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M3 Junction 12 Improvements

Summary Options Report

Hampshire County Council

14 August 2018

Notice

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This document has 25 pages including the cover.

Document history

Revision	Purpose description	Originated	Checked	Reviewed	Authorised	Date
Rev 1.0	DRAFT	SB				13/08/2018
Rev 1.1	For Information	SB	NW	NW	SPB	14/08/2018

Client signoff

Client	Hampshire County Council
Project	M3 Junction 12 Improvements
Job number	5163196
Client signature / date	

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1. Introduction

1.1. Background

The Eastleigh Borough Council Emerging Local Plan outlines the amount of development required within the borough between 2016 and 2036, potential development sites and infrastructure to support this development. The Local Plan supporting evidence includes a transport modelling study, undertaken by SYSTRA, which identifies locations where highway improvements will be required to provide additional network capacity. Atkins has been commissioned by Hampshire County Council, on behalf of Eastleigh Borough Council, to assess the highway network capacity around Junction 12 of the M3 and to ascertain what improvements are required to mitigate the impact of additional traffic resulting from the proposed Local Plan development. The study considers some of the wider implications of the proposals including land availability, pedestrian/cycle routes and network constraints. This report outlines the work undertaken in developing and assessing potential network improvements for the study area.

1.2. Location

The study area comprises of four junctions and the links between them. For the purposes of this study, the four junctions have been numbered as follows:

- J1 – Hocombe Road / Winchester Road
- J2 – Otterbourne Hill / Winchester Road
- J3 – M3 Junction 12 East (Allbrook Way / Winchester Road / M3)
- J4 – M3 Junction 12 West

The study area has two motorway bridges (between J1 and J2, and between J3 and J4) spanning the M3. A shared use footway/cycleway is located on the southern side of the J1/J2 bridge and links to a subway under the eastern side of Winchester Road before heading north on Otterbourne Hill. There are no pedestrian/cycle facilities at the M3 Junction 12 roundabouts.

A new Dementia Care Home facility is currently being constructed off Otterbourne Hill. This site will take access from Otterbourne Hill, approximately 50 metres north of the existing mini-roundabout.

Figure 1-1 M3 Junction 12 and associated junctions

1.3. Scope

The scope of Atkins appointment includes for the following:

- Commission surveys suitable for use in developing and validating a Vissim model of the study area;
- Develop a Vissim model of the study area and undertake validation for the surveyed traffic flows;
- Agree the methodology for determining 'do something' design flows and develop forecast flows for 2036;
- Develop options for network improvements within the study area to reduce the impact of the proposed developments;
- Assess the potential options in the Vissim Model;
- Provide a GA layout, high level cost estimate and compliance table for the preferred option; and
- Identify constraints and residual risks of the 'Best performing' option.

1.4. Report Structure

This report provides a summary of the study process and findings. It should be read in conjunction with the *M3 Junction 12 Model Forecasting and Options Report* which forms an integral part of the study and is contained in Appendix A.

The remainder of this report is structured as follows:

- Chapter 2 - Traffic Flows
- Chapter 3 - Vissim Modelling
- Chapter 4 - Option Development
- Chapter 5 – Best Performing Option
- Chapter 6 - Summary and Conclusions

2. Traffic Flows

The methodology for obtaining traffic flows to use in this study has been agreed with Hampshire County Council and validated using alternative sources where possible. The traffic flows relating to future development were obtained from the Solent Sub-Regional Transport Model (SRTM).

2.1. Existing Traffic Flows

Classified junction turning counts, queue length surveys and journey time surveys were undertaken on Thursday 22nd March 2018. The AM peak hour was identified as 08:00 to 09:00 and the PM peak hour as 17:00 to 18:00. Table 2-1 provides a summary of the recorded peak hour traffic flows at each junction.

Table 2-1 2018 Surveyed Flows at Junctions

		Total Flows at Junction (PCUs)	
	Source	AM (08:00-09:00)	PM (17:00-18:00)
J1 - Hocombe Road	2018 MCC	2,255	2,431
J2 - Otterbourne Hill	2018 MCC	2,920	3,064
J3 - M3 J12 West	2018 MCC	3,342	3,451
J4 - M3 J12 West	2018 MCC	1,349	1,075
	2018 MCC Total	**9,866**	**10,021**

The video data and queue length surveys showed that the existing junctions (with the exception of J4) are over capacity and long queues were evident on Allbrook Way, Winchester Road and Otterbourne Hill.

Further details on the data collected can be found in section 2 of the Model Forecasting and Options Report (Appendix A).

2.2. Design Flows

The SRTM model provided traffic flow outputs for the 2015 Base, 2036 Do Minimum and 2036 Do Something scenarios. It is understood that the 2036 Do Minimum scenario includes traffic flows from committed development but not traffic from the Emerging Local Plan. The 2036 Do Something scenario includes development from the proposed sites within the Emerging Local Plan and highway improvements identified in the SYSTRA transport modelling study.

The traffic flows surveyed in 2018 were found to be significantly higher than the 2015 Base flows in the SRTM model. The traffic growth factors from TEMPro are also higher than the growth factors from the SRTM model.

To ensure a robust assessment of the future traffic scenario, it was agreed with Hampshire County Council that growth factors to 2036 derived from TEMPro would be applied to the 2018 surveyed flows, and that the difference between the flows from the SRTM Do Something and Do Minimum scenarios would then be added. The resultant derived 2036 forecast flows used in this study are up to 30% higher than those forecast in the SRTM model.

A detailed description of the traffic forecasting and comparison of the design flows and SRTM flows is contained in section 3 of the Model Forecasting and Options Report (Appendix A).

3. Vissim Modelling

3.1. Methodology

A detailed methodology of the Vissim model development, calibration and validation is contained in the Model Forecasting and Options Report (Appendix A).

The 2018 Base year model was constructed by taking the existing road network from Ordnance Survey mapping provided, Google Earth and Google Street View.

The performance and reliability of the base model is measured using criteria which are set out in TAG Unit M3.1. One of the key criteria is to compare modelled flows against observed data. The process is undertaken with the aim of ensuring the base model provides a satisfactory representation of existing network conditions.

Following development of the M3 Junction 12 model, the model was calibrated and validated against:

- Observed MCC data (March 2018)
- Observed journey time data (March 2018)

3.2. Model Validation Results

A detailed summary of the 2018 Base model calibration and validation is contained in the Model Forecasting and Options Report (Appendix A).

The results from section 4 of the Model Forecasting and Options Report demonstrate that across the two peaks, the model validates well against the observed conditions - meeting, and exceeding, the criteria set out in TAG Unit M3.1 for both traffic flows and journey times. The Base model is therefore considered acceptable.

4. Option Development

To determine the most efficient and cost-effective mitigation for the M3 Junction 12 network, an incremental approach to network improvements was undertaken. The option development considered the available land and the constraints of the motorway bridges. The shared use footway / cycleway is maintained in all options.

Each option identified was tested in the Vissim model using the agreed 2036 design flows. The options are described in sections 4.1 to 4.6 below.

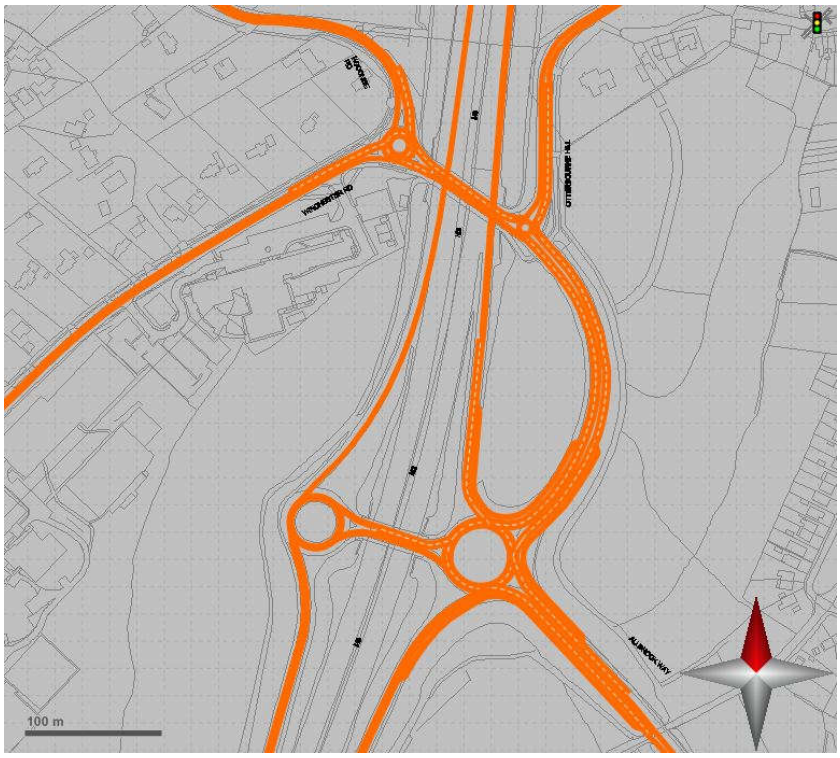
A detailed description of the Vissim model results for each option is contained in section 6 of the Model Forecasting and Options Report (Appendix A). A summary taken from this report is reproduced in section 4.7.

4.1. Option 1

Option 1 proposed geometric improvements of the existing roundabouts, providing additional entry lanes and the roundabouts and dualling of the Winchester Road between J2 and J3.

The model outputs indicate that this option does not provide sufficient capacity to remove queues from J1 and J2, and increases queues on J4.

Figure 4-1 DS1 – Geometric improvements only

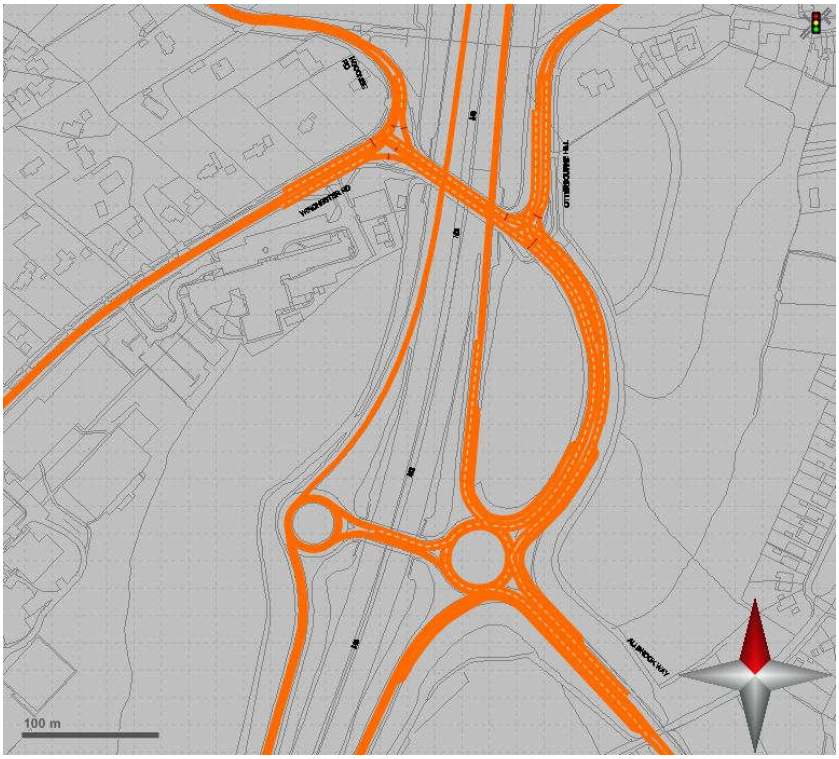


4.2. Option 2

Option 2 proposed signalised junctions at J1 and J2, dualling on Winchester Road and geometric improvements at J3. The carriageway on the motorway bridge between J1 and J2 is widened to four lanes.

The model outputs indicate that this option results in improvements to J2 only.

Figure 4-2 DS2 – Signals at J1 and J2

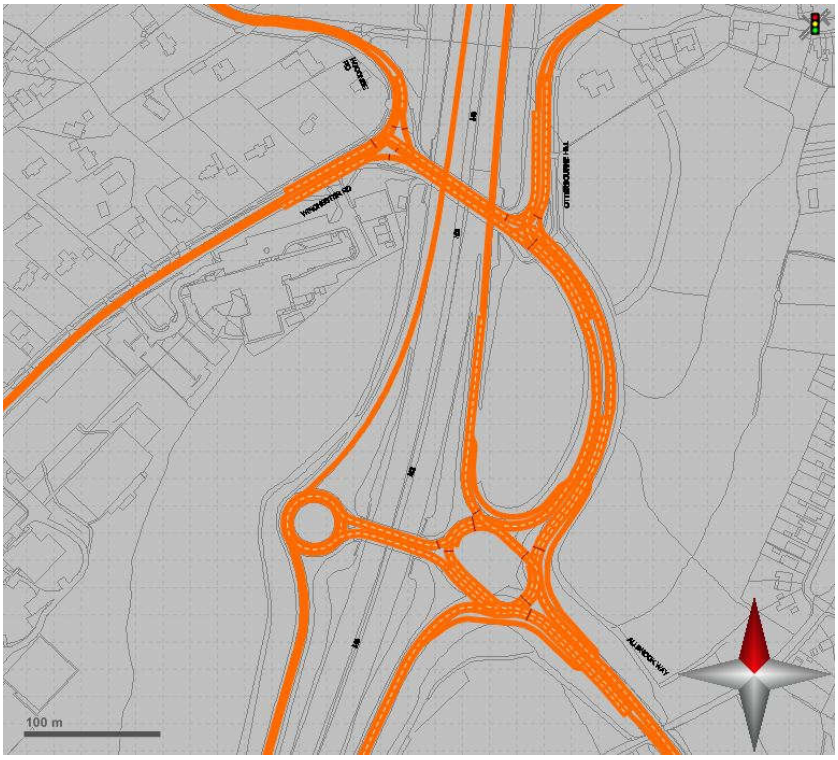


4.3. Option 3

Option 3 proposed signalising junctions J1, J2 and J3. In addition to dualling on Winchester Road and four lanes on both motorway bridges. J3 was increased in size to accommodate the signalisation and include bypass lanes.

The model outputs indicate that this option provides significant improvements at J1, J2 and J3, but increased queues at J4.

Figure 4-3 DS3 – Signals at J1, J2 and J3

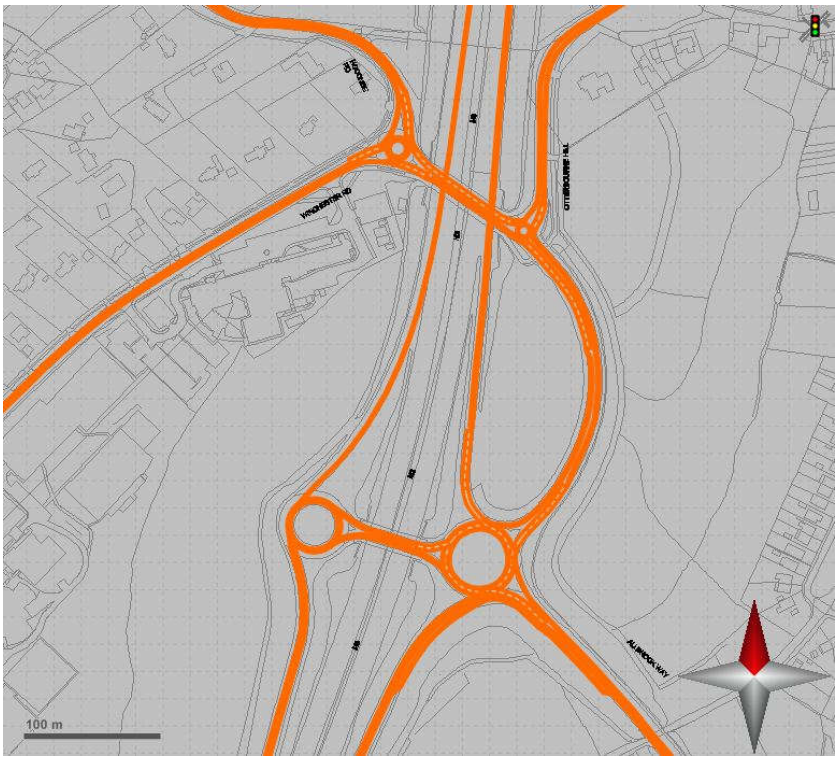


4.4. Option 4

Option 4 was requested by the client and proposes a bypass lane from Allbrook Way to the M3 southbound on-slip.

The model outputs indicate that this option provides benefits to Allbrook way and to J2, but there is no significant improvement to J3 overall.

Figure 4-4 DS4 – High Speed Merge

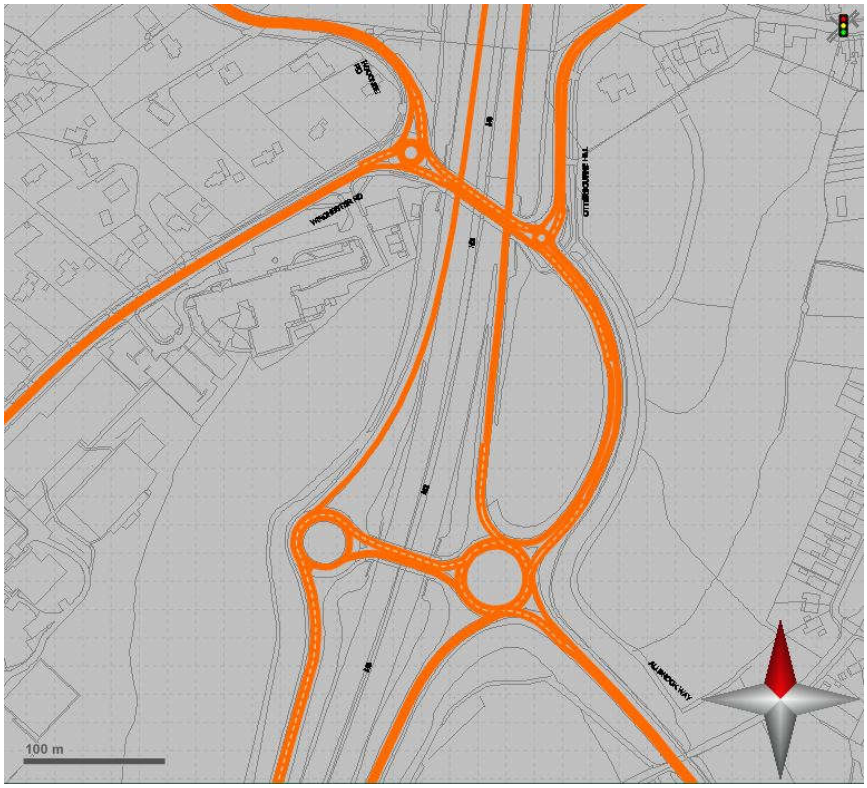


4.5. Option 5

Option 5 was requested by the client and proposes a two-lane off-slip from the M3 northbound.

The model outputs indicate that this option improves queuing at J4 but has no impact on the other junctions.

Figure 4-5 DS5 – Additional Lane at J4



4.6. Option 6

Option 6 combines Options 3 and 5. At J3, the bypass lane from the M3 southbound off-slip is removed to allow for longer right turn lanes at J2. This option also incorporates a signalised access to the Care Home.

The model outputs indicate that the queues are reduced to acceptable levels at all four junctions.

Figure 4-6 DS6 – Best Performing Option

4.7. Summary

A Vissim model has been developed and demonstrated to validate well against existing conditions. A 2036 forecast scenario has been created and a total of six options for the M3 Junction 12 network have been tested using the model. The modelling results demonstrate that Option 6 provides improvements that result in delay and queues at an acceptable level. Table 4-1 below summaries the options and results from the Vissim models. The best performing option is discussed in more detail in Chapter 5.

Table 4-1 Summary of Modelled Options

Option Name	Description	J1	J2	J3	J4	Comments
DS1	Geometric improvements only	✗	✗	✓	✗	DS1 does not bring improvements to J1 and a long queue occurs on Winchester Road at J2 in the PM peak. Additional traffic released to J4 causes delay at that junction.
DS2	Signals at J1 and J2, geometric improvements at J3	✗	✓	✗	✗	Long queues remain on Hocombe and Winchester Roads at J1. Long queues occur on Allbrook Way at J3. Additional traffic released to J4 causes delay at that junction.
DS3	Signals at J1, J2 and J3	✓	✓	✓	✗	Significant improvements at J1, J2 and J3. Additional traffic released to J4 causes delay at that junction.
DS4	High Speed Merge (HSM) at J3	✗	✓	✗	✗	Improved Allbrook Way and Winchester Road but overall negative results at J3. Improvement to Winchester Road at J3 allows J2 to improve somewhat. Additional traffic released to J4 causes delay at that junction.
DS5	Additional off-slip lane at J4	✗	✗	✗	✓	Improves J4 – has no impact on other junctions
DS6	Best Performing Option	✓	✓	✓	✓	Acceptable average queues at all junctions. No blocking back to M3 mainline.

5. Best Performing Option

5.1. Layout

At this early stage, the level of design for Option 6 has been undertaken at optioneering level and is based on Ordnance Survey (OS) mapping (topographical survey information has not been provided). A General Arrangement (GA) layout for this option is contained in Appendix B.

The preferred option proposes the following:

J1 – Hocombe Road / Winchester Road

- Signalisation
- Widening of the approaches on all arms
- Pedestrian crossings incorporated into the junction

J2- Otterbourne Hill / Winchester Road

- Signalisation
- Widening of the approaches on all arms
- Widening of the exit lanes to two lanes
- Incorporating a signalised access to the Care Home

J3 – M3 Junction 12 East

- Enlarged roundabout
- Signalisation
- Bypass lanes on Allbrook Way and Winchester Road
- Widening on the approaches on all arms
- Widening of the exit lanes to two lanes

J4 – M3 junction 12 West

- Widening of the M3 on-slip and off-slip to two lanes
- Widening of the entry and exit onto the bridge to two lanes

This option would require carriageway widening on both of the bridges over the M3. As-built drawings, assessments and Approval In Principle (AIP) information was requested from Highways England for both bridges. An initial review of this data suggests that some widening should be possible but that further work is required to confirm this assumption. The carriageway widening is likely require the edge beams under the footway to be tied to the beams under the carriageway to provide additional loading capacity. It is assumed that the existing carriageway can be widened from 10m to 11m, thereby allowing 4 lanes of 2.75m width each. On the Winchester Road bridge this would require widening 1m on the northern side, and on the M3 Junction 12 bridge this would require widening 0.5m on each side.

5.2. Compliance / Non-Compliance

A preliminary compliance schedule has been undertaken on the preferred layout and is contained in Appendix C.

The schedule identifies several non-compliances due to reduced visibility caused by overgrown vegetation. This could be addressed by vegetation clearance.

The most significant non-compliance relates to the narrow lanes on the motorway bridges. To maintain the 3m wide footway/cycleway on the Winchester Road bridge, the carriageway widening has been confined to the northern side of the bridge. This will enable four 2.75m wide lanes to be provided. Further assessment is required to ascertain how much the carriageway can be widened on these bridges. As there are no pedestrian facilities on the M3 Junction 12 bridge, it may be possible to provide a carriageway in excess of 11m, subject to further structural assessment.

5.3. Land Requirements

Hampshire County Council has provided details of the adopted highway boundary and further information on land ownership has been obtained from HM Land Registry. Where possible, the proposed design has been developed to use only that land that is within the existing adopted highway boundary. The highway boundary is shown on the GA plan in Appendix B. There are several locations where the land necessary to undertake the improvements is outside of the highway boundary. The HM Land Registry title documents confirm that all of this land is within the ownership of Highways England.

5.4. Cost Estimate

An outline construction cost estimate has been prepared for Option 6.

The construction cost estimate is £10.1 million and is based on the GA layout contained in Appendix B. The estimate includes the following assumptions:

- Risk/contingency at 20%;
- Optimism bias at 44%;
- Statutory Undertakers diversion at 5%;
- Landscaping ecology at 1%; and
- Preliminary works (to include traffic management) at 40%.

It should be noted that outline cost estimate excludes the following:

- The works to strengthen the motorway bridges is excluded from the estimate as the level of work required at this stage is not known.
- Design and supervision Fees
- Costs associated with legal fees or other third-party costs.

5.5. Constraints and Risks

Due to the early stage of design a number of risks and constraints have been identified. These are outlined below.

- **Motorway bridge strengthening:** A detailed structural assessment will be required to ascertain the existing loading capacity of the bridges and what work is required to provide for the widened carriageway. There is a risk that the bridges are not suitable for increased carriageway widening.
- **Land:** Additional land outside of the current highway boundary is required to implement the preferred option. This land is owned by Highways England so it is assumed that it could be acquired for highway improvements but this would need to be confirmed.
- **Ecology:** The land surrounding the existing road network is predominantly wooded areas adjoining the carriageway. However, north of Allbrook Way is Lincoln Copse which is designated as 'ancient woodland'. A small sectionof this land may be required for the dualling of Allbrook Way. It may be possible to re-align the road widening to use land further south but this increases the risk of requiring land outside of public ownership. An ecology survey, to include identifying trees with TPOs, is recommended.
- **Stakeholders and residents**: The network improvements result in junctions and adjoining roads that are substantially larger than the existing. This includes roads fronted by residential properties. No consultation with local residents or affected stakeholders has been undertaken.
- **Statutory Undertakers diversions**: Investigations into statutory undertakers plant that may be affected by the proposals has not been undertaken at this stage and is outside the current scope of this study.

- **Allbrook Way dualling:** The Vissim model includes a dual carriageway on Allbrook Way heading south. The model assumes that the network ends with this dual section and does not reduce to a single lane. The reduction to single lane (over a short distance) was tested in the model but caused queuing to develop. It may therefore be necessary to continue the dualling southbound over a greater distance than that shown on the GA layout. It is understood that further works outside of this study network are proposed for the area south of Allbrook Way and extending the study network to include this should be considered.
- **Topographical survey**: The design is based on OS data and as such there is a risk of inaccuracies within the data. It is recommended that topographical survey data is obtained to undertake the next stages of design.

6. Summary and Conclusions

6.1. Summary

This study has undertaken a review of the highway capacity relating to proposed development resulting from the Eastleigh Borough Council Emerging Local Plan and identified a preferred option to mitigate the increased traffic levels. This report, in conjunction with the Model Forecasting and Options Report, outlines the methodology used to develop the Vissim model to assess the existing traffic conditions and test developing options. A preferred option is identified which provided acceptable levels of queuing and delay. This option has been costed and the constraints and ongoing risks identified.

6.2. Further work

It is recommended that additional work is undertaken before the preferred option is progressed to the next stage of design. This work is as follows:

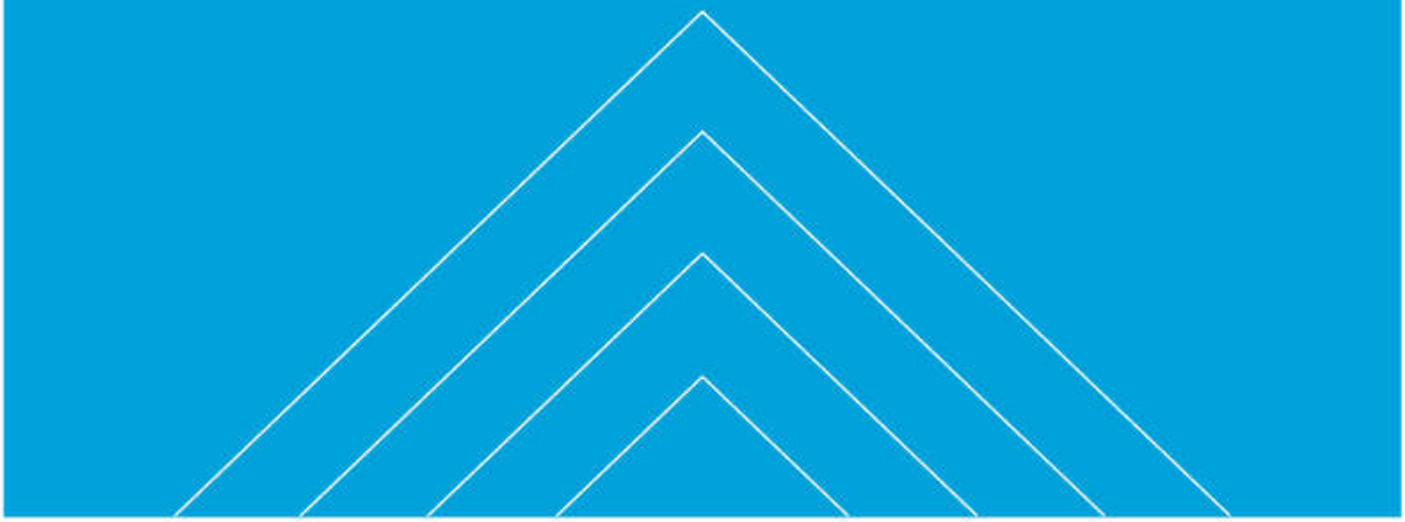
- **Rationalisation of Traffic flows**: The agreed methodology for deriving the traffic flows has resulted in flows which are significantly higher than those in the SRTM model. Whilst the preferred option can accommodate the agreed flows, it is unclear if the wider highway network can support this level of traffic. It is recommended that a review of the 2036 agreed forecast flows is undertaken with the relevant stakeholders.
- **Bridge assessments**: The carriageway widening on the two motorway overbridges is an integral part of the preferred option. It is recommended that further assessments are undertaken to determine the work required to accommodate this widening.
- **Highways England land agreement**: Land outside of the highway boundary is required to implement the preferred option. This land is owned by Highways England, so an early agreement to use this land should be obtained.
- **Ecology**: The land adjoining the existing carriageway are mostly wooded areas and it is recommended that a review is undertaken of the existing ecology to identify areas of importance.
- **Road Safety Audit**: It is recommended that a Stage 1 Road Safety Audit is undertaken to enable early identification of design issues.

6.3. Conclusions

The existing highway network surrounding the M3 Junction 12 is currently operating over capacity with long queues developing in the peak hours. The study has considered a range of potential highway improvements to the network in the context of agreed forecast traffic demands for 2036 which take into account the Eastleigh Borough Council Emerging Local Plan. The modelling assessment demonstrates that Option 6 accommodates the 2036 forecast flows and results in queues and delays that are significantly less than those currently experienced. The cost of these improvements is calculated to be approximately £10million and can be provided using land that is within public ownership.

It is recommended that the actions listed in section 6.2 (Further Work) are taken forward to progress the scheme.

Appendices



Appendix A. Model Forecasting and Options report

Appendix B. Preferred Option

Appendix C. Compliance Schedule

DMRB Compliance/Non Compliance Report of 2D-Geometry for M3J12

Sl.No.	Geometric Design Parameters	DMRB Clause Reference Detail			Design Element	Departure/ Relaxation	Compliance/ Non-Compliance as per Proposed (Revised	Remarks/ Implication/ Potential Improvements
		Desirable Value	Absolute Value	Reference No.	As per Proposed Layout	As per Proposed Layout		
JUNCTION 1 : J1								
A1-1	Design Speed at the major road	-	-	Clause 2.2 of TD 50/04	40mph	-	-	
A1-2	Design Speed at the minor road	-	-	Clause 2.2 of TD 50/04	30mph	-	-	
A1-3	Junction Intervisibility	-	-	Clause 2.10, 2.11, 6.11 of TD 50/04	-	-	Non - Compliance	Obstructed by existing Vegetation
A1-4	Entry Kerb radius (metre)(entry to major road)	Min. 10.0m	6.0m	Clause 7.17 of TD 42/95	15m	-	Compliance	
A1-5	Exit radius(entry to minor road)	Min. 10.0m	6.0m	Clause 7.17 of TD 42/95	48m	-	-	
A1-6	Through Lane Carriageway Width East Bound (Major Road)	<3.65m & >3.0m	3.0m	Clause 7.20 of TD42/95	2.75m	-	Non - Compliance	due to lane configuration on bridge
A1-7	Through Lane Carriageway Width West Bound (Major Road)	<3.65m & >3.0m	3.0m	Clause 7.20 of TD42/95	2.75m	-	Non - Compliance	due to lane configuration on bridge
A1-8	Lane width (Minor Road)	<4.5m & >3.0m	3.0m	Clause 7.20 & 7.23 (a & b) of TD42/95	3.5m - 3.95m	-	Compliance	
A1-9	Lane taper	1 in 5	-	Clause 2.25 of TD50/04	1 in 6	-	Compliance	
A1-12	Ghost island through lane width	3.65m	3.0m	Clause 7.20 of TD42/95	3.25	-	-	
A1-13	Ghost island taper	1:10	-	Clause 2.26 of TD50/04	1:10	-	Compliance	
A1-14	Direct Taper Length	7.5m	-	Clause 2.26 of TD50/04	7.5m	-	Compliance	
A1-15	Swept path	Checked with 16.48m long articulated vehicle	-	Clause 2.34, 2.35, 2.36 of TD 50/04 and Clause 7.15 of TD42/95	No encroachment	-	Compliance	
JUCNTION - 2: J2								
A1-1	Design Speed at the major road	-	-	Clause 2.2 of TD 50/04	40mph	-	-	
A1-2	Design Speed at the minor road	-	-	Clause 2.2 of TD 50/04	30mph	-	-	
A1-3	Junction Intervisibility	-	-	Clause 2.10, 2.11, 6.11 of TD 50/04	-	-	Non - Compliance	Obstructed by existing Vegetation
A1-4	Entry Kerb radius (metre)(entry to major road)	Min. 10.0m	6.0m	Clause 7.17 of TD 42/95	16m	-	Compliance	
A1-5	Exit radius(entry to minor road)	Min. 10.0m	6.0m	Clause 7.17 of TD 42/95	10m	-	-	
A1-6	Through Lane Carriageway Width East Bound (Major Road)	<3.65m & >3.0m	3.0m	Clause 7.20 of TD42/95	2.75-3.25m	-	Non - Compliance	due to lane configuration on bridge
A1-7	Through Lane Carriageway Width West Bound (Major Road)	<3.65m & >3.0m	3.0m	Clause 7.20 of TD42/95	2.75-3.25m	-	Non - Compliance	due to lane configuration on bridge
A1-8	Lane width (Minor Road)	<4.5m & >3.0m	3.0m	Clause 7.20 & 7.23 (a & b) of TD42/95	3.25m - 3.5m	-	Compliance	
A1-9	Swept path	Checked with 16.48m long articulated vehicle	-	Clause 2.34, 2.35, 2.36 of TD 50/04 and Clause 7.15 of TD42/95	No encroachment	-	Compliance	

DMRB Compliance/Non Compliance Report of 2D-Geometry for M3 J12

Sl.No.	Geometric Design Parameters	DMRB Clause Reference Detail			Design Element	Departure/ Relaxation	Compliance/ Non-Compliance as per Proposed (Revised Composite) Layout	Remarks/ Implication/ Potential Improvements
		Desirable Value	Absolute Value	Reference No.	As per Proposed Layout	As per Proposed Layout		
Arm-1 (bridge side)								
A1-1	Approach Design Speed at entry	-	-	TD 50/04, Clause 2.2	40mph	-	-	-
A1-2	Junction Intervisibility	-	-	TD 50/04, Clause 2.10, 2.11, 6.11	Obstructed by vegetation	-	Non- Compliance	Vegetation Clearance is required to mitigate this departure.
A1-3	Entry Kerb radius (metre)	>20m <100m	10m	TD 16/07, Clause 7.49	31m	-	Compliance	-
A1-4	Entry Angle	>20º <60º	-	TD 16/07, Clause 7.47	52	-	Compliance	-
A1-5	Entry Lane width	3 to 3.65 m	Max 4.5m	(TD 50/04, Clause 2.22, 2.23), (TD 16/07, Clause 7.24)	4.2-4.4m	-	Compliance	-
A1-6	Total Entry Width (metre)	< 15m for Dual CW approach	-	TD 16/07, Clause 7.25	8.6m	-	Compliance	
A1-7	Swept path (1)	Checked with 16.48m long articulated vehicle	-	TD 50/04, Clause 2.34, 2.35, 2.36 and TD42/95, Clause 7.15	No encroachment	-	Compliance	
A1-8	Exit Kerb radius (metre)	>20m <100m Desirable 40m	15m	TD 16/07, Clause 7.68, 7.69	40 m	-	Compliance	-
Arm-2								
A2-1	Approach Design Speed at entry	-	-	TD 50/04, Clause 2.2	40mph	-	-	-
A2-2	Junction Intervisibility	-	-	TD 50/04, Clause 2.10, 2.11, 6.11	Obstructed by vegetation	-	Non- Compliance	Vegetation Clearance is required to mitigate this departure.
A2-3	Entry Kerb radius (metre)	>20m <100m	10m	TD 16/07, Clause 7.49	37m	-	Compliance	-
A2-4	Entry Angle	>20º <60º	-	TD 16/07, Clause 7.47	45	-	Compliance	-
A2-5	Entry Taper	Urban 1 in 5, Rural 1 in 10	Min. 1 in 5	TD 50/04, Table 2/1 & clause 2.25	1 in 5	-	Compliance	-
A2-6	Entry Lane width	3 to 3.65 m	Max 4.5m	(TD 50/04, Clause 2.22, 2.23), (TD 16/07, Clause 7.24)	3.5 to 3.6 m	-	Compliance	-
A2-7	Total Entry Width (metre)	< 15m for Dual CW approach	-	TD 16/07, Clause 7.25	10.65m	-	Compliance	-
A2-8	Swept path (1)	Checked with 16.5m long articulated vehicle	-	TD 50/04, Clause 2.34, 2.35, 2.36 and TD42/95, Clause 7.15	No encroachment	-	Compliance	-
A2-9	Exit Kerb radius (metre)	>20m <100m Desirable 40m	15m	TD 16/07, Clause 7.68, 7.69	33m		Compliance	-
A2-10	entry/exit taper (segregated lane)	1 in 20	-	TD51/17, Clause 2.6.9 ,2.7.3 and Table 2.5	1 in 20		Compliance	-
A2-11	carriageway width at start of entry/exit taper (segregated lane)	3.5	-	TD51/17, Clause 2.7.3	3.5		Compliance	-
A2-12	segregated lane width	-	-	TD51/17, Table 2.2	4.7		Compliance	-
A2-13	physical island (segregated lane)	>1.6m	-	TD51/17, Clause 2.4.10	1.8		Compliance	-

Arm-3:								
A3-1	Approach Design Speed at entry	-	-	-	40mph	-	-	-
A3-2	Junction Intervisibility	-	-	TD 50/04, Clause 2.10, 2.11, 6.11	Obstructed by vegetation	-	Non- Compliance	Vegetation Clearance is required to mitigate this departure.
A3-3	Entry Kerb radius (metre)	>20m <100m	10m	TD 16/07, Clause 7.49	38m	-	Compliance	-
A3-4	Entry Angle	>20º <60º	-	TD 16/07, Clause 7.47	32.2	-	Compliance	
A3-5	Entry Lane width	3 to 3.65 m	Max 4.5m	(TD 50/04, Clause 2.22, 2.23), (TD 16/07, Clause 7.24)	3.57m	-	Compliance	
A3-6	Total Entry Width (metre)	< 15m for Dual CW approach	-	TD 16/07, Clause 7.25	10.7	-	Compliance	
A3-7	Swept path (1)	Checked with 16.5m long articulated vehicle	-	TD 50/04, Clause 2.34, 2.35, 2.36 and TD42/95, Clause 7.15	No encroachment	-	Compliance	
A3-8	Exit Kerb radius (metre)	>20m <100m Desirable 40m	15m	TD 16/07, Clause 7.68, 7.69	50m	-	Compliance	
A3-9	entry/exit taper (segregated lane)	1 in 20	-	TD51/17, Clause 2.6.9 ,2.7.3 and Table 2.5	1 in 20	-	Compliance	
A3-10	carriageway width at start of entry/exit taper (segregated lane)	3.5	-	TD51/17, Clause 2.7.3	3.5	-	Compliance	
A3-11	segregated lane width	5.3	-	TD51/17, Table 2.2	5.3	-	Compliance	
A3-12	physical island (segregated lane)	>=1.6m	-	TD51/17, Clause 2.4.10	1.6	-	Compliance	
Arm-4:								
A4-1	Approach Design Speed at entry	-	-	TD 50/04, Clause 2.2	40mph	-	-	-
A4-2	Junction Intervisibility	-	-	TD 50/04, Clause 2.10, 2.11, 6.11	Obstructed by vegetation	-	-	Vegetation Clearance is required to mitigate this departure.
A4-3	Entry Kerb radius (metre)	>20m <100m	10m	TD 16/07, Clause 7.49	27m	-	Compliance	-
A4-4	Entry Angle	>20º <60º	-	TD 16/07, Clause 7.47	46	-	Compliance	
A4-5	Entry Lane width	3 to 3.65 m	max.4.5m	TD 50/04, Clause 2.22, 2.23	3.4-4.0m	-	Compliance	-
A4-6	Total Entry Width (metre)	< 15m for Dual CW approach	-	TD 16/07, Clause 7.25	10.7m	-	Compliance	
A4-7	Swept path (1)	Checked with 16.48m long articulated vehicle	-	TD 50/04, Clause 2.34, 2.35, 2.36 and TD42/95, Clause 7.15	No encroachment	-	Compliance	-
A4-8	Exit Kerb radius (metre)	>20m <100m Desirable 40m	15m	TD 16/07, Clause 7.68, 7.69	25m	-	Compliance	
A4-9	Entry Taper	Urban 1 in 5, Rural 1 in 10	Min. 1 in 5	TD 50/04, Table 2/1 & clause 2.25	1 in 6	-	Compliance	

Stephanie Burgess
Atkins Limited
County Gate
County Way
Trowbridge
BA14 7FJ

Tel: +44 (0) 1225 730360
stephanie.burgess@atkinsglobal.com