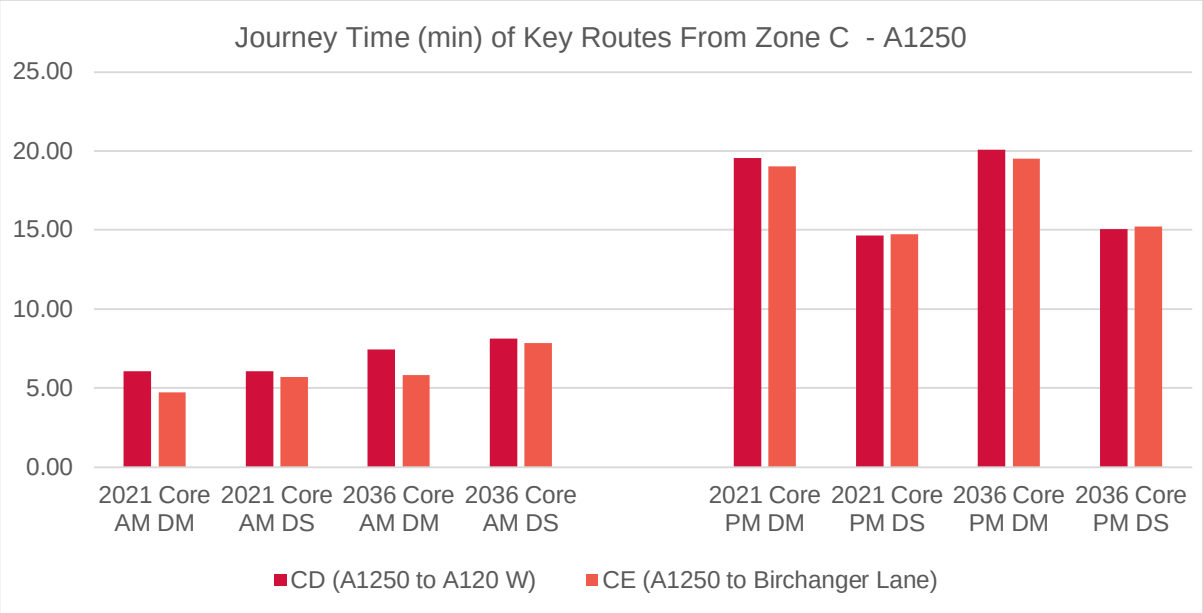
Graphic 6 shows that there are significant journey time improvements in the DS scenarios for vehicles travelling to the service station from the M11 South. This is due to the additional lane on the M11 Northbound off-slip provided exclusively for this movement. This improvement on the M11 off-slip also reduce travel times to A120 West in the PM however, in the AM this is outweighed by increased delay at the signalised A120/A1250 junction resulting in travel times increasing slightly in 2021 and more so in 2036 for traffic travelling from M11 (S) to A120 (W). In the AM there is significantly more demand from Birchanger Lane which reduces the green time available for A120 westbound traffic.

Graphic 7 : Comparison of Journey Times on Two Key Routes from B – Service Station



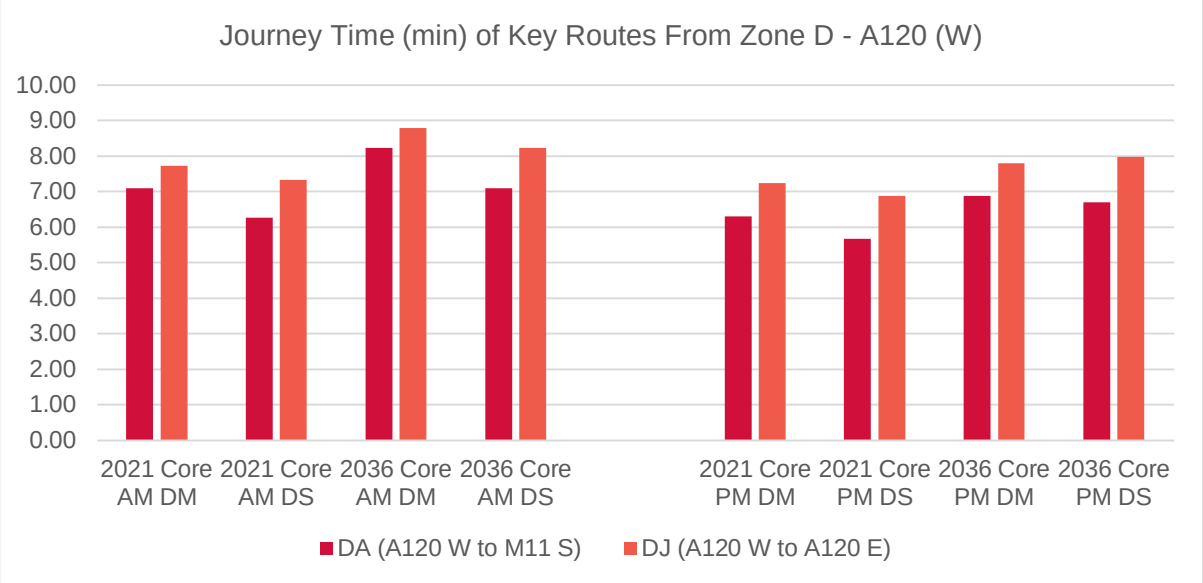
Graphic 7 shows little change between the scenarios in the PM. In the AM DS scenarios, there is a small reduction in in travel time to the M11 North due to optimisation of signal times and a small increase in travel time to the A120 due to the signalisation of the A120/A1250 junction. In the AM there is significantly more demand from Birchanger Lane which reduces the green time available for A120 westbound traffic.

Graphic 8 : Comparison of Journey Times on Two Key Routes from C – A1250



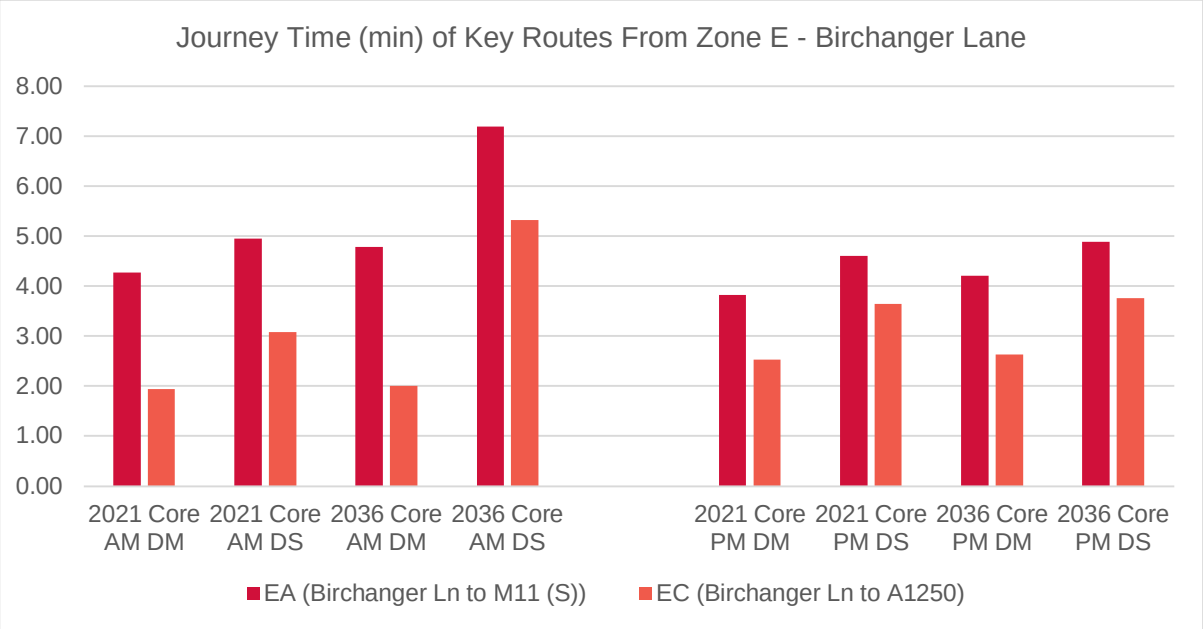
Graphic 8 shows improved journey times in the DS scenarios for traffic travelling from the A1250 in the PM. Again, in the AM, travel times increase due to the signalisation of the A120/A1250 junction. This is most pronounced for the signalised through movement to Birchanger Lane.

Graphic 9 : Comparison of Journey Times on Two Key Routes from D – A120 West



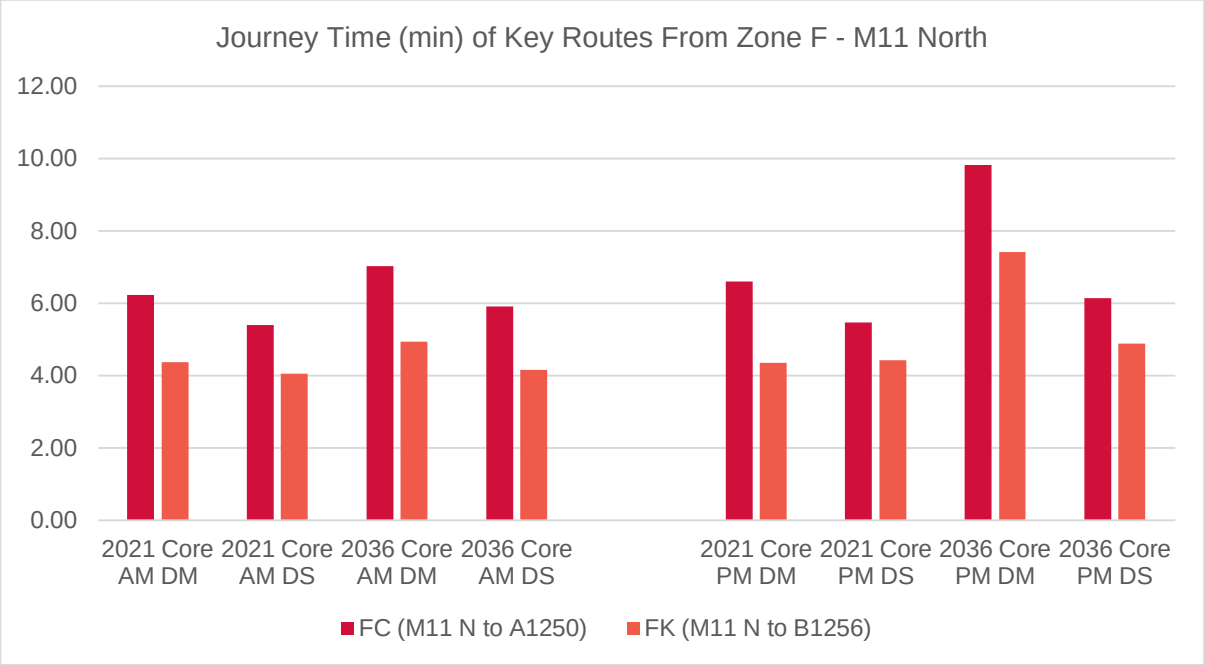
Graphic 9 shows that, in general, journey times from the A120 West reduce despite the signalisation of the A120/A1250 junction. The exception to this is the 2036 PM DS scenario where travel times increase. This is because the signalised junction is oversaturated in 2036 which requires more green time to be provided to the A1250 approach which increases volumes from there at the expense of vehicles from the A120 West approach.

Graphic 10 : Comparison of Journey Times on Two Key Routes from E – Birchanger Lane



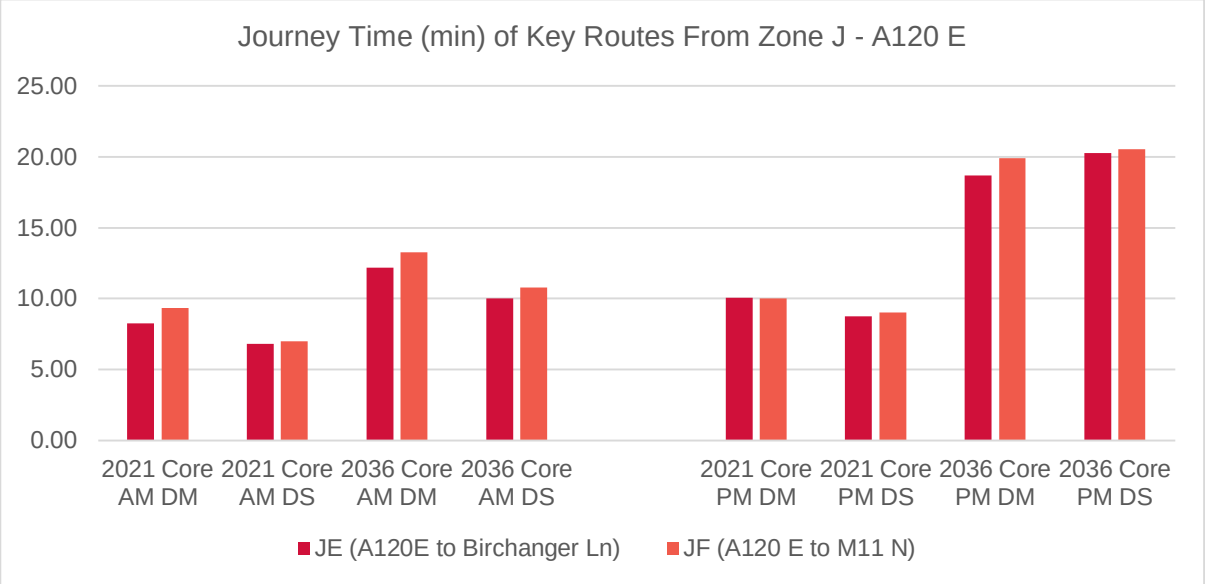
Graphic 10 shows increases in journey times for vehicles from Birchanger Lane in all DS scenarios. Vehicles from this approach receive minimal green time as they are controlled on its own signal stage which requires stopping all other movements. As noted previously, traffic volumes on Birchanger Lane are greater during the AM which leads to more significant delays than during the PM.

Graphic 11 : Comparison of Journey Times on Two Key Routes from F – M11 North



Graphic 11 shows that there are journey time decreases in all DS scenarios for routes from the M11 North due to the improvements to the M11 southbound off-slip.

Graphic 12 : Comparison of Journey Times on Two Key Routes from J – A120 East



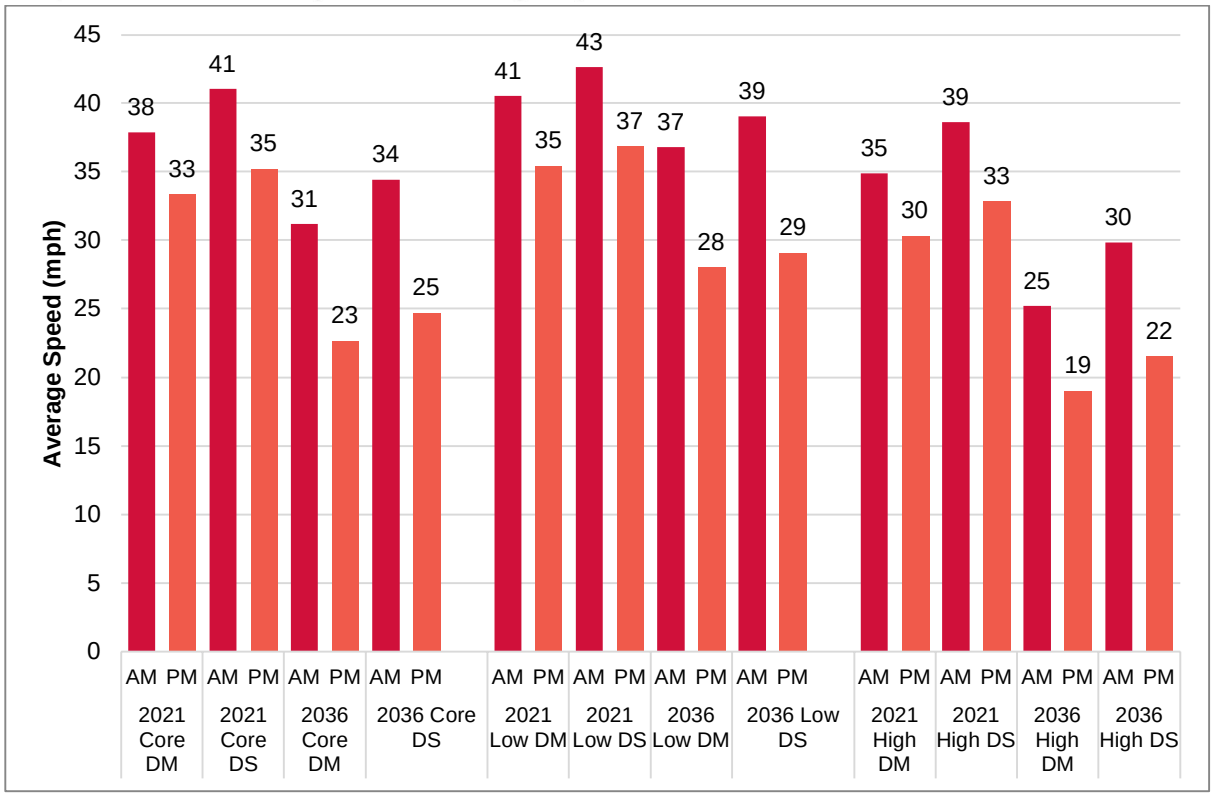
Graphic 12 shows that the journey time decreases from A120 East to Birchanger Lane and the M11 North except for in the 2036 PM DS scenario. This small increase is likely due to the improvements on the M11 southbound off-slip which enables more vehicles to enter the roundabout from this approach, this increase is most significant in the 2036 PM DS scenario.

3.3 Sensitivity Test Journey times

The average speeds for the Core, Low and High scenarios are shown in Graphic 13. As expected, the Low scenarios result in increased speeds and decreased journey times with the reverse for High scenarios. The average speeds suggest that the improvements in the DS scenario result in a slightly more resilient network as speeds decrease less than in the DM High scenario – the difference between the two is only in the order of 0.5 to 1.5 mph, however.

Detailed journey times for key routes are provided for Low and High scenarios in Appendix B.

Graphic 13 : Sensitivity Tests Average Speeds

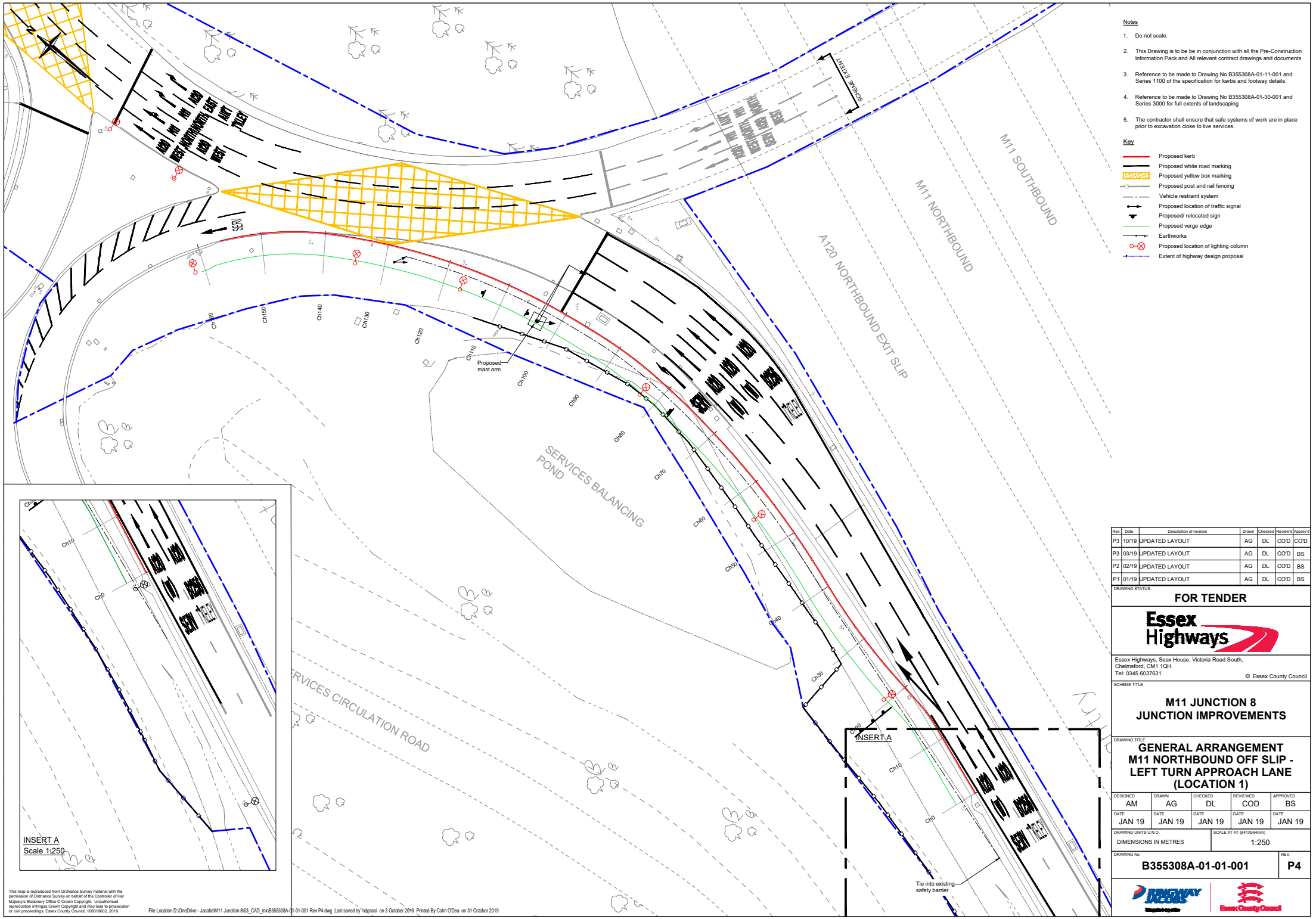


4. Conclusion

This note details the methodology used to produce forecast VISSIM Modelled Scenarios for the appraisal of the proposed M11 J8 improvement scheme and provides a summary of the forecasting results.

The DS scenarios show reductions to average journey times across the network as a result of improvements to the M11 northbound and M11 southbound off-slips. At a route-level however, the proposed signalisation of the A120/A1250 junction sometimes offsets the travel time reductions for routes that pass through this location.

Appendix A: M11 J8 Junction Improvements



Notes

1. Do not scale.
2. This Drawing is to be be in conjunction with all the Pre-Construction Information Pack and All relevant contract drawings and documents.
3. Reference to be made to Drawing No B355308A-01-11-001 and Series 1100 of the specification for kerbs and footway details.
4. Reference to be made to Drawing No B355308A-01-30-001 and Series 3000 for full extents of landscaping
5. The contractor shall ensure that safe systems of work are in place prior to excavation close to live services.

Key

- Proposed kerb
- Proposed white road marking
- Proposed yellow box marking
- Proposed post and rail fencing
- Vehicle restraint system
- Proposed location of traffic signal
- Proposed/ relocated sign
- Proposed verge edge
- Earthworks
- Proposed location of lighting column
- Extent of highway design proposal

Rev.	Date	Description of revision	Drawn	Checked	Review'd	Approv'd
P3	10/19	UPDATED LAYOUT	AG	DL	CO'D	CO'D
P3	03/19	UPDATED LAYOUT	AG	DL	CO'D	BS
P2	02/19	UPDATED LAYOUT	AG	DL	CO'D	BS
P1	01/19	UPDATED LAYOUT	AG	DL	CO'D	BS

DRAWING STATUS

FOR TENDER

Essex Highways

Essex Highways, Seax House, Victoria Road South,
Chelmsford, CM1 1QH.
Tel: 0345 6037631

SCHEME TITLE

**M11 JUNCTION 8
JUNCTION IMPROVEMENTS**

DRAWING TITLE

**GENERAL ARRANGEMENT
M11 NORTHBOUND OFF SLIP -
LEFT TURN APPROACH LANE
(LOCATION 1)**

DESIGNED	DRAWN	CHECKED	REVIEWED	APPROVED
AM	AG	DL	COD	BS
DATE	DATE	DATE	DATE	DATE
JAN 19	JAN 19	JAN 19	JAN 19	JAN 19

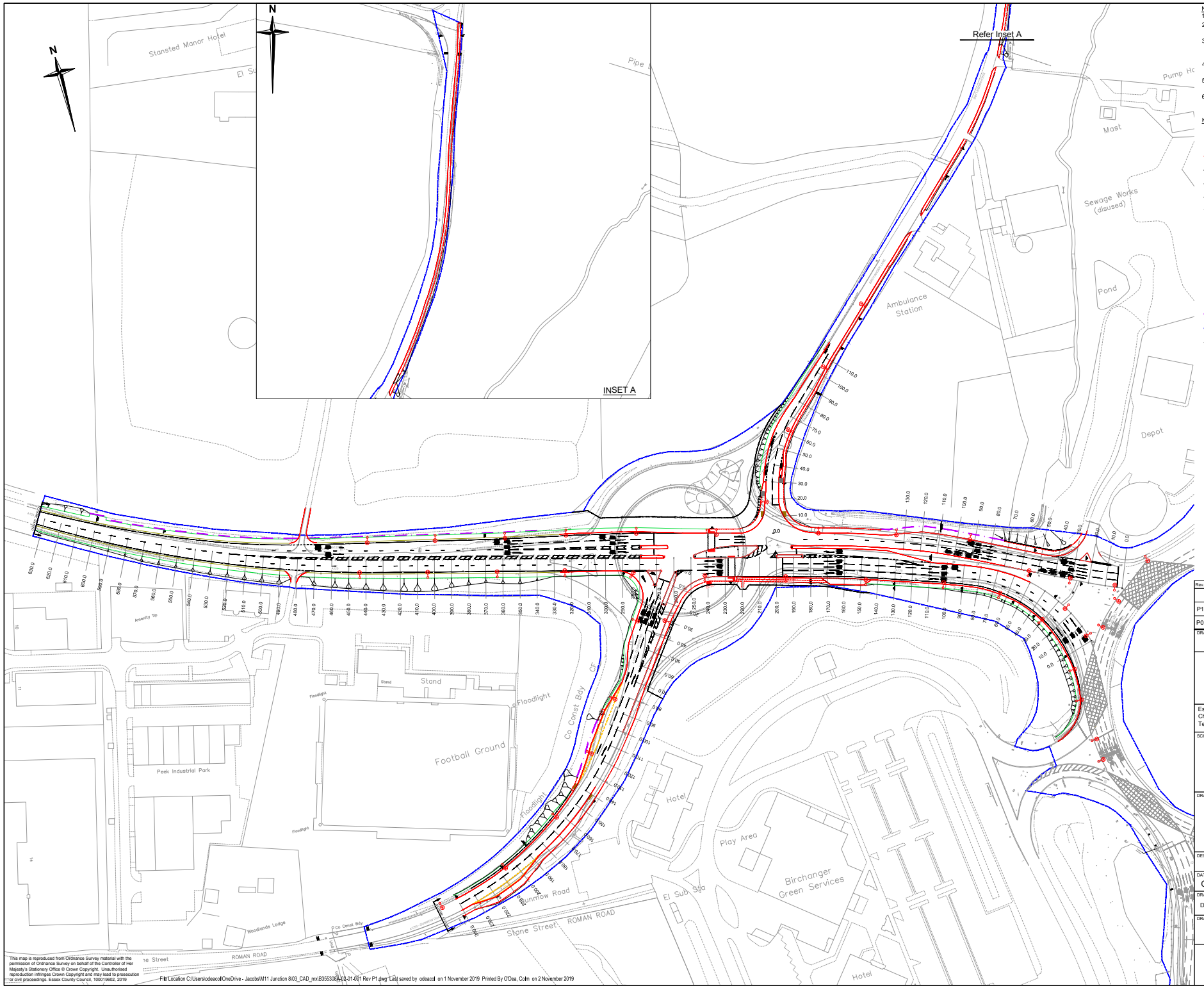
DRAWING UNITS U.N.O.: DIMENSIONS IN METRES

SCALE AT A1 (841X594mm): 1:250

DRAWING No.: **B355308A-01-01-001**

REV.: **P4**

File Location D:\OneDrive - Jacobs\M11 Junction 8\03_CAD_mx\B355308A-01-01-001 Rev P4.dwg Last saved by 'odeacol' on 3 October 2019 Printed By Colm O'Dea on 31 October 2019



Notes
1. Do not scale.
2. This drawing is to be read in conjunction with all the drawings and specifications detailed in the Works Information.
3. All works to be in accordance with the Department for Transport's specification for highway works and Essex County Council's specifications and standard construction drawings.
4. Reference to be made to series 1100 drawings and specification for kerbs and footway details.
5. Reference to be made to series 3000 drawings specification for full landscape extents.
6. The contractor shall ensure that safe systems of work are in place prior to excavation close to live services.

Key
- Proposed kerb
- Proposed dropped kerb
- Proposed PCC edging kerb
- Proposed white road marking
- Vehicle restraint system
- Proposed fencing
- Earthworks
- Proposed/ relocated sign
- Proposed traffic bollards
- Existing sign to remain
- Indicative location of lighting column
- Proposed red / buff coloured blister tactile paving
- Proposed corduroy tactile paving
- Proposed retaining wall
- Extent of highway design proposal
- Proposed pedestrian guard rail

Rev.	Date	Description of revision	Drawn	Checked	Review'd	Approv'd
P1	10/19	UPDATED LIGHTING LAYOUT	AG	DL	COD	TR
P0	06/19	FIRST ISSUE	AG	DL	COD	COD

DRAWING STATUS
FOR TENDER

Essex Highways

Essex Highways, Seax House, Victoria Road South, Chelmsford, CM1 1QH.
Tel: 0345 6037631

SCHEME TITLE
M11 JUNCTION 8 JUNCTION IMPROVEMENTS

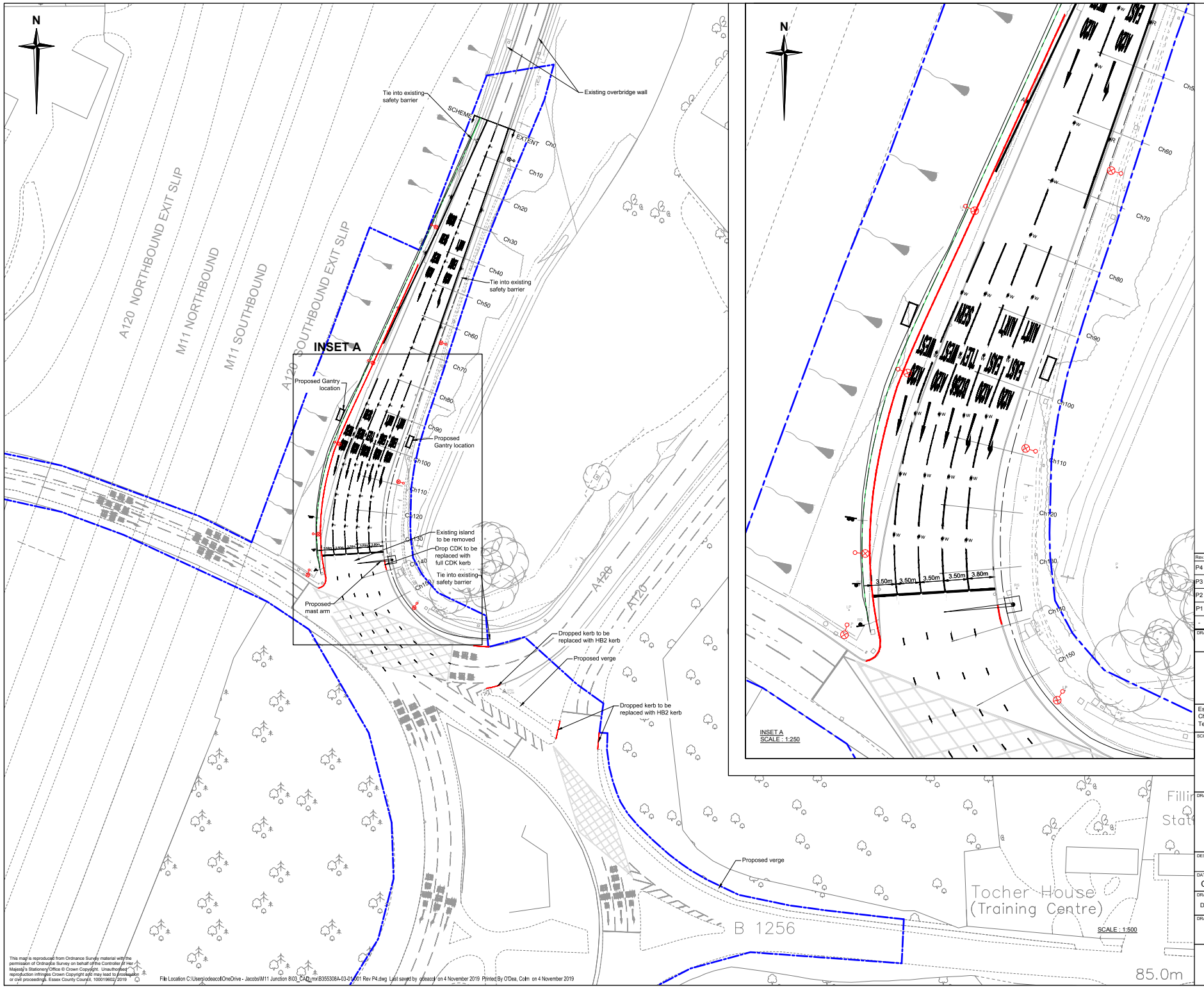
DRAWING TITLE
GENERAL ARRANGEMENT A120 SIGNALISED STAGGERED JUNCTION ARRANGEMENT (LOCATION 2)

DESIGNED	DRAWN	CHECKED	REVIEWED	APPROVED
AM	AG	DL	COD	TR
DATE OCT 19	DATE OCT 19	DATE OCT 19	DATE OCT 19	DATE OCT 19

DRAWING UNITS U.N.O.: DIMENSIONS IN METRES
SCALE AT A1 (841X594mm): 1:1000

DRAWING No.: B355308A-02-01-001
REV.: P1

File Location C:\Users\odeacol\OneDrive - Jacobs\M11 Junction 8\03_CAD_mx\B355308A-02-01-001 Rev P1.dwg Last saved by odeacol on 1 November 2019 Printed By O'Dea, Colm on 2 November 2019



Notes

1. Do not scale.
2. This Drawing is to be be in conjunction with all the Pre-Construction Information Pack and All relevant contract drawings and documents.
3. Reference to be made to Drawing No B355308A-03-11-001 and Series 1100 of the specification for kerbs and footway details.
4. Reference to be made to Drawing No B355308A-03-30-001 and Series 3000 for full extents of landscaping
5. The contractor shall ensure that safe systems of work are in place prior to excavation close to live services.

Key

- Proposed kerb
- Proposed white road marking
- Vehicle restraint system
- Proposed verge edge
- Earthworks
- Proposed location of lighting column
- Proposed/ relocated sign
- Extent of highway design proposal

Rev.	Date	Description of revision	Drawn	Checked	Review'd	Approv'd
P4	10/19	UPDATED LAYOUT/KEY	AG	DL	CO'D	TR
P3	03/19	UPDATED GUIDE LINE MARKING	AG	DL	CO'D	BS
P2	02/19	UPDATED GUIDE LINE MARKING	AG	DL	CO'D	BS
P1	01/19	UPDATED KEY	AG	DL	CO'D	BS
-	11/18	ISSUED FOR COMMENT	AG	DL	CO'D	BS

DRAWING STATUS

FOR TENDER

Essex Highways

Essex Highways, Seax House, Victoria Road South, Chelmsford, CM1 1QH.
Tel: 0345 6037631

SCHEME TITLE

M11 JUNCTION 8 JUNCTION IMPROVEMENTS

DRAWING TITLE

GENERAL ARRANGEMENT M11 SOUTHBOUND OFF SLIP - FIVE LANE APPROACH (LOCATION 3)

DESIGNED	DRAWN	CHECKED	REVIEWED	APPROVED
JA	AG	DL	COD	BS
DATE	DATE	DATE	DATE	DATE
OCT 19	OCT 19	OCT 19	OCT 19	OCT 19

DRAWING UNITS U.N.O.: DIMENSIONS IN METRES

SCALE AT A1 (841X594mm): AS SHOWN

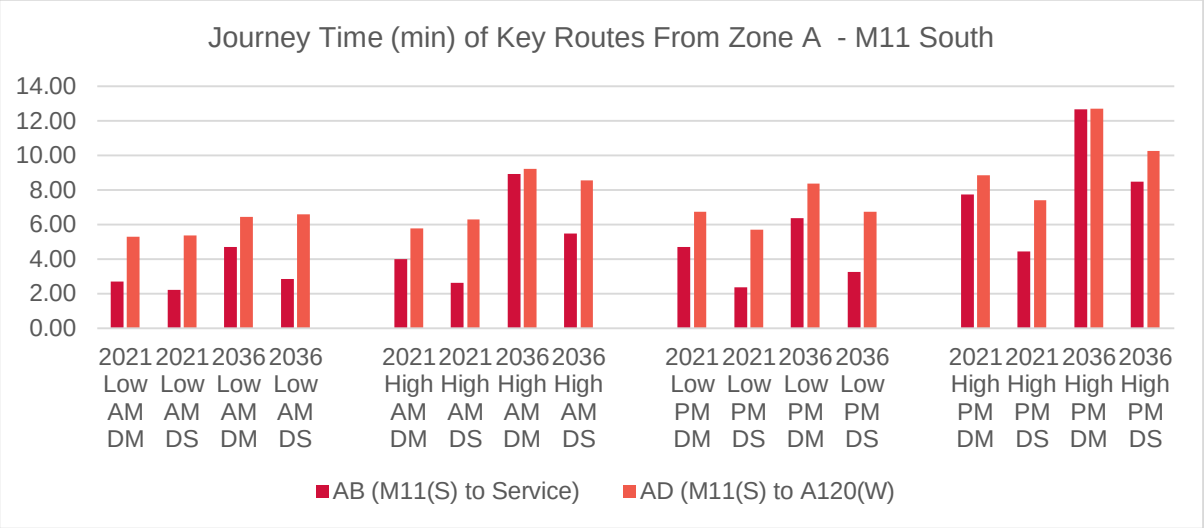
DRAWING No.: **B355308A-03-01-001**

REV.: **P4**

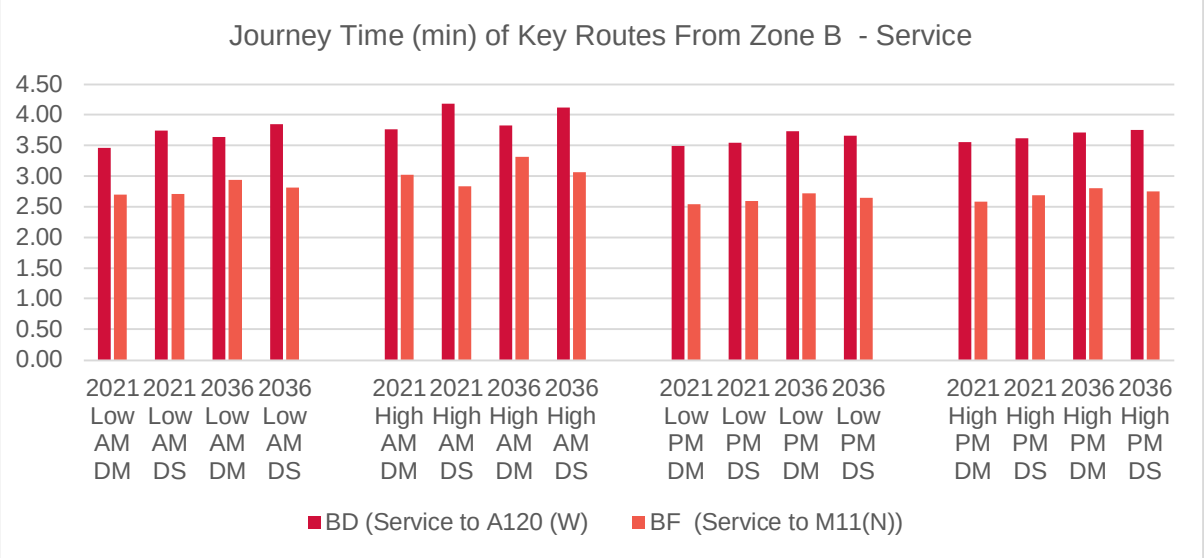
File Location C:\Users\odeacot\OneDrive - Jacobs\M11 Junction 8\03_CAD_mx\B355308A-03-01-001 Rev P4.dwg Last saved by odeacot on 4 November 2019 Printed By O'Dea, Colm on 4 November 2019

Appendix B: Journey Time for Sensitivity Tests

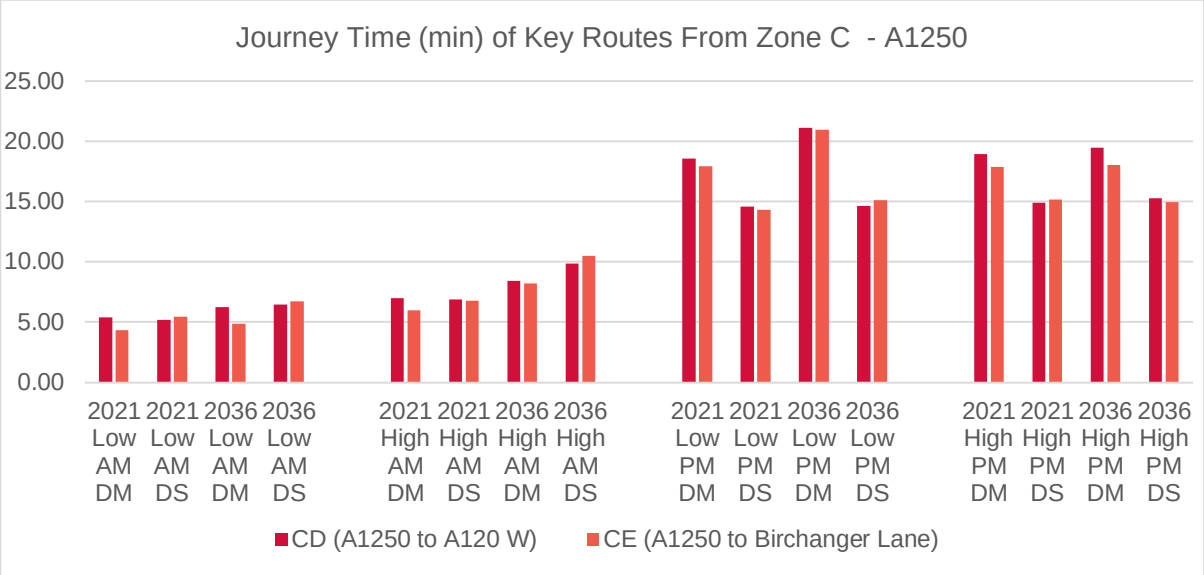
Graphic A1 : Comparison of Journey Times on Two Key Routes from A – M11 South



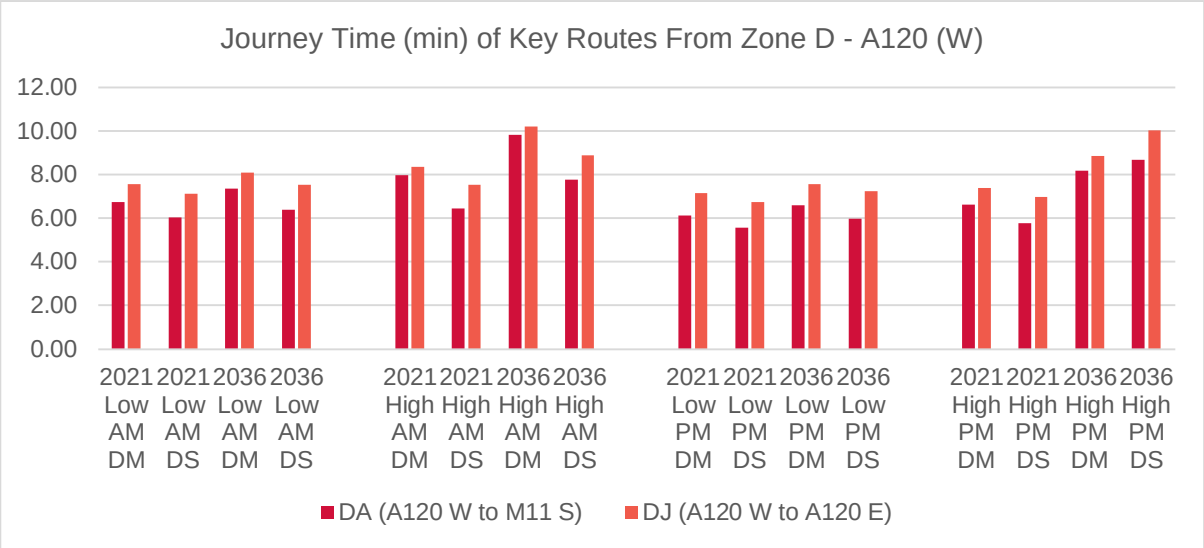
Graphic A2 : Comparison of Journey Times on Two Key Routes from B – Service Station



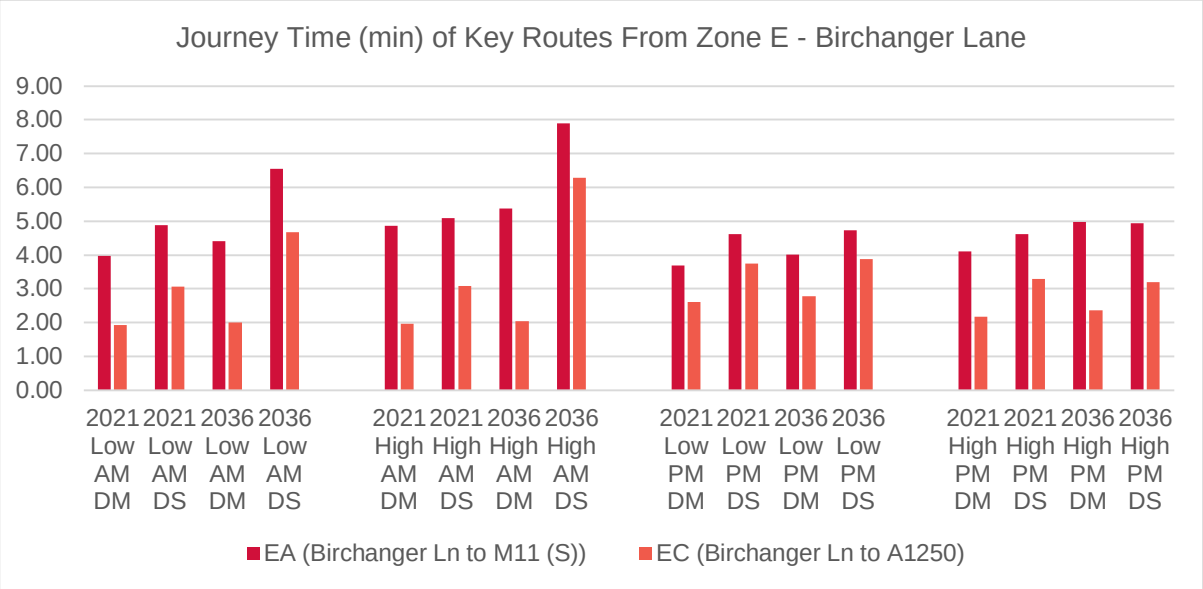
Graphic A3 : Comparison of Journey Times on Two Key Routes from C – A1250



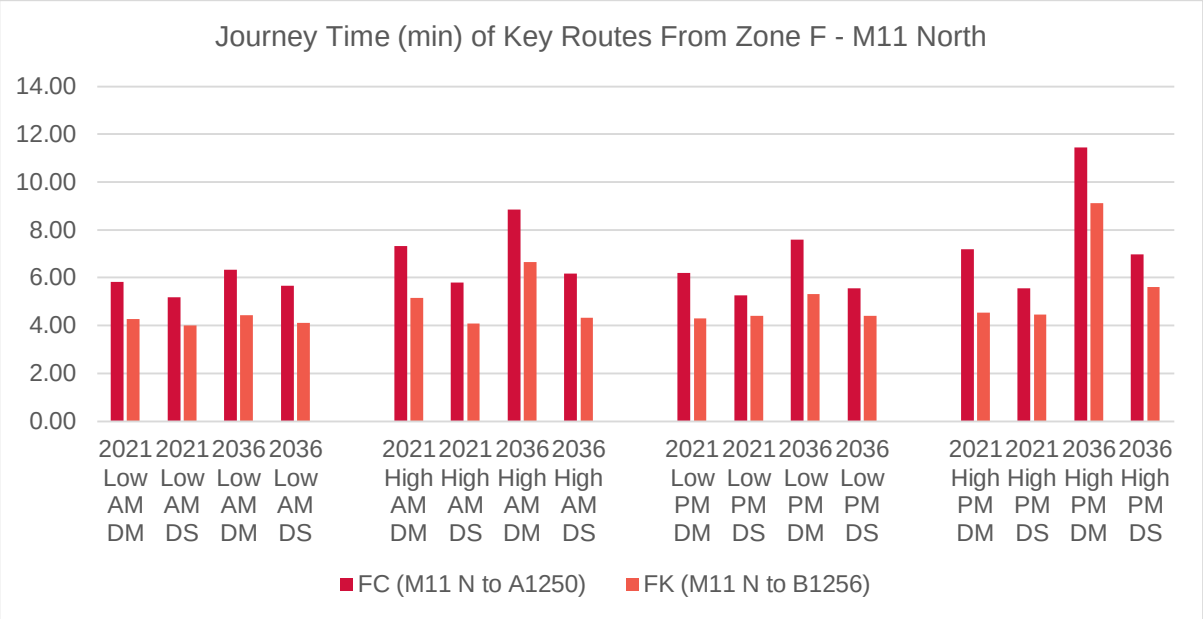
Graphic A4 : Comparison of Journey Times on Two Key Routes from D – A120 West



Graphic A5 : Comparison of Journey Times on Two Key Routes from E – Birchanger Lane



Graphic A6 : Comparison of Journey Times on Two Key Routes from F – M11 North



Graphic A7 : Comparison of Journey Times on Two Key Routes from J – A120 East