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M3 Junction 12 Improvements

Model Forecasting and Options Report

Hampshire County Council

9 August 2018

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This document has 34 pages including the cover.

Document history

Revision	Purpose description	Originated	Checked	Reviewed	Authorised	Date
Rev 0	For Information	RPS	AS			06/08/18
Rev 1.0	For Information	RPS	AS			09/08/18

Client signoff

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

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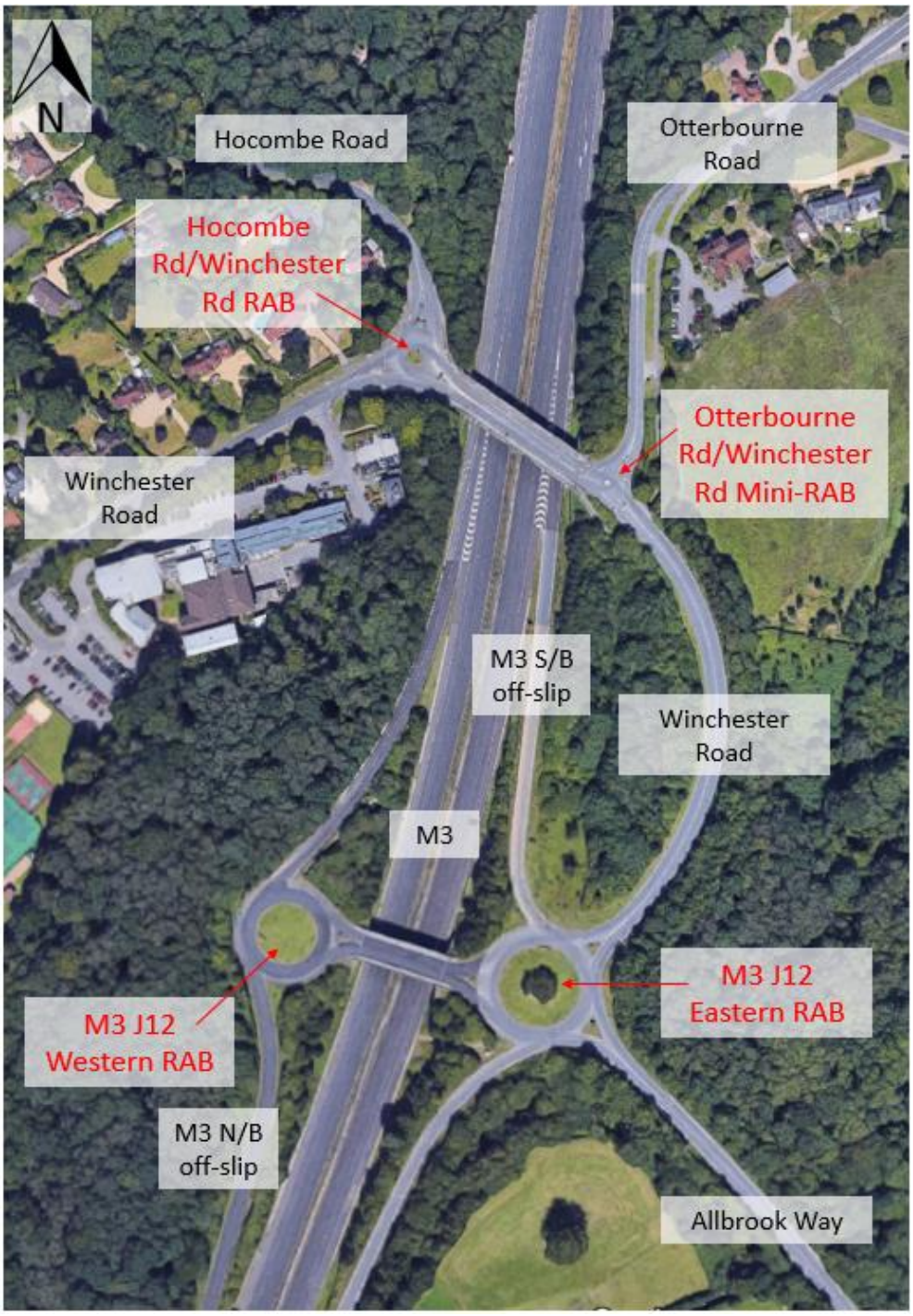
1. Introduction

1.1. Location

M3 Junction 12 comprises two linked roundabouts providing entry and exit to either carriageway of the M3, as shown in Figure 1, below. Access to the south east and north east of the junction is via Allbrook Way and Winchester Road respectively which connect to the five arm (one exit-only arm) eastern roundabout. There are no direct connections to the west from the junction so the western roundabout has only three arms (including one exit-only arm).

Approximately 260m to the north of the eastern roundabout, Winchester Road meets Otterbourne Hill at a 'T' format mini-roundabout. Approximately 92m to the west of this junction, across the motorway, lies a second roundabout where Winchester Road meets Hocombe Road.

Figure 1-1 M3 Junction 12 and associated junctions



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
- J4 M3 Junction 12 West

Footways are present on both sides of Winchester Road at J1 but only on the western side of Hocombe Road. The footway on the eastern side of Winchester Road is designated as a local cycle route and continues across the motorway bridge to J2 where is passes under the Winchester Road arm in an underpass before emerging on the eastern side of Otterbourne Hill. It is possible for pedestrians to cross the Hocombe Road arm of J1 to a footway on the northern side of the motorway bridge but this footway ends at J2 with no safe crossing facilities. The northern footway on the motorway bridge does not therefore provide access for pedestrians.

There are no pedestrian facilities at J3 or J4.

1.2. Project Background

The Eastleigh Borough Council (EBC) Emerging Local Plan has identified that mitigation will be required to reduce queueing within the study area. Hampshire County Council (HCC) has appointed Atkins to examine options to improve the junctions.

As an initial stage in developing mitigation options at M3 Junction 12 (Stage 1a), Atkins assessed existing conditions at the junction and immediate road network using the TRL Junctions 9 modelling platform. The modelling was based on Manual Classified Counts (MCC), queue lengths surveys and video surveys of J2 and J3 undertaken in November 2017.

The standard ARCADY modelling undertaken was found to replicate existing long queues on Allbrook Way in the AM and PM peaks at J3. The ARCADY model however under-estimated queuing on Winchester Road and over-estimating queues on the M3 Junction 12 off-slip. The model also replicated the existing long queues observed on the Otterbourne Hill and motorway bridge arms of J2. The model did not show the queue on Winchester Road (east) at J2 which is observed to back up to J3. J1 was not modelled as no survey was undertaken at that junction, but observations from survey videos at J2 show queues to be blocking back between J1 and J2. There was insufficient survey data to calibrate an ARCADY lane simulation model for the junction.

There is significant development proposed in the EBC area and this is captured in the Solent Regional Transport Model (SRTM). Atkins received DM and DS turning counts from the SRTM in December 2017. Revised DM and DS flows were subsequently provided in June 2018.

In July 2018 it was confirmed that access to the proposed Shared Care Dementia Living Scheme (Care Home) would be located on Otterbourne Hill approximately 50m north of J2.

1.3. Study Objective

The aim of this study is to develop, calibrate and validate a VISSIM micro-simulation model and to use the model to test various improvement options at a 2036 design year.

1.4. Report Structure

This Report is made up of the following sections:

2. Modelling Approach and Assumptions
3. Traffic Forecasting
4. Model Calibration and Validation
5. Modelled Options
6. Option Performance
7. Summary and Conclusion

2. Modelling Approach and Assumptions

2.1. Methodology

In line with the study objective (Section 1.3), a VISSIM microsimulation model has been developed to test a range of improvement options. VISSIM version 10.00-07 has been used.

As a local junction improvement scheme, it is assumed that DfT webTAG guidance is not strictly required for the M3 Junction 12 modelling study.

A 2018 Base Year Model has been constructed with traffic flows obtained from March 2018 surveys and has been calibrated and validated to an appropriate level based on the surveyed traffic flows and journey times. Calibration and validation is summarised in Chapter 4; as agreed a Local Model Validation Report has not been produced.

In order to benchmark the performance of the proposed improvements, the existing network has been tested for the following scenarios with forecast traffic flows at 2018 and 2036:

- 2018 Do Nothing Scenario (2018 DN)
- 2036 Do Nothing Scenario (2036 DN)

Forecast flows have been developed using the SRTM for the year 2036 as required by HCC. Chapter 3 sets out the methodology used to develop the forecast flows.

A LinSig model has been developed for J1, J2 and J3 to optimise signal timings given the geometries and junction configurations proposed.

2.2. Model Inputs

2.2.1. Network

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

2.2.2. Traffic Surveys

MCC were undertaken at the four study junctions on Thursday 22nd March 2018. Easter Sunday was on 1st of April 2018, so the survey day can be considered to have been undertaken in a neutral period of the year under WebTAG guidance (late March, excluding the weeks before or after Easter). The AM peak hour was identified as 08:00 to 09:00 and the PM peak hour as 17:00 to 18:00 based on the MCC data.

A review of Highways England WebTris data for the M3 southbound off and on-slips at the junction showed traffic flows on 22nd March to be in line with other neutral days.

Table 2-1 shows total peak hour flows at the junctions based on the survey data. It can be seen that J2 and J3 carry the highest volumes of traffic.

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**

Vehicle assignment and journey times were undertaken via an Automatic Number Plate Recognition survey undertaken at the same time. Queue lengths were also surveyed at each junction.

2.2.3. Bus Routes

Bus timetable and routing information for the modelled time periods has been taken from Google Maps and www.traveline.info, as summarised in Table 2-2, below.

Table 2-2 Bus Route Summary

Peak Period Route Number	Description
Route 1 East Bound	Southampton - Chandlers Ford - Winchester
Route 1 West bound	Winchester - Chandlers Ford - Southampton

3. Traffic Forecasting

3.1. Proposed Methodology

There is significant development proposed in EBC and this is captured in the SRTM. To ensure that current traffic volumes and a robust rate of background traffic growth are included in the model forecast flows, it was agreed with HCC to apply TEMPro growth factors to 2018 survey data and then add the SRTM DS flows with the SRTM DM subtracted.

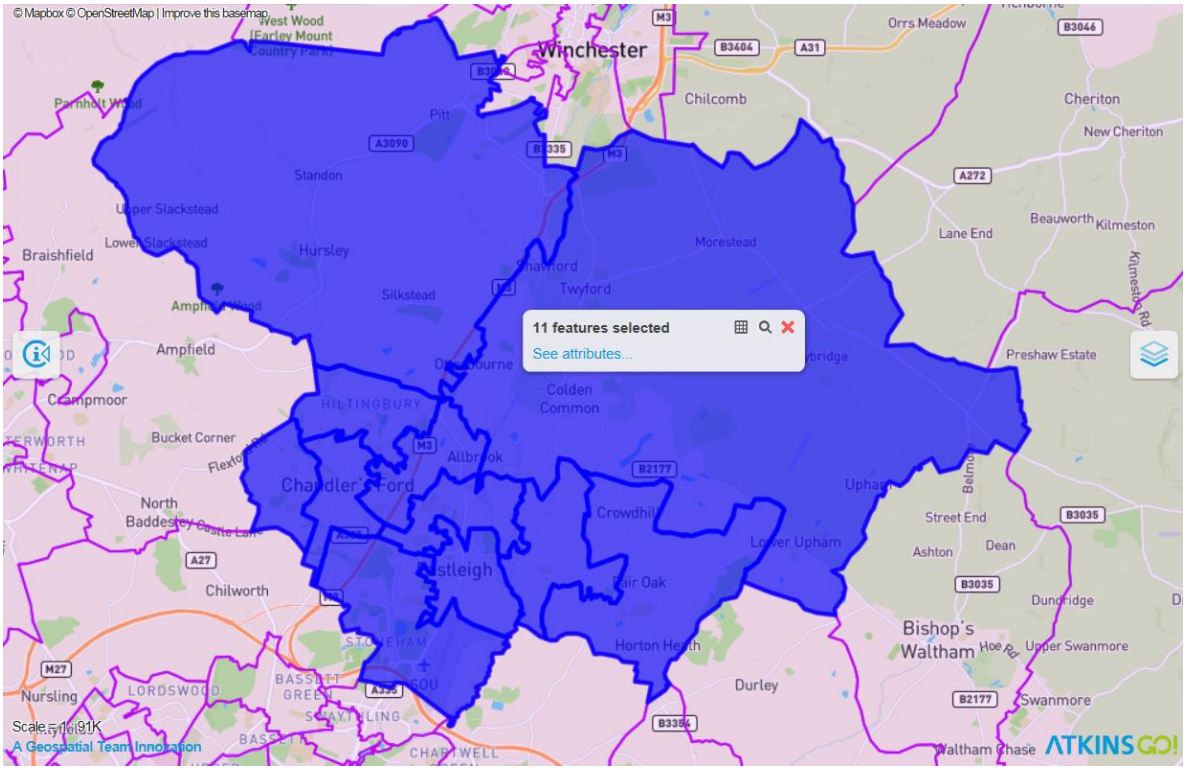
3.2. TEMPro Growth Factors

Growth factors to obtain the 2036 traffic flows were obtained using the latest version of Trip End Model Presentation Program (TEMPro): version 7.2.

Trip end growth factors for car drivers were derived for local Middle Super Output Areas (MSOA) as shown in Figure 3-1.

The TEMPro growth factors were then adjusted by NTM dataset AF15 for 'urban' area type and 'principal' road type to reflect the nature of the study road network.

Figure 3-1 MSOAs selected for TEMPro analysis



TEMPro-adjusted NTM growth factors are summarised as follows:

- 2018 to 2036 AM: 1.1833
- 2018 to 2036 PM: 1.1915

NTM Road Traffic Forecast (RTF) growth factors for heavy vehicles were used to apply a more specific growth factor for such vehicles.

Details of the growth factors used are attached in **Appendix A**.

3.3. Forecast Traffic using SRTM

Atkins was provided with 2036 DCY Do Minimum (DCY DM) and DIU Interim Do Something (Interim DS) turning counts for J2, J3 and J4 for 2036 from the Solent Regional Transport Model (STRM) on 4th December 2017. The turning counts are attached in **Appendix B**. The DIU Interim DS flows include the following improvements to J3:

- A335 Allbrook Way northbound between Pitmore Road overbridge and M3 J12 eastern roundabout: widening to accommodate three running lanes (2 lanes northbound approach to roundabout, 1 lane southbound).
- Widening the A335 Allbrook Way roundabout entry (and circulatory part of the roundabout if required) from two lane entry to three lane entry, giving one entry lane per turning movement
- Winchester Rd southbound: widening to provide a ~200m long three lane section (2 lanes southbound, one lane northbound on approach to M3 J12 eastern roundabout, and creation of two entry lanes to the roundabout (improvement from current single entry lane).

In June 2018, Atkins received updated SRTM flows for the following scenarios:

- 2015 DKF Baseline
- 2036 DOP Baseline (DOP DM)
- 2036 DPP Do Something 3 (DS3)

This data is attached in **Appendix C**.

3.3.1. Comparison of SRTM Traffic Growth (2036 DCY DM and DIU Interim DS)

A review of the SRTM turning data showed the quantum of traffic across the three junctions to be low in the DM scenario. As shown in Figure 3-2, total demand in the SRTM DCY DM scenario at J2 is 2,355 PCUs in the AM peak in comparison with 2,920 PCUs in the 2018 MCC surveys. The PM peak DM is also lower than the 2018 surveys and even the SRTM 2036 Interim DS flows are lower than the survey data at J2.

Applying TEMPro growth factors to the 2018 survey data, it can be seen total flows will increase from 2,920 in the AM peak at 2018 to 3,386 in 2036, an increase of approximately 16%. In the PM peak the increase is approximately 17%.

As agreed with HCC, the difference between the SRTM DCY DM and Interim DS was added to the factored 2018 flows. This approach results in an increase from 2,920 PCUs (2018 survey) to 3,868 PCUs at 2036 (approximately 32%) and from the PM surveyed flows of 3,064 to 4,097 PCUs (approximately 34%).

Figure 3-2 Comparison of demand at J2

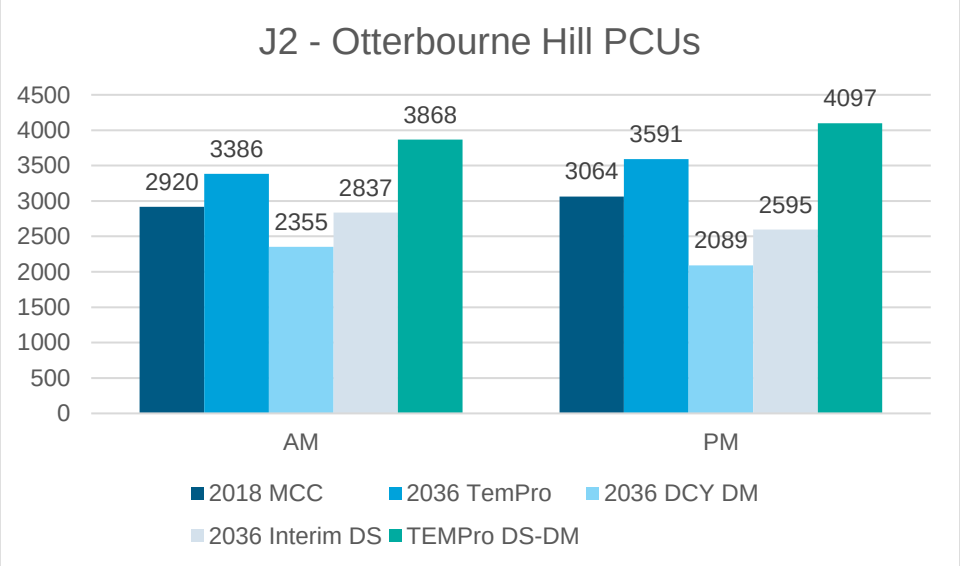
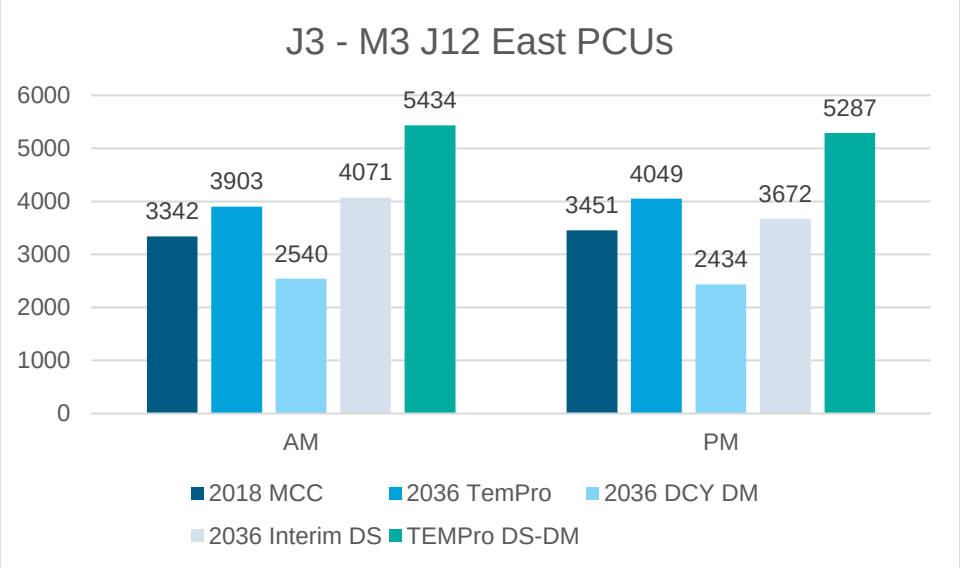


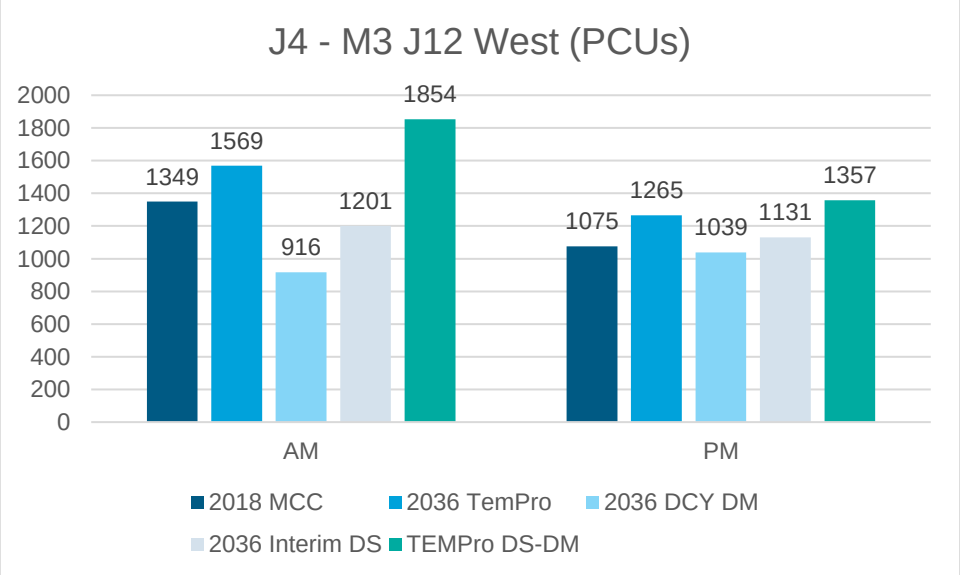
Figure 3-3 below shows the same data for J3. At J3 there is a similar pattern to the data, with the exception that the SRTM Interim DS flows are much higher than the DCY DM and even higher than TEMPro in the AM. Applying the agreed methodology at J3 therefore results in a very large increase in traffic flows. 2036 forecast flows are 63% higher than 2018 in the AM and 53% higher in the PM.

Figure 3-3 Comparison of demand at J3



As shown in Figure 3-4, the increased in demand at J4 is similar to J2, with a large but not unrealistic increase in the AM peak of 37% and 26% in the PM peak.

Figure 3-4 Comparison of demand at J4



In summary, it can be seen that the proposed forecast methodology results in large increases in demand at J2 and J4 at 2036, and very large increases in demand at J3.

3.3.2. Comparison of SRTM Traffic Growth (2015 DKF Baseline, 2036 DOP DM and 2036 DPP DS3)

Figures 3-5 to 3-7 show the SRTM flows for DOP DM, DS3 and TEMPro + DS3-DOP DM in comparison with the SRTM data described in Section 3.3.1.

It can be seen from the figures that the DOP DM and DS3 data is higher than the DCY DM and Interim DS data across all three junctions. The increase in forecast traffic volumes (TEMPro + DS-DM) is 9.7% in the AM peak and 0.6% in the PM peak at J2, 6.6% in the AM peak and 8.0% in the PM peak at J3 and 8.3% in the AM peak and 21.8% in the PM peak at J4.

Figure 3-5 Comparison of SRTM demand at J2

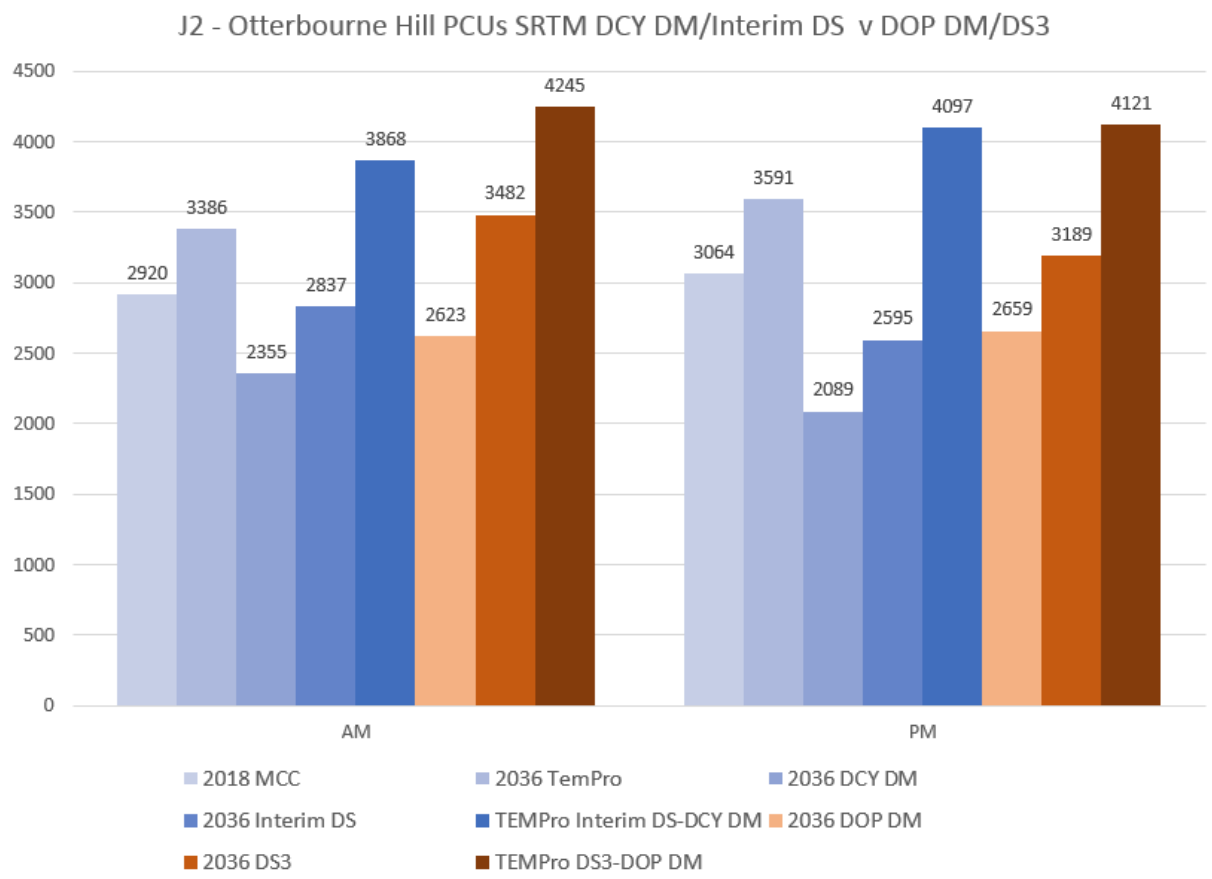


Figure 3-6 Comparison of SRTM demand at J3

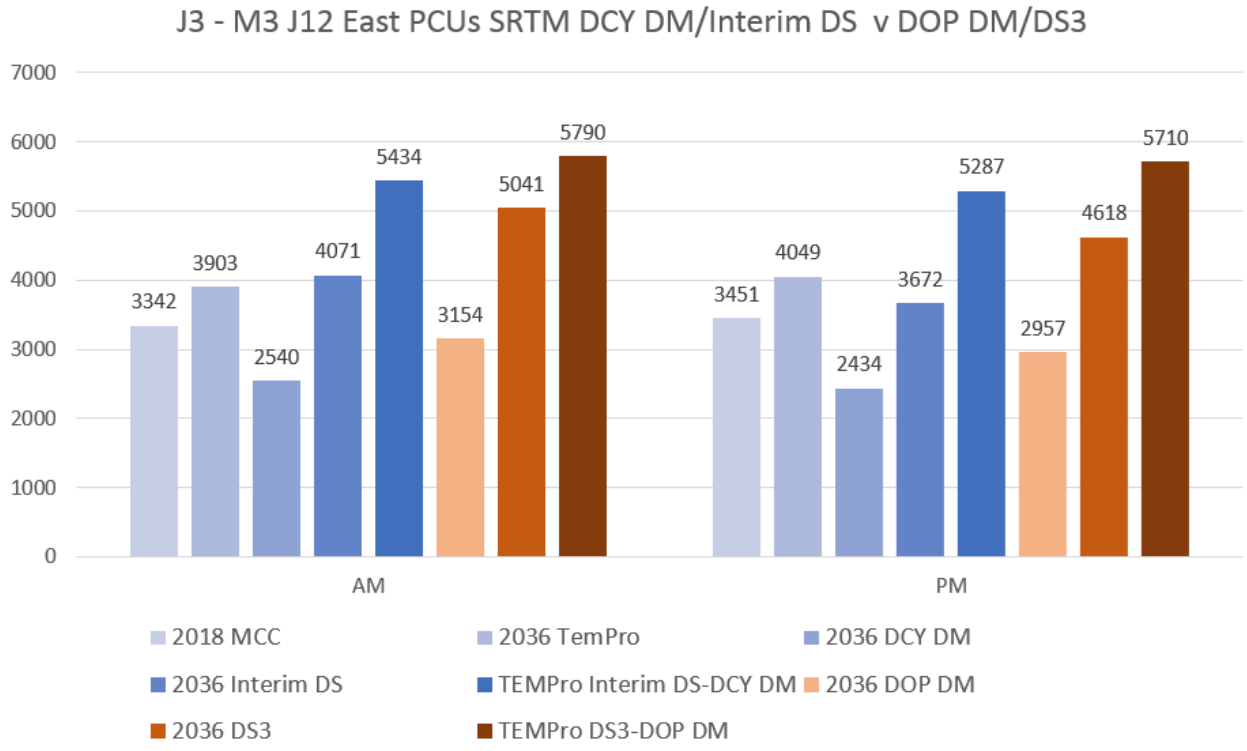
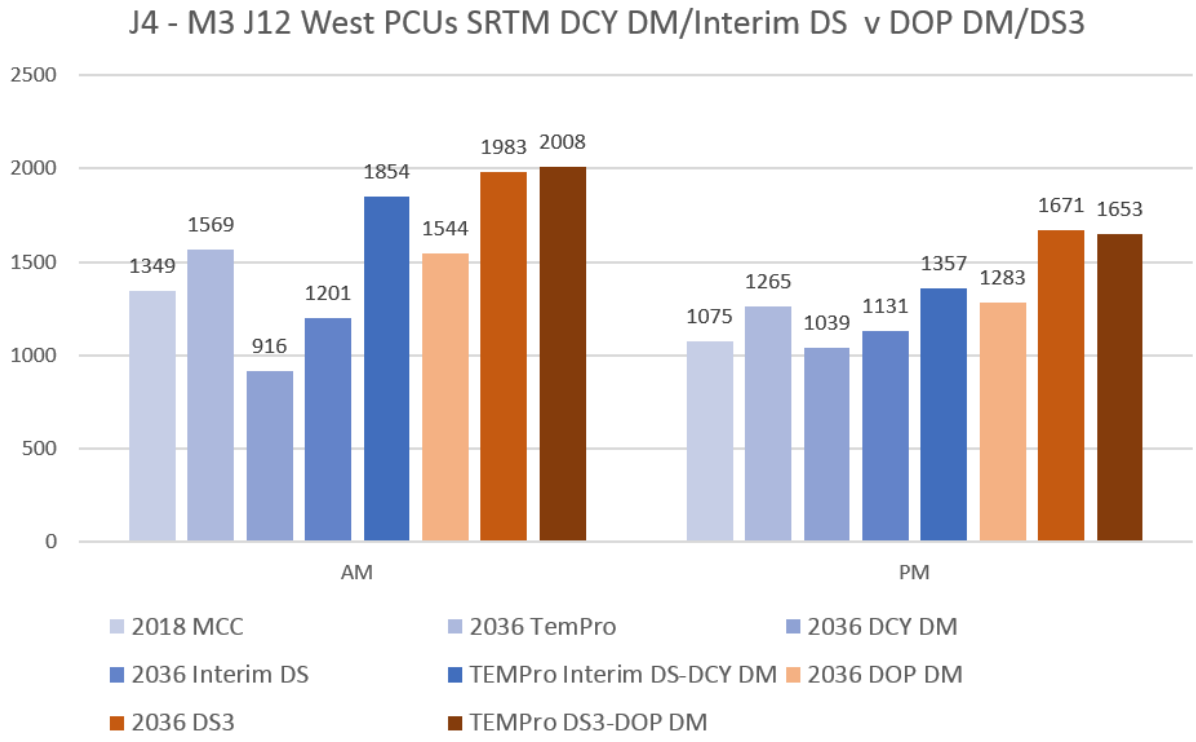


Figure 3-7 Comparison of SRTM demand at J4



3.3.3. SRTM Baseline and Growth Summary

Using the data provided in June 2018, the SRTM 2015 baseline was compared with the 2018 survey data. As can be seen in Table 3-1 below, total PCU flows across the four junctions in the SRTM 2015 baseline are 7,471 PCU in the AM peak and 8,195 PCUs in the PM Peak. This compares with the 2018 total surveyed PCUs shown in Table 3-2 of 9,866 and 10,021 in the AM and PM peaks respectively. The 2018 peak hour volumes are therefore 32% and 22% higher than the SRTM 2015 base flows in the AM and PM peaks respectively.

Table 3-1 also illustrates that background growth in the SRTM between the 2015 baseline and 2036 (DOP DM) is 4% and 5% across the four junctions in the AM and PM peak hours respectively. This compares with TEMPro growth of 17% and 19% respectively as shown in Table 3-2. The SRTM therefore has a significantly lower baseline than the 2018 traffic volumes and includes a much lower background (non-DS3) growth rate than TEMPro.

Table 3-1 Growth between 2015 Baseline SRTM and 2036 DOP DM flows - Total flows by junction

	2015 AM	2036 AM	2015-2036 AM Growth	2015 PM	2036 PM	2015-2036 PM Growth
J1	1432	1531	7%	1838	1921	5%
J2	2166	2287	6%	2388	2565	7%
J3	2637	2753	4%	2812	2869	2%
J4	1236	1223	-1%	1157	1218	5%
Total	**7471**	**7794**	**4%**	**8195**	**8572**	**5%**

Table 3-2 Growth between 2018 Surveyed and 2036 TEMPro-factored surveyed flows Total flows by junction

	2018 AM	2036 AM	2018-2036 AM Growth	2018 PM	2036 PM	2018-2036 PM Growth
J1	2255	2658	18%	2431	2890	19%
J2	2920	3424	17%	3064	3645	19%
J3	3342	3922	17%	3451	4091	19%
J4	1349	1579	17%	1075	1273	19%
Total	**9866**	**11582**	**17%**	**10021**	**11899**	**19%**
	32%			**22%**		

4. Model Calibration and Validation

4.1. Model Acceptability

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 as set out in Chapter 2, the model was calibrated and validated against:

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

The preferred measure of closeness of fit for modelled and observed traffic flows is expressed by the GEH statistic, which is a form of Chi-Squared Test. This test allows comparison of two different values of flows on a link, V1 (observed) and V2 (modelled) without the pitfalls that occur when using a simple percentage to compare two sets of volumes, as it is self-scaling and can be used over a wide range of volumes. The GEH statistic is defined by:

$$= \sqrt{\frac{(V2 - V1)^2}{0.5\ (V1 + V2)}}$$

The acceptability criteria in respect of individual flows, as set out in TAG Unit M3.1 (section 3.27), is defined as a GEH value of less than 5 for 85% or more of the modelled flows.

For journey times, TAG Unit M3.1 states that modelled times along the surveyed routes should be within 15% of the observed data. More than 85% of the routes in modelled peak periods should validate within the set criterion of 15%.

4.2. Comparison of Observed Traffic Flows

In line with TAG Unit M3.1, Table 4-1 below summarises the comparison of modelled versus observed traffic flows for LGV and HGV combined for turn counts greater than zero for the modelled network using the GEH statistic.

Table 4-1 Summary of Observed Flow Comparison (GEH)

GEH Criteria	AM Peak	PM Peak
GEH>=5	0	0
GEH<5	55	46
Maximum GEH	2.5	3.2
Average GEH	0.5	0.3

As can be seen from Table 4-1, all links meet the criterion of GEH<5, with an average GEH value of 0.5 the AM Peak and 0.3 in the PM Peak. The model is therefore well calibrated against observed traffic flows. Full details of the comparison of observed flows are attached in **Appendix D**.

4.3. Comparison with Observed Journey Times

Journey times for all vehicles have been extracted from the model and compared with surveyed data. In order to make best use of data available from the ANPR survey, journey times have been extracted for 14 routes through the network. The routes for validation were selected based on the highest volume of traffic in peak hour OD pairs and to include all turn movements at junctions.

Tables 4-2 and 4-3 (overleaf) provide a comparison between the modelled journey time and ANPR data for each of the routes in the AM and PM peak hours respectively, with illustrative graphs for each route also provided in **Appendix D**.

Table 4-2 Comparison of Observed and Modelled Journey Times – AM Peak

Route Number	Journey Time Route	Distance (m)	Observed Average (s)	Modelled Average (s)	Difference (%)	Validated (+/- 15% Error)
1	A-D, Hocombe Rd-Allbrook Way	1670	356	337	-5%	✓
2	D-A, Allbrook Way-Hocombe Rd	1921	289	297	3%	✓
3	B-C, Winchester Rd-Otterbourne Hill	998	143	152	6%	✓
4	C-B, Otterbourne Hill-Winchester Rd	1741	247	213	-14%	✓
5	B-G, Winchester Road-M3 NB on slip	1036	168	172	3%	✓
6	E-B, M3 SB off slip-Winchester Road	1573	168	160	-5%	✓
7	C-F, Otterbourne Hill - M3 SB on slip	1033	179	144	-19%	✗
8	H-C, M3 NB off slip-Otterbourne Hill	1187	129	129	0%	✓
9	D-G, Allbrook way – M3 NB on slip	1398	225	228	1%	✓
10	E-D, M3 SB off slip-Allbrook way	1290	97	85	-13%	✓
11	A-B, Hocombe Rd-Winchester Rd	1514	295	297	1%	✓
12	B-A, Winchester Rd-Hocombe Rd	745	98	111	14%	✓
13	A-F, Hocombe Rd- M3 SB on slip	1019	309	294	-5%	✓
14	H-D, M3 NB off slip-Allbrook Way	1251	91	93	2%	✓

The journey time validation data presented in Tables 4-2 and 4-3 demonstrates that more than 85% of the routes in modelled peak periods validate within the set criterion of 15%.

The model validates well against all routes in the AM peak which has the higher volume compared to PM peak. As matching VISSIM parameters are recommended to be used for AM and PM peaks, all but 1 routes in the AM peak and 2 routes in PM peak validates well within 15% of criterion.

Table 4-3 Comparison of Observed and Modelled Journey Times – PM Peak

Route Number	Journey Time Route	Distance (m)	Observed Average (s)	Modelled Average (s)	Difference (%)	Validated (+/- 15% Error)
1	A-D, Hocombe Rd-Allbrook Way	1670	192	193	1%	✓
3	B-C, Winchester Rd-Otterbourne Hill	998	123	121	-1%	✓
4	C-B, Otterbourne Hill-Winchester Rd	1741	285	292	2%	✓
5	B-G, Winchester Road-M3 NB on slip	1036	144	135	-6%	✓
6	E-B, M3 SB off slip-Winchester Road	1573	235	218	-7%	✓
7	C-F, Otterbourne Hill - M3 SB on slip	1033	231	222	-4%	✓
8	H-C, M3 NB off slip-Otterbourne Hill	1187	152	128	-16%	✗
9	D-G, Allbrook way – M3 NB on slip	1398	103	92	-11%	✓
10	E-D, M3 SB off slip-Allbrook way	1290	118	124	5%	✓
11	A-B, Hocombe Rd-Winchester Rd	1514	139	168	21%	✗
12	B-A, Winchester Rd-Hocombe Rd	745	81	86	6%	✓
13	A-F, Hocombe Rd- M3 SB on slip	1019	138	149	8%	✓
14	H-D, M3 NB off slip-Allbrook Way	1251	93	85	-9%	✓
3	B-C, Winchester Rd-Otterbourne Hill	998	123	121	-1%	✓

4.4. Modifications during calibration

During calibration some of the entry links on approaches to junctions were coded as two lanes or with longer short lanes where it was observed that traffic was queueing in two lanes. Modified links are presented in the Table 4.4

Table 4-4 Modelled geometry of links

Links	Existing geometry	Modelled geometry
M3J12 SB off slip at J3	Single lane at stop line	Two lanes with short lane at entry as the slip is quite wide at the stop line and vehicles are observed to queue in parallel at entry of roundabout during congested conditions.
Winchester Road S/B approach to J3	Single lane at stop line	Two lanes with long short lane. At stop line the approach is wide enough for two vehicles to queue in parallel. Overtaking is also observed to reach the stop line.
Winchester Road W/B	2 lanes with short lane	The short lane is extended to allow for overtaking of vehicles to reach stop line to turn right to Otterbourne Hill observed in the survey videos.

approach to J2		
Bridge approach EB at J3	1 lane	Two lanes with a short lane. The stop line is wide enough for vehicles to wait parallelly at entry to roundabout and is observed in survey videos
Exit link at J1 to Bridge	2 lanes	2 lanes with priority rules set up to replicate the behaviour of drivers on Hocombe Road pushing into the exit during congested conditions even though the priority is for Winchester Road vehicles to exit the roundabout.

4.5. Validation

The results across the two peaks show that the model validates well against the observed conditions, meeting, and exceeding, the criteria set out in TAG Unit M3.1 for both flows and journey times.

5. Modelled Options

5.1. Background

In order to determine the most efficient and cost-effective mitigation for the M3 J12 network, an incremental approach to improvement was proposed. Initially widening of the approaches to the existing roundabouts and other geometric improvements was tested. If insufficient capacity was created through these measures, signalisation of the smaller J1 and J2 junctions was to be tested and finally if necessary, signalisation of the larger J3, as follows:

DS1 Geometric improvements only
DS2 Geometric improvements and signalised T-junctions
DS3 Geometric improvements, signalised T-junctions and signalised roundabouts

In addition to the above, HCC suggested the following specific measures be tested based on discussions with stakeholders:

DS4 A by-pass and High-Speed Merge (HSM) from Allbrook Way to the M3 southbound on-slip at J3
DS5 An additional lane on the M3 J12 northbound off-slip at J4

In order to combine the best measures in DS1 to DS3 with DS4 and DS5, a preferred option DS6 (PO) is also required.

5.2. Modelled Options

Table 5-1 summaries the key elements of the six options tested, with Figures 5-1 to 5-6 showing the indicative option layouts for reference.

Table 5-1 Summary of Modelled Options

Option Name	Description	Geometry Changes	Signals	Demand Flows	Care Home Access	Land outside of HB
DS1	Geometric improvements only	Extended all short Lanes, Marked two lanes at the circulatory J2-Extended all short lanes J3-Extended all short Lane, Bypasses on M3 SB off slip, Winchester Road and Allbrook Way. Winchester road dualled between J2 and J3	None	2036 TEMPro + SRTM DS3-DOP DM	×	TBC
DS2	Signals at J1 and J2, geometric improvements at J3	J3-Extended all short lanes, bypasses on M3 SB off slip, Winchester Road and Allbrook Way. Winchester road duelled between J2 and J3. Geometry improvements for movements on J1 and J2 Motorway bridge between J1 and J2 dualled (two lanes in each direction)	J1 and J2 Signalised with improved geometry.	2036 TEMPro + SRTM DS3-DOP DM	×	TBC
DS3	Signals at J1, J2 and J3	Motorway bridges between J1 and J2 and J3 and J4 dualled (two lanes in each direction)	J1, J2 Signalised with improved geometry. J3 signalised with improved geometry and with bypasses on M3 SB off slip, Winchester Road and Allbrook Way.	2036 TEMPro + SRTM DS3-DOP DM	×	yes

Option Name	Description	Geometry Changes	Signals	Demand Flows	Care Home Access	Land outside of HB
DS4	High Speed Merge (HSM) at J3	By-pass and HSM from Allbrook Way to M3 S/B on-slip at J3	None	2036 TEMPro + SRTM DS3-DOP DM	×	yes
DS5	Additional off-slip lane at J4	M3 NB off slip of duelled for full length	None	2036 TEMPro + SRTM DS3-DOP DM	×	No
DS6	Preferred Option	DS4 +DS5 (M3 NB off slip duelled for 100 metres) + M3 NB on slip duelled for 100 metres	DS3 + Bypass on M3 SB off slip removed and left turn to Winchester road movement made part of signal. Care home access signalised with keep clear box J1-additional left turn lane to bridge from Hocombe Road added.	2036 TEMPro + SRTM DS3-DOP DM	✓	yes

Figure 5-1 DS1 – Geometric improvements only

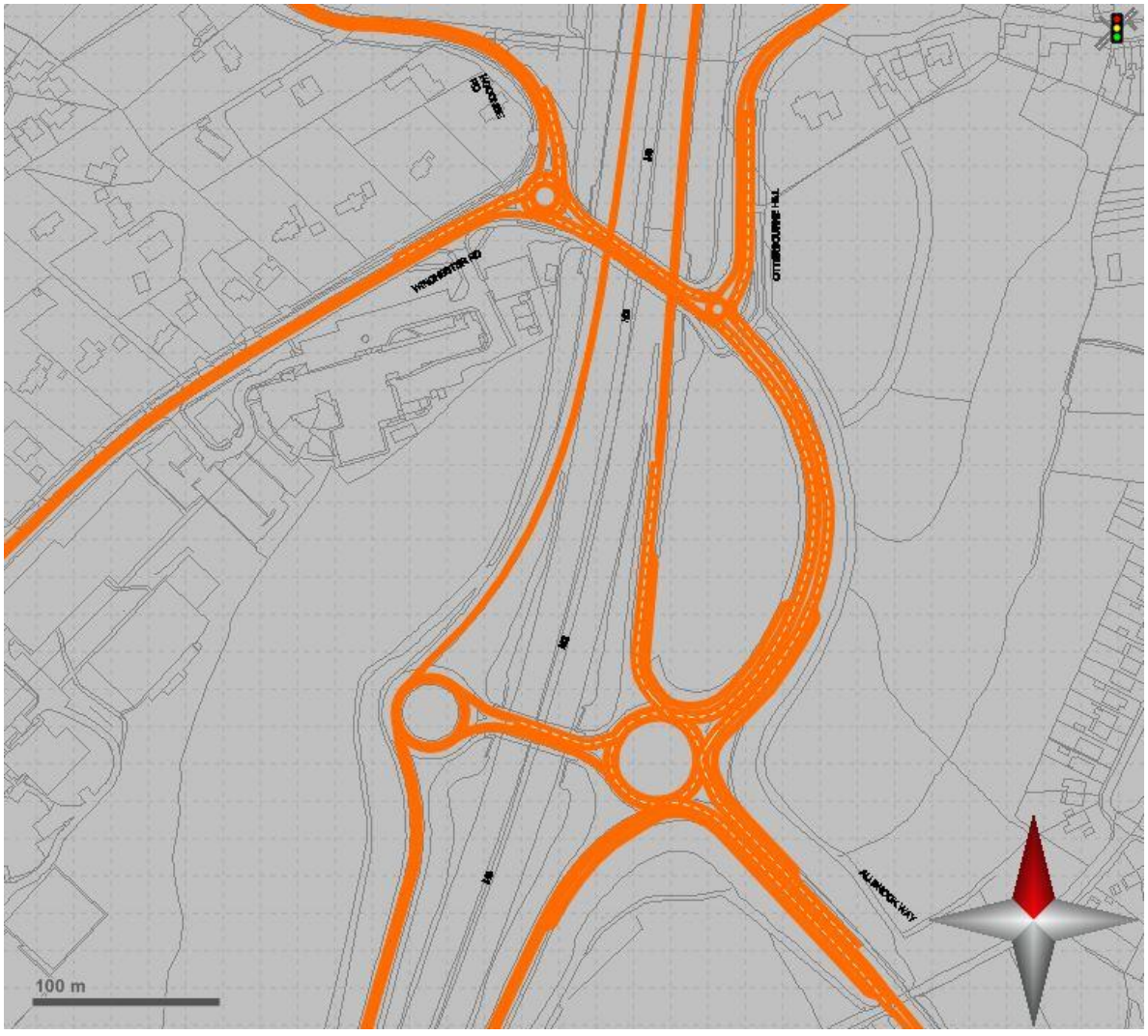


Figure 5-2 DS2 – Signals at J1 and J2

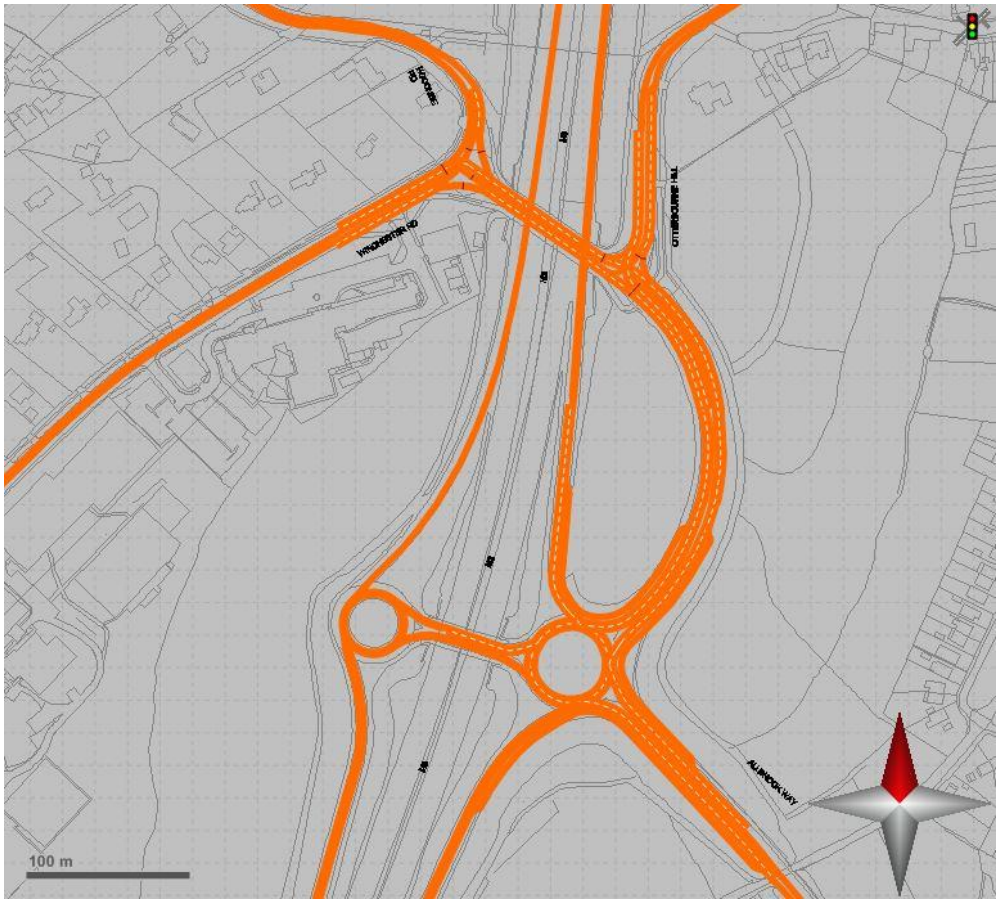


Figure 5-3 DS3 – Signals at J1, J2 and J3

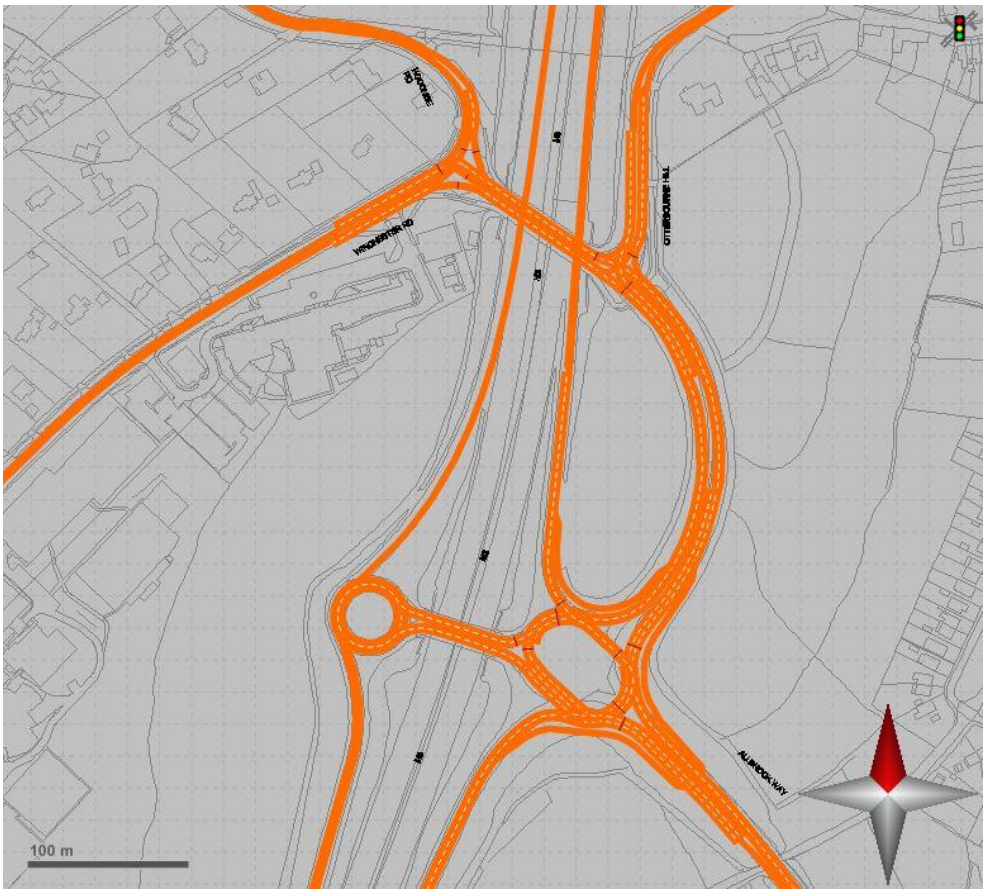


Figure 5-4 DS4 – High Speed Merge

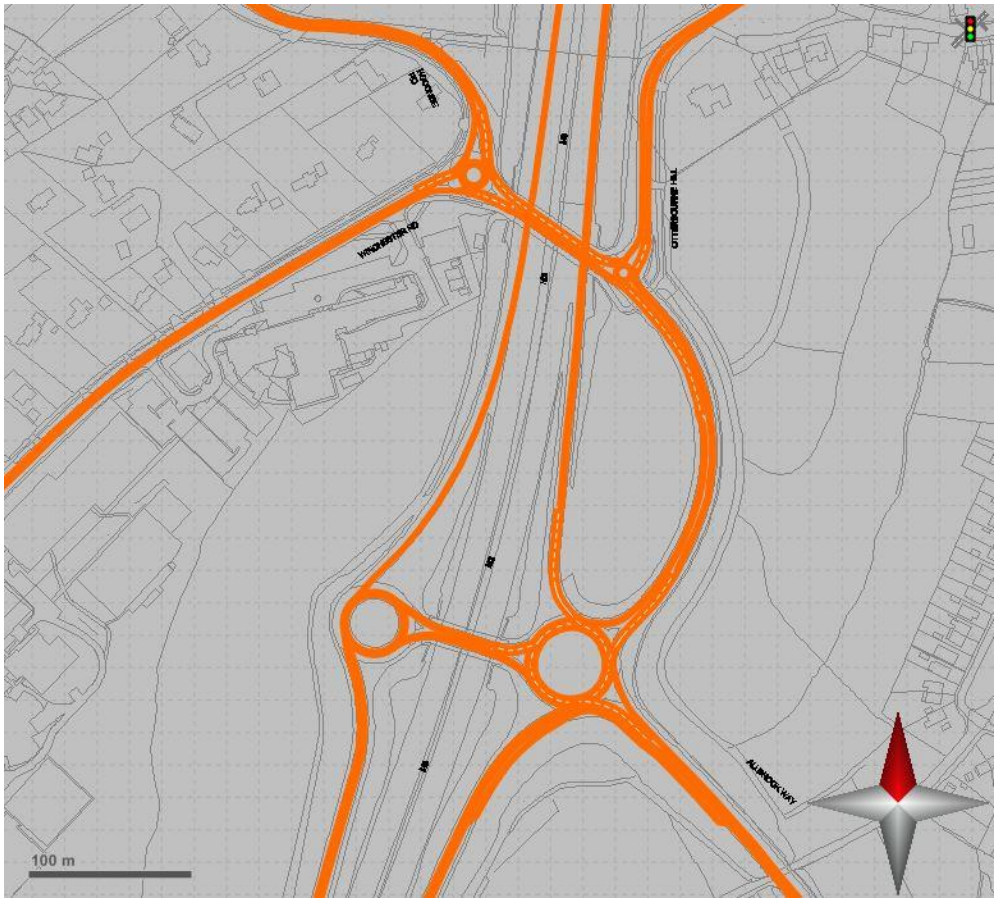


Figure 5-5 DS5 – Additional Lane at J4

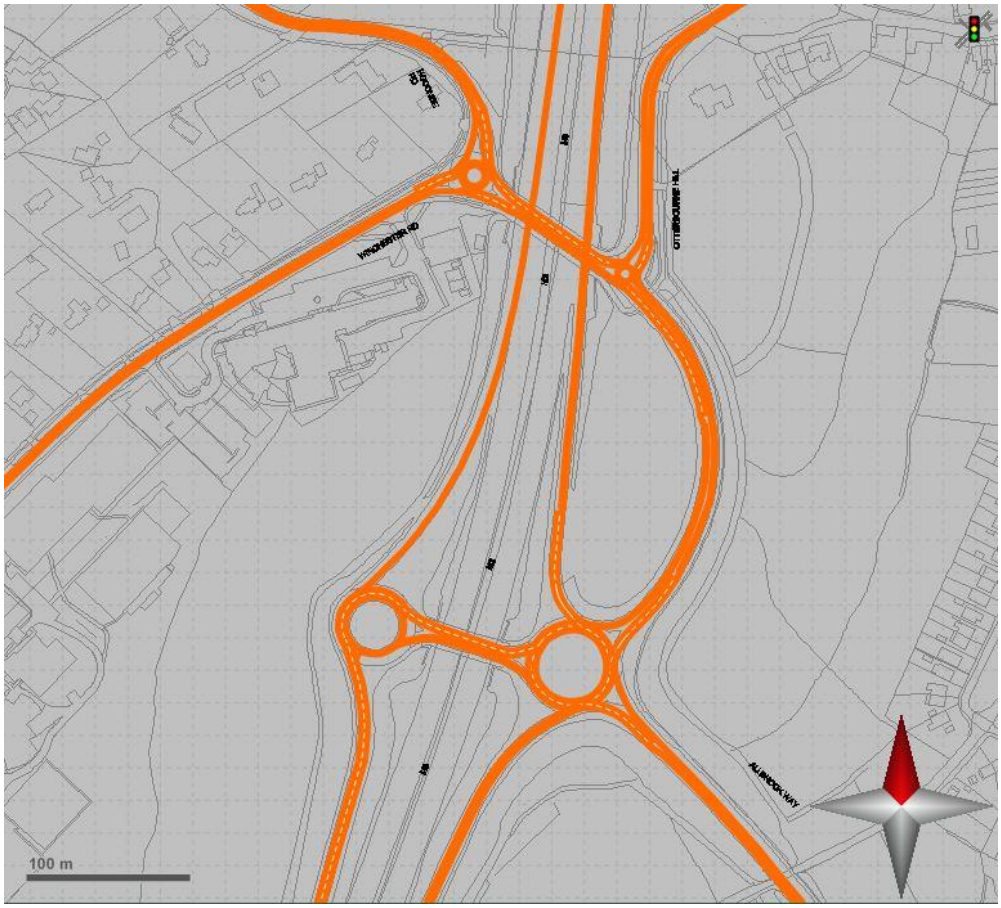
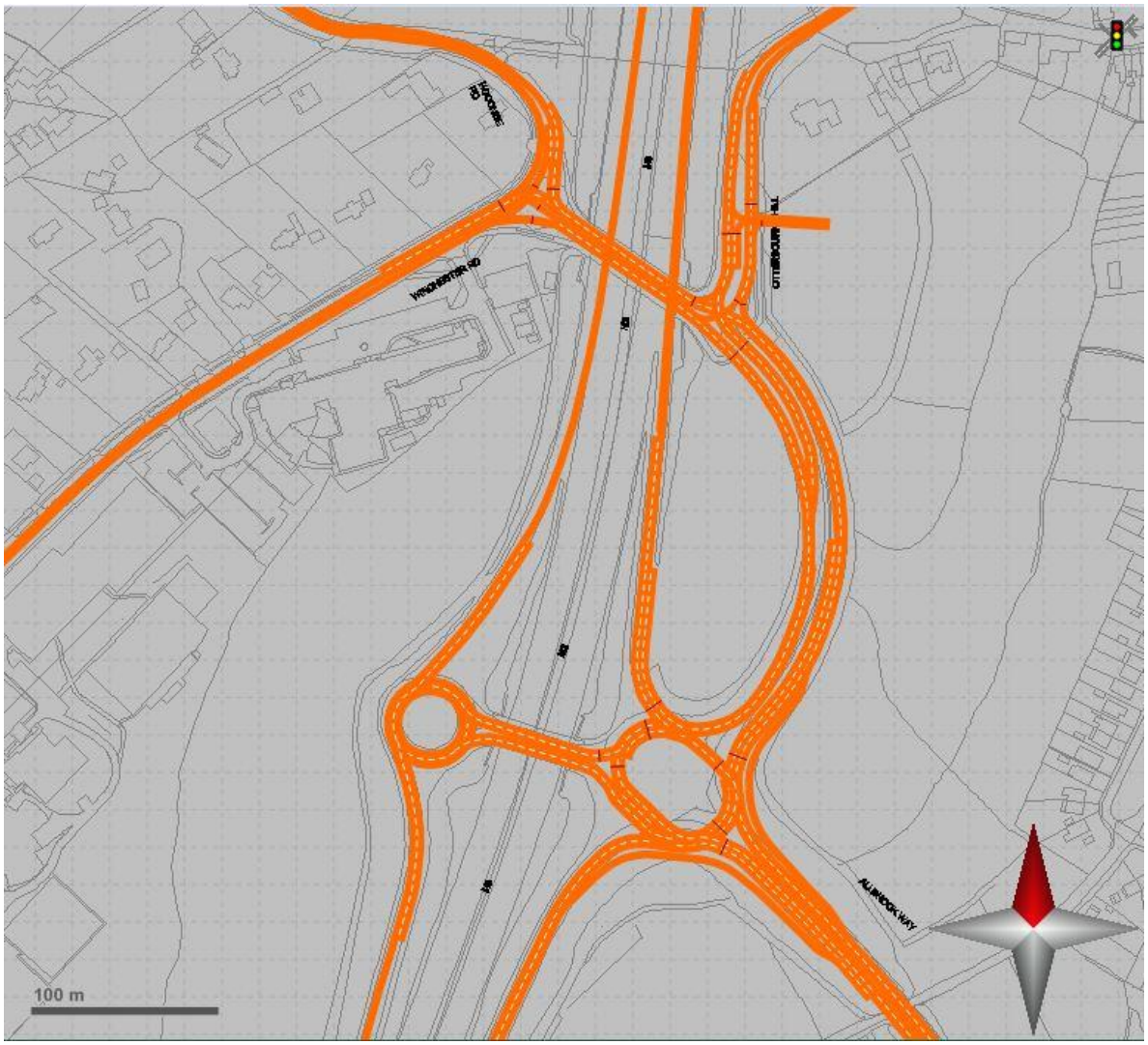


Figure 5-6 DS6 – Preferred Option



6. Option Performance

6.1. Network and Junction Performance Indicators

VISSIM produces a range of statistics to measure network performance as well as queueing and delay on individual arms at junctions. These statistics can be used to benchmark the performance of proposed improvements against a Do-Nothing scenario.

The following VISSIM statistics provide a good overview of network performance between modelled scenarios, allowing general changes in network congestion to be identified:

- **Average network journey time** – for vehicles travelling though the modelled network in the peak hour in minutes.
- **Average network speeds** – average speeds in miles per hour for all vehicles during the peak hour.
- **Average delay time** – the difference between the theoretical travel time with no congestion, signals or other stops and the actual travel time per vehicle during the peak hour in minutes.

When considering individual junctions, the following performance measures have been used:

- **Average queue** - the mean queue measured by VISSIM over the modelled time period in metres.
- **Maximum queue** – the maximum queue measured by VISSIM over the modelled time period in metres.

Level of Service (LOS) based on delay at junctions has been included a broad indicator of performance by arm at each junction. LOS (taken from the United States Highway Capacity Manual) criteria is shown in Table 6-1, below.

Table 6-1 HCM LOS Criteria

LOS	Signalised Junction	Priority Junction
A	≤10 sec	≤10 sec
B	10–20 sec	10–15 sec
C	20–35 sec	15–25 sec
D	35–55 sec	25–35 sec
E	55–80 sec	35–50 sec
F	>80 sec	>50 sec

6.2. Option Performance – Network Wide

Table 6-2, overleaf, illustrates the overall performance of the modelled network for the DN and DS scenarios in 2036. The percentage change in the network performance indicators in comparison with the DN 2036 scenario under each option is also shown, and colour-coded; green where an improvement results and red where there is a deterioration.

It can be seen from the results below that there is a very significant reduction in network performance across all indicators between 2018 and 2036. Options 1, 2 and 3 have incrementally better performance in both peaks when compared with DN 2036. Options 4 and 5 are more localised so bring smaller improvements when taken as part of the network. Note that Options 1 to 5 all perform worse than the Base 2018 network. On the other hand, the preferred option is a significant improvement on the DN 2036 scenario and in fact offers either offers an improvement on, or comparable performance to, the Base 2018 network as well.

Table 6-2 Network Performance Results (DS v DN 2036)

	Performance Indicator	Base 2018	DN 2036 AM		DS opt 1 2036 AM		DS opt 2 2036 AM		DS opt 3 2036 AM		DS opt 4 2036 AM		DS opt 5 2036 AM		DS PO_Update	
AM	Average Network Journey Time (mins)	4.12	7.04	71%	6.60	-6%	5.81	-18%	4.52	-36%	6.85	-3%	6.90	-2%	3.31	-53%
	Average Delay Time (mins)	1.80	4.44	147%	4.01	-10%	3.26	-27%	2.11	-53%	4.24	-5%	4.34	-2%	1.07	-76%
	Average Network Speed (mph)	17.70	10.25	-42%	11.04	8%	12.83	25%	16.55	61%	10.59	3%	10.44	2%	22.54	120%

	Performance Indicator	Base 2018	DN 2036 PM		DS opt 1 2036 PM		DS opt 2 2036 PM		DS opt 3 2036 PM		DS opt 4 2036 PM		DS opt 5 2036 PM		DS PO_Update	
PM	Average Network Journey Time (mins)	3.34	7.35	120%	6.75	-8%	5.70	-23%	4.00	-46%	7.25	-1%	7.18	-2%	3.37	-54%
	Average Delay Time (mins)	1.10	4.69	327%	4.17	-11%	3.15	-33%	1.65	-65%	4.59	-2%	4.55	-3%	1.14	-76%
	Average Network Speed (mph)	21.78	10.01	-54%	10.99	10%	13.23	32%	18.72	87%	10.22	2%	10.24	2%	22.18	122%

6.3. Option Performance - Junctions

6.3.1. J1 – Hocombe Road/Winchester Road

Table 6-3 shows average and maximum queue lengths on each arm of J1 in the 2036 AM peak. The percentage change in relation to the DN 2036 scenario is shown for each option and colour-coded (red increase in queue length, green decrease in queue length). To allow ease of comparison, total queuing on all arms for each option is also shown. Level of Service (LOS) is also shown as broad indicator of performance.

With reference to the total queues, it can be seen that only options DS 2 and 3 result in significant average queue length reductions. Improvements under options DS4 and 5 are however remote from this junction would not be expected to have a significant impact. The 2036 cumulative average queue under DS1 is approximately three times as long as 2018. The preferred option results in significant improvements to both average and maximum queues when compared with 2036 DN and some improvement on the 2018 base. In particular, note the average queue on Hocombe Road reduces from 500m in the DN 2036 scenario to 21m in the Preferred Option. LOS significantly improves on Hocombe Road and Winchester Road. Short queues in the AM Peak on Hocombe Road under the preferred option are shown in Figure 6-1, overleaf.

It is important to note that whilst there are large percentage increases in the queue lengths on the motorway bridge in all options, the DN queues on this arm are very short so the increases are not long in absolute terms. This is clearly illustrated in the average queue length histogram in Figure 6-2, overleaf. Figure 6-2 also clearly shows that Options DS and DS3 bring some benefits to this junction, with the Preferred Option having the biggest impact on average queues in the AM peak.

Table 6-3 J1 Queueing and LOS – AM Peak

Entry arm	Indicator	Base 2018	DN 2036		DS opt 1 2036		DS opt 2 2036		DS opt 3 2036		DS opt 4 2036		DS opt 5 2036		DS PO_Update 2036	
Hocombe Road	Average Queue (m)	177.69	500.14	181%	500.74	0%	359	-28%	247.58	-50%	500.09	0%	500.14	0%	21.14	-96%
	Max Queue (m)	422.66	512.14	21%	511.88	0%	510.23	0%	492.86	-4%	511.82	0%	512.47	0%	197.58	-61%
	Worst Movement LOS	F	F		F		F		F		F		F		C	
Bridge	Average Queue (m)	0.12	0.05	-58%	1.42	2740%	9.81	19520%	13.8	27500%	0.06	20%	0.05	0%	16.07	32040%
	Max Queue (m)	18.55	14.94	-19%	73.37	391%	85.47	472%	96.66	547%	14.76	-1%	14.92	0%	119.36	699%
	Worst Movement LOS	A	A		A		A		A		A		A		A	
Winchester Road	Average Queue (m)	207.62	481.78	132%	437.39	-9%	254.67	-47%	237.22	-51%	483.18	0%	481.41	0%	67.26	-86%
	Max Queue (m)	508.73	515.3	1%	513.75	0%	512.64	-1%	512.08	-1%	515.63	0%	515.63	0%	472.19	-8%
	Worst Movement LOS	F	F		F		F		F	0	F		F		D	
Cumulative Total	Average Queue (m)	385.43	981.97	155%	939.55	-4%	623.48	-37%	498.6	-49%	983.33	0%	981.6	0%	104.47	-89%
	Max Queue (m)	949.94	1042.4	10%	1099	5%	1108.3	6%	1101.6	6%	1042.2	0%	1043	0%	789.13	-24%

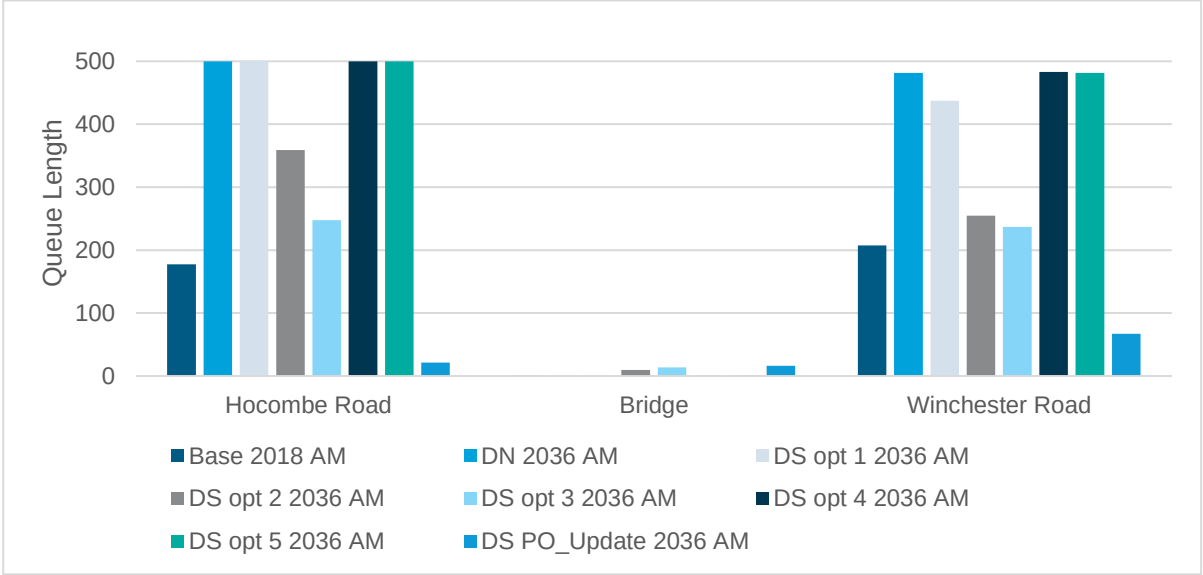
Table 6-4, overleaf, shows that there are similar results in the PM peak. Whilst DS2 and DS3 deliver significant improvements in terms of average queues, only the preferred option brings significant improvements in terms of maximum queues.

Table 6-4 J1 Queueing and LOS – PM Peak

Entry arm	Indicator	Base 2018	DN 2036		DS opt 1 2036		DS opt 2 2036		DS opt 3 2036		DS opt 4 2036		DS opt 5 2036		DS PO_Update 2036	
Hocombe Road	Average Queue (m)	24.01	499.54	1981%	500.8	0%	357.14	-29%	273.44	-45%	499.42	0%	499.63	0%	23.85	-95%
	Max Queue (m)	153	514.75	236%	514.43	0%	509.21	-1%	507.86	-1%	514.77	0%	514.6	0%	190.96	-63%
	Worst Movement LOS	E	F	0	F	0	F	0	F	0	F	0	F	0	C	
Bridge	Average Queue (m)	0.52	0.06	-88%	2.24	3633%	15.34	25467%	18.4	30567%	0.06	0%	0.07	17%	21.86	43620%
	Max Queue (m)	44.61	13.73	-69%	96.96	606%	99.7	626%	108.06	687%	13.58	-1%	13.35	-3%	116	676%
	Worst Movement LOS	A	A	0	A	0	A	0	A	0	A	0	A	0	A	
Winchester Road	Average Queue (m)	59.45	478.94	706%	416.71	-13%	263.1	-45%	251.39	-48%	483.44	1%	480.67	0%	114	-76%
	Max Queue (m)	399.23	515.67	29%	514.35	0%	509.83	-1%	511.99	-1%	515.81	0%	515.44	0%	501.09	-3%
	Worst Movement LOS	E	F	0	F	0	F	0	F	0	F	0	F	0	E	
																0
Cumulative Total	Average Queue (m)	83.98	978.54	1065%	919.75	-6%	635.58	-35%	543.23	-44%	982.92	0%	980.37	0%	159.71	-84%
	Max Queue (m)	596.84	1044.2	75%	1125.7	8%	1118.7	7%	1127.9	8%	1044.2	0%	1043.4	0%	808.05	-22%

Figure 6-1 J1 – Preferred Option Low Queues on Hocombe Road (AM Peak)

Figure 6-2 J1 – Average Queue Length (AM Peak)



6.3.2. J2 – Otterbourne Hill/Winchester Road

Table 6.5 shows that Option DS1 as well as DS2 and DS3 result in reductions in average and maximum queues in the AM Peak at J2. The preferred option results in average queues comparable to 2018 levels and an improvement on 2018 maximum queues. LOS is also significantly improved on Otterbourne Hill in the Preferred Option.

Table 6-5 J2 Queueing and LOS – AM Peak

Entry arm	Indicator	Base 2018	DN 2036		DS opt 1 2036		DS opt 2 2036		DS opt 3 2036		DS opt 4 2036		DS opt 5 2036		DS PO_Update 2036	
Otterbourne Hill	Average Queue (m)	55.46	135.21	144%	3.12	-98%	95.63	-29%	45.49	-66%	77.58	-43%	120.89	-11%	67.85	-50%
	Max Queue (m)	316.62	452.29	43%	49.19	-89%	320.67	-29%	185.94	-59%	357.72	-21%	442.98	-2%	254.53	-44%
	Worst Movement LOS	F	F	0	A	0	E	0	D	0	F	0	F	0	D	0
Winchester Road	Average Queue (m)	2.63	1.97	-25%	75.37	3726%	16.91	758%	24.97	1168%	2.67	36%	2.27	15%	20.83	957%
	Max Queue (m)	91.24	78.72	-14%	248.6	216%	93.31	19%	156.12	98%	100.77	28%	90.4	15%	59.32	-25%
	Worst Movement LOS	B	B	0	D	0	A	0	B	0	B	0	B	0	A	0
Bridge	Average Queue (m)	23.02	36.49	59%	22.15	-39%	21.19	-42%	15.59	-57%	38.81	6%	36.49	0%	24.77	-32%
	Max Queue (m)	117.21	119.14	2%	119.77	1%	110.46	-7%	81.64	-31%	119.82	1%	119.67	0%	115.18	-3%
	Worst Movement LOS	A	A	0	A	0	A	0	A	0	A	0	A	0	A	0
Cumulative Total	Average Queue (m)	81.11	173.67	114%	100.64	-42%	133.73	-23%	86.05	-50%	119.06	-31%	159.65	-8%	113.45	-35%
	Max Queue (m)	525.07	650.15	24%	417.56	-36%	524.44	-19%	423.7	-35%	578.31	-11%	653.05	0%	429.03	-34%

In the PM peak, Option DS1 results in long average queues on Winchester Road, as shown in Table 6-6. Options DS2 and DS3 also result in less of an improvement compared with the AM Peak.

It is noted that there is a reduction in average and maximum queues on Otterbourne Hill between 2018 and 2036 in the PM peak. This is possibly due to a change in the balance of flows in the SRTM, as well as increased demand at 2036 being held back by capacity constraints at J1 and J3.

Preferred Option queues are generally an improvement on 2018 in terms of average and maximum queues, although the addition of a yellow box at the Care Home access does increase queue lengths to a small extent on Otterbourne Hill. LOS is improved on Otterbourne Hill and Winchester Road in the Preferred Option. Figure 6-3, overleaf, illustrates PM peak right-turning traffic being accommodated in the right-tuning bay on Winchester Road.

Table 6-6 J2 Queueing and LOS – PM Peak

Entry arm	Indicator	Base 2018	DN 2036		DS opt 1 2036		DS opt 2 2036		DS opt 3 2036		DS opt 4 2036		DS opt 5 2036		DS PO_Update 2036	
Otterbourne Hill	Average Queue (m)	191.43	52.62	-73%	3.17	-94%	43.96	-16%	35.09	-33%	28.28	-46%	64.04	22%	57.3	9%
	Max Queue (m)	505.5	284.61	-44%	45.84	-84%	203.64	-28%	175.33	-38%	205.95	-28%	320.95	13%	303.72	7%
	Worst Movement LOS	F	F	0	A	0	D	0	D	0	E	0	F	0	D	0
Winchester Road	Average Queue (m)	10.55	1.76	-83%	156.59	8797%	21.14	1101%	31.62	1697%	2.14	22%	1.75	-1%	24.06	1267%
	Max Queue (m)	231.24	80.4	-65%	279.8	248%	137.31	71%	181.45	126%	80.95	1%	66.99	-17%	51.11	-36%
	Worst Movement LOS	C	A	0	E	0	B	0	B	0	B	0	B	0	A	0
Bridge	Average Queue (m)	11.27	31.77	182%	15.93	-50%	23.09	-27%	15.59	-51%	36.21	14%	33.65	6%	23.22	-27%
	Max Queue (m)	112.02	120.53	8%	119.18	-1%	114.57	-5%	83.59	-31%	119.79	-1%	117.91	-2%	102.86	-15%
	Worst Movement LOS	A	A	0	A	0	A	0	A	0	A	0	A	0	A	0
Cumulative Total	Average Queue (m)	213.25	86.15	-60%	175.69	104%	88.19	2%	82.3	-4%	66.63	-23%	99.44	15%	104.58	21%
	Max Queue (m)	848.76	485.54	-43%	444.82	-8%	455.52	-6%	440.37	-9%	406.69	-16%	505.85	4%	457.69	-6%

6.3.1. J3 – M3 Junction 12 East

As shown in Table 6-7, overleaf, the high 2036 demand at J3 results in very long average queues in the AM peak on Allbrook Way. Options DS1 and DS3 result in significant improvements to queuing at the junction. Note that whilst Option DS4 (the high-speed merge) reduces queues on Allbrook Way and Winchester Road, queue lengths increase on the M3 southbound off-slip. This is because the additional capacity provided by the high-speed merge allows more traffic from Allbrook Way to discharge on to the roundabout, preventing vehicles under priority control on the off-slip joining the circulatory carriageway, as shown in Figure 6-4, overleaf.

The high-speed merge brings some improvements but these need to be delivered as part of a package of measures, as shown in the Preferred Option, which results in average queues that are an improvement on Allbrook Way and the M3 off-slip, as shown by the queue length histogram in Figure 6-5, overleaf. LOS is improved in the preferred option on these arms.

Note both Option DS3 and the Preferred Option require two lanes westbound on the motorway bridge to allow traffic to discharge sufficient quickly from Allbrook Way.

Figure 6-3 J2 – Preferred Option queue on Winchester Road (PM Peak)

Table 6-7 J3 Queueing and LOS – AM Peak

Entry arm	Indicator	Base 2018	DN 2036		DS opt 1 2036		DS opt 2 2036		DS opt 3 2036		DS opt 4 2036		DS opt 5 2036		DS PO_Update 2036	
Winchester Road	Average Queue (m)	1.65	3.87	135%	2.07	-47%	37.52	870%	8.25	113%	2.74	-29%	3.8	-2%	11.32	193%
	Max Queue (m)	34	69.53	105%	41.47	-40%	287.61	314%	51.7	-26%	41.05	-41%	58.15	-16%	63.2	-9%
	Worst Movement LOS	A	A		A		A		A		A		A		A	
Allbrook Way	Average Queue (m)	242.65	259.47	7%	159.34	-39%	308.59	19%	13.82	-95%	114.79	-56%	248.08	-4%	15.91	-94%
	Max Queue (m)	501.36	512.23	2%	507.78	-1%	513.27	0%	48.64	-91%	510.68	0%	512.11	0%	63.92	-88%
	Worst Movement LOS	F	F		A		A		A		A		F		A	
M3 J12 SB On	Average Queue (m)	Exit Only														
	Max Queue (m)															
	Worst Movement LOS															
Bridge	Average Queue (m)	0.67	1.2	79%	1.69	41%	0.79	-34%	3.06	155%	2.18	82%	1.17	-3%	15.49	1191%
	Max Queue (m)	35.13	58.94	68%	33.28	-44%	26.69	-55%	42.66	-28%	64.79	10%	39.61	-33%	96.33	63%
	Worst Movement LOS	A	A		A		A		B		A		A		C	
M3 J12 SB Off	Average Queue (m)	8.82	54.99	523%	6.98	-87%	2.82	-95%	4.83	-91%	137.8	151%	32.24	-41%	8.46	-85%
	Max Queue (m)	91.52	288.86	216%	50.23	-83%	36.47	-87%	33.05	-89%	425.69	47%	200.31	-31%	42.99	-85%
	Worst Movement LOS	C	F		A		A		A		F		E		B	
Cumulative Total	Average Queue (m)	253.79	319.53	26%	170.08	-47%	349.72	9%	29.96	-91%	257.51	-19%	285.29	-11%	51.18	-84%
	Max Queue (m)	662.01	929.56	40%	632.76	-32%	864.04	-7%	176.05	-81%	1042.2	12%	810.18	-13%	266.44	-71%

Figure 6-4 J3 – DS Option 4 creates long queues on the M3 off-slip (AM Peak)

Figure 6-5 J3 – Average Queue Length (AM Peak)

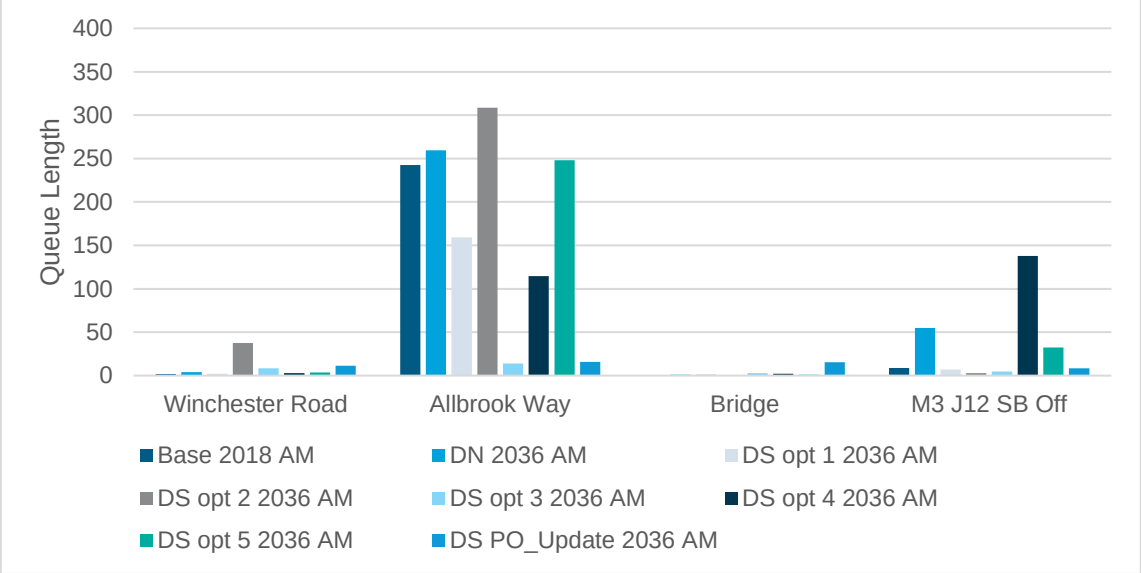


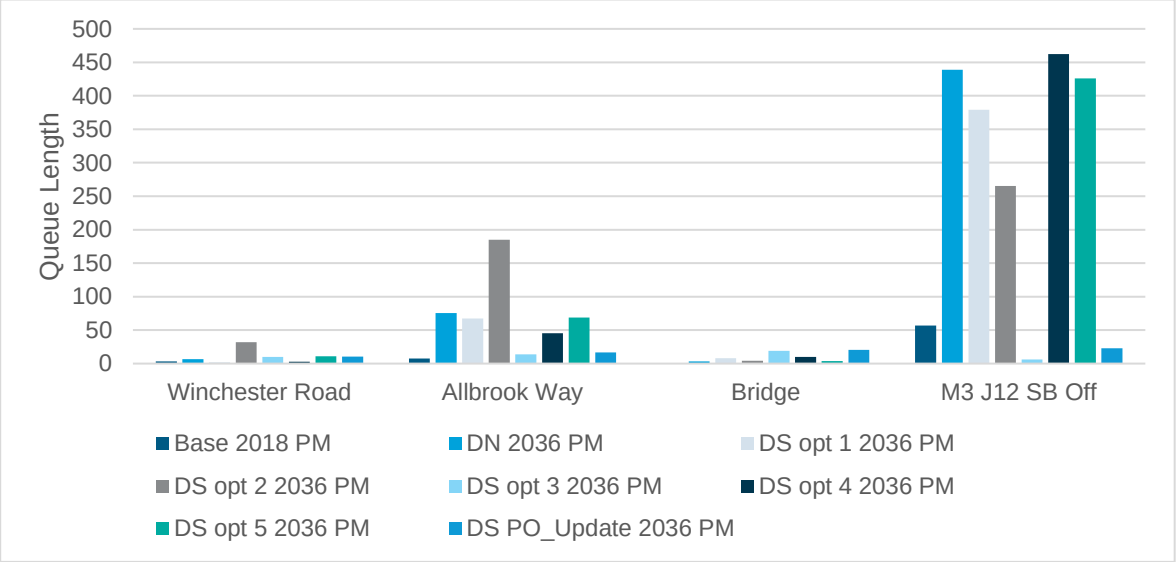
Table 6-8, overleaf, shows that demand in the PM peak results in longer average and maximum queues than the AM peak at 2036. In particular, an average queue of 439m occurs in the M3 southbound off-slip which would back up on to the motorway mainline. It can be seen that Options DS1 and DS2 result in less significant improvements to average queues in the PM peak. DS3 and the Preferred Option have similarly good results to the AM Peak with short average queues on all arms. In particular it can be seen that both the average and maximum queues on the M3 off-slip are short with no danger of queues backing up on to the motorway in the Preferred Option, as shown in Figure 6-6, below. The histogram in Figure 6-7, overleaf, shows the improvement in average queue length under the Preferred Option. LOS is improved on the M3 off-slip in the Preferred Option.

Figure 6-6 J3 – Preferred Option low queues on off-slip (PM Peak)

Table 6-8 J3 Queueing and LOS – PM Peak

Entry arm	Indicator	Base 2018	DN 2036		DS opt 1 2036		DS opt 2 2036		DS opt 3 2036		DS opt 4 2036		DS opt 5 2036		DS PO_Update 2036	
Winchester Road	Average Queue (m)	3.46	6.47	87%	2	-69%	32.09	396%	9.84	52%	3.01	-53%	10.78	67%	10.66	65%
	Max Queue (m)	71.42	127.75	79%	31.93	-75%	249.95	96%	58.01	-55%	66.11	-48%	204.56	60%	74.84	-41%
	Worst Movement LOS	A	B		A		A		A		A		C		A	
Allbrook Way	Average Queue (m)	7.49	75.48	908%	67.53	-11%	185.15	145%	13.82	-82%	45.56	-40%	68.64	-9%	16.82	-78%
	Max Queue (m)	119.63	506.2	323%	386.17	-24%	507.92	0%	49.48	-90%	503.9	0%	507.14	0%	65.36	-87%
	Worst Movement LOS	B	F		A		A		A		A		F		A	
Bridge	Average Queue (m)	0.78	3.24	315%	8	147%	4.06	25%	19	486%	10.1	212%	3.51	8%	20.45	531%
	Max Queue (m)	37.92	98.55	160%	89.04	-10%	51.79	-47%	96.76	-2%	156.12	58%	67.82	-31%	102.47	4%
	Worst Movement LOS	A	A		B		A		B		B		A		B	
M3 J12 SB Off	Average Queue (m)	57	438.94	670%	379.25	-14%	265.25	-40%	6.33	-99%	462.24	5%	425.93	-3%	22.63	-95%
	Max Queue (m)	297.67	481.1	62%	477.47	-1%	480.34	0%	38.94	-92%	481.29	0%	481.17	0%	74.17	-85%
	Worst Movement LOS	F	F		A		A		A		F		F		D	
Cumulative Total	Average Queue (m)	68.73	524.13	663%	456.78	-13%	486.55	-7%	48.99	-91%	520.91	-1%	508.86	-3%	70.56	-87%
	Max Queue (m)	526.64	1213.6	130%	984.61	-19%	1290	6%	243.19	-80%	1207.4	-1%	1260.7	4%	316.84	-74%

Figure 6-7 J3 – Average Queue Length (PM Peak)



It should be noted that there is a very high demand for Allbrook Way southbound in the PM peak in excess of 2,000 PCUs. This quantum of traffic requires two lanes in order to prevent queue backing back up to J3 and this has been assumed in the modelling.

6.3.2. J4 – M3 Junction 12 West

As shown in Table 6-9, overleaf, average AM peak queues on the M3 northbound off-slip at J4 are relatively short and will continue to be so at 2036. The maximum queue at 2018 is 155m however and will increase to approximately 200m in length. It is noted that this distance is significantly shorter than the length of the off-slip. It can also be seen from the table that Options DS1 to 4 all have significantly adverse impacts on this junction as they release more traffic on to the roundabout from the bridge preventing traffic on the off-slip joining the circulatory carriageway. Maximum queues on all four options are likely to block back close to the M3 mainline. It can be seen that Option DS5 (additional lane on the off-slip) improves the operation of the roundabout by providing extra capacity at the give way line. Two lanes are required eastbound on the motorway bridge to allow this option to work. The Preferred Option therefore includes Option DS5 as well as improvements to the other junctions. Provision of two lanes on the off-slip therefore mitigates the additional traffic arriving from J3.

Note the provision of two lanes westbound on the bridge (to allow traffic to discharge through J3) means that two lanes are also required for part of the northbound motorway on-slip.

Figure 6-8, overleaf, shows the short queues on M3 off-slip in the AM peak.

Table 6-9 J4 Queueing and LOS – AM Peak

Entry arm	Indicator	Base 2018	DN 2036		DS opt 1 2036		DS opt 2 2036		DS opt 3 2036		DS opt 4 2036		DS opt 5 2036		DS PO_Update 2036	
M3 J12 NB On	Average Queue (m)	0	0		216.35		0		0		0		0		0	
	Max Queue (m)	0	0		509.23		0		0		0		0		0	
	Worst Movement LOS	A	A		A		A		A		A		A		A	
Bridge	Average Queue (m)	0	0		0		0		0.02		0		0		0.02	
	Max Queue (m)	0	0		0		0		18.31		0		1.37		17.93	
	Worst Movement LOS	A	A		A		A		A		A		A		A	
M3 J12 NB Off	Average Queue (m)	19.42	26.24	35%	216.35	725%	328.8	1153%	425.71	1522%	114.94	338%	2.83	-89%	10.09	-62%
	Max Queue (m)	155.16	203.73	31%	509.23	150%	513.41	152%	512.72	152%	425.36	109%	42.89	-79%	73.67	-64%
	Worst Movement LOS	C	C		F		F		F		F		A		C	
Cumulative Total	Average Queue (m)	19.42	26.24	35%	432.7	1549%	328.8	1153%	425.73	1522%	114.94	338%	2.83	-89%	10.11	-61%
	Max Queue (m)	155.16	203.73	31%	1018.5	400%	513.41	152%	531.03	161%	425.36	109%	44.26	-78%	91.6	-55%

Figure 6-8 J4 – Preferred Option low queues on off-slip (AM Peak)

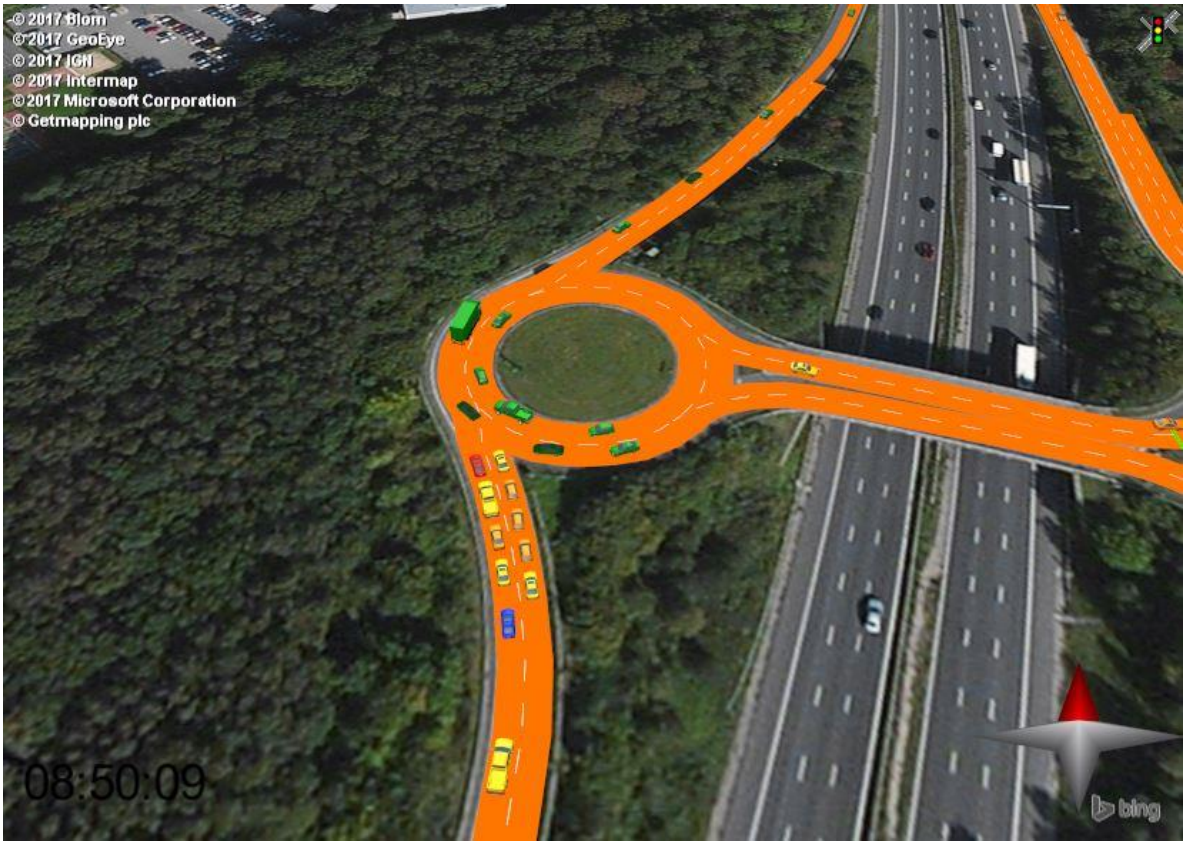


Table 6-10 shows that average and maximum queue lengths in the PM peak at 2036 will be similar to the AM peaks. The DS options also have similar results, although it is noted that the Preferred Option has a more significant impact on average and maximum queue lengths at the junction in the PM peak.

Table 6-10 J4 Queueing and LOS – PM Peak

Entry arm	Indicator	Base 2018	DN 2036		DS opt 1 2036		DS opt 2 2036		DS opt 3 2036		DS opt 4 2036		DS opt 5 2036		DS PO_Update 2036	
M3 J12 NB On	Average Queue (m)	0	0		65.2		0		0		0		0		0	
	Max Queue (m)	0	0		309.95		0		0		0		0		0	
	Worst Movement LOS	A	A		A		A		A		A		A		A	
Bridge	Average Queue (m)	0	0		0		0		0		0		0		0.01	
	Max Queue (m)	0	0		0		0		5.63		0		4.47		6.27	
	Worst Movement LOS	A	A		A		A		A		A		A		A	
M3 J12 NB Off	Average Queue (m)	2.45	20.31	729%	65.2	221%	168.26	728%	84.95	318%	95.76	371%	1.59	-92%	2.67	-87%
	Max Queue (m)	70.17	221.7	216%	309.95	40%	455.9	106%	363.26	64%	381.52	72%	37.59	-83%	44.11	-80%
	Worst Movement LOS	A	C		E		F		A		F		A		A	
Cumulative Total	Average Queue (m)	2.45	20.31	729%	130.4	542%	168.26	728%	84.95	318%	95.76	371%	1.59	-92%	2.68	-87%
	Max Queue (m)	70.17	221.7	216%	619.9	180%	455.9	106%	368.89	66%	381.52	72%	42.06	-81%	50.38	-77%

6.3.3. Junction Results Summary

Table 6-11 provides a summary of the impact of each option on each junction, together with a brief note on the main disadvantages with each. In short, signals are required at J1 and J2 in order to significantly impact on queues at these junctions. A range of measures are required at J3 including both geometric improvements and signals. The high-speed merge (Option DS4) brings some improvement to J3 but not if it is implemented on its own. Option DS5 is required at J4 in order to mitigate the impact of the other options at this junction. The Preferred Option can be considered as a combination of Options DS3, 4 and 5 and brings significant improvement to all junctions.

A clear illustration of the improvements brought by the preferred option is shown in Figure 6-9, overleaf, which shows delay under DN 2036 and the Preferred Option.

When considering the Preferred Option, it should be noted:

- Four lanes are required on both motorway bridges
- Increasing Allbrook Way to two lanes southbound would be required to accommodate demand at 2036 in the PM peak
- A signalised access to the Care Home on Otterbourne Hill can be accommodated. This junction was not tested in the other options.

Table 6-11 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	Preferred Option	✓	✓	✓	✓	Acceptable average queues at all junctions. No blocking back to M3 mainline.

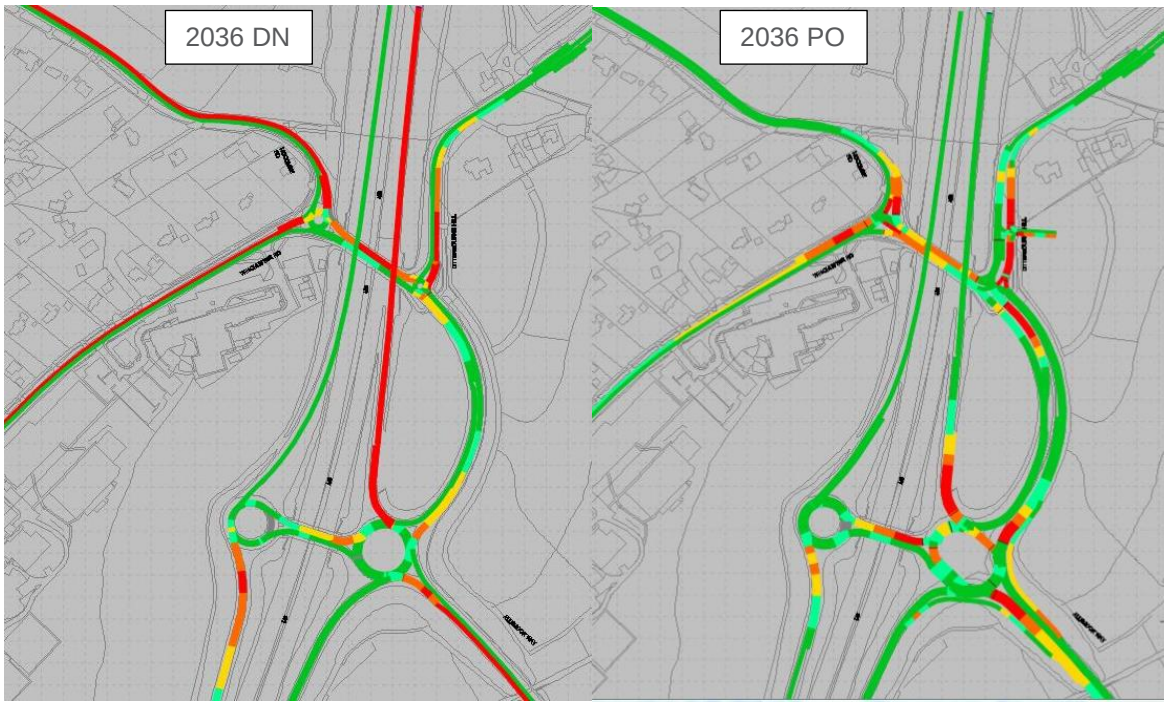
Figure 6-9 Delay – DN2036 v Preferred Option (AM Peak)

Note: The link segments in the network after model run are coloured based on the *Relative Delay* value -Total delay (in seconds) divided by total travel time (in seconds) of all vehicles in this link segment during the peak hour:

Class bounds and colors:

Count: 6	LowerBound	UpperBound	Color
1	MIN	0.350	(255, 0, 194, 33)
2	0.350	0.500	(255, 0, 255, 144
3	0.500	0.650	(255, 255, 216, 0
4	0.650	0.800	(255, 255, 106, 0
5	0.800	1.000	(255, 255, 0, 0)
6	1.000	MAX	(255, 127, 0, 0)

Figure 6-10 Delay – DN2036 v Preferred Option (PM Peak)



7. Summary and Conclusion

7.1. Summary

The Eastleigh Borough Council (EBC) Emerging Local Plan has identified that mitigation will be required to reduce queueing at M3 Junction 12. Hampshire County Council (HCC) has appointed Atkins to develop, calibrate and validate a VISSIM micro-simulation model and to use the model to test various improvement options at a 2036 design year.

Atkins has built a microsimulation model using VISSIM (version 10.00-07) for the following junctions:

- J1 Hocombe Road/Winchester Road
- J2 Otterbourne Hill/Winchester Road
- J3 M3 Junction 12 East
- J4 M3 Junction 12 West

A Base Year Model has been constructed with traffic flows obtained from March 2018 surveys and has been calibrated and validated to an appropriate level based on the surveyed traffic flows and journey times.

In order to benchmark the performance of the proposed improvements, the existing network has been tested for the following scenarios with forecast traffic flows at 2018 and 2036:

- 2018 Do Nothing Scenario (2018 DN)
- 2036 Do Nothing Scenario (2036 DN)

Forecast flows have been developed using TEMPro 7.2 and the Solent Regional Transport Model (SRTM) for the year 2036 as agreed with HCC. Chapter 3 sets out the methodology used to develop the forecast flows.

A LinSig model has been developed for J1, J2 and J3 to optimise signal timings given the geometries and junction configurations proposed.

Five DS options have been developed based on incrementally more significant highways mitigation measures (DS1 to DS3) and suggested improvements from HCC (DS4 and DS5):

- DS1 – Geometric improvements only
- DS2 – Signals at J1 and J2 and geometric improvements at J3
- DS3 - Signals at J1, J2 and J3
- DS4 - High Speed Merge (HSM) at J3
- DS5 - Additional off-slip lane at J4

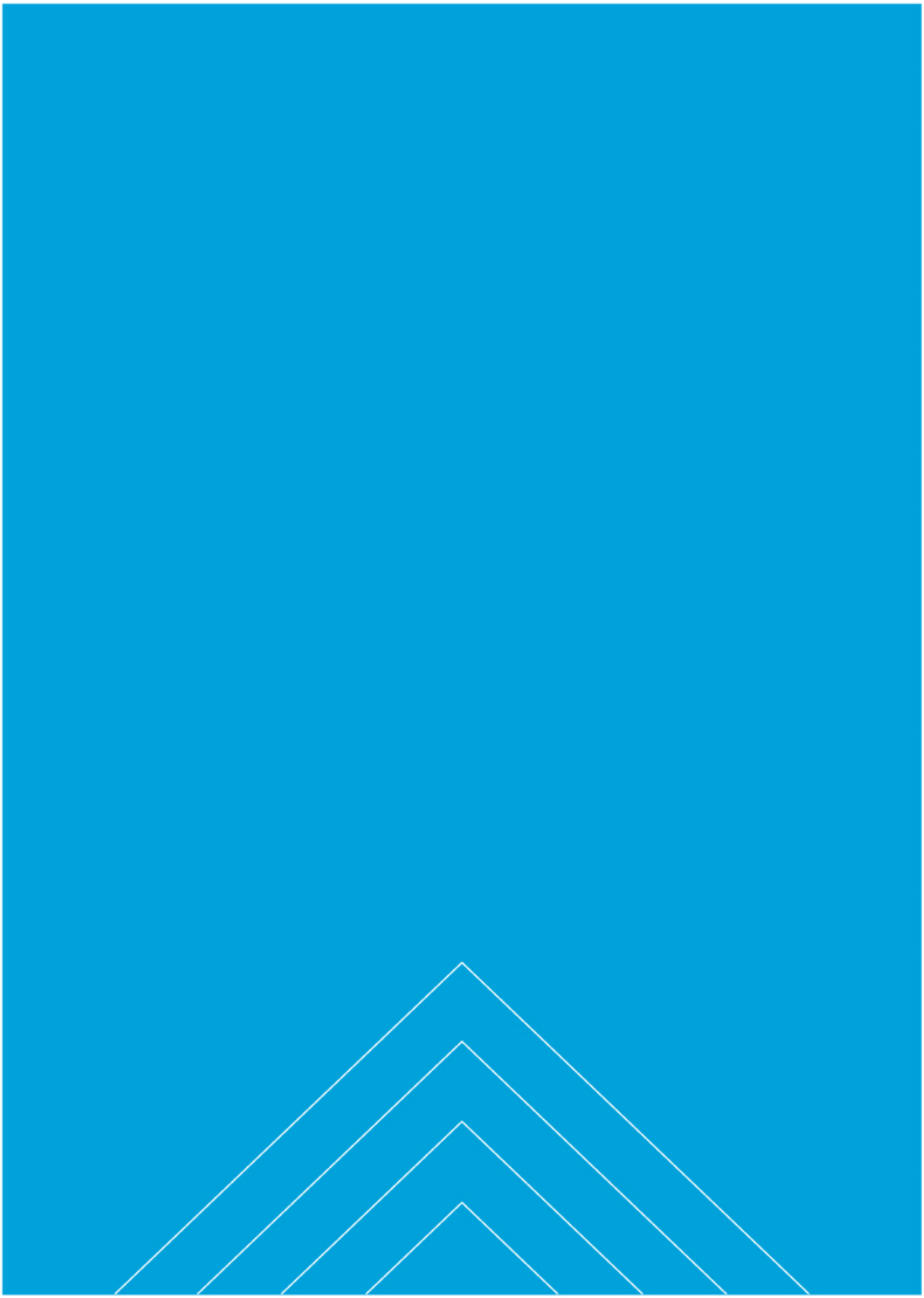
Outputs from each VISSIM model were analysed in terms of network performance and average and maximum queue lengths at all four junctions. Based on a comparison of the results, Preferred Option (DS6) has been developed to reduce average queues at the junction to an appropriate level.

7.2. Conclusion

In terms of overall network performance, Options DS2 and DS3 result in significantly better operation in comparison with DN 2036 or DS1, DS4 and DS5. This demonstrates that signals are required at J1 and J2 in order to significantly impact on queues at these junctions. A range of measures are required at J3 including both geometric improvements and signals. The high-speed merge (Option DS4) brings some improvement to J3 but not if it is implemented on its own. Option DS5 is required at J4 in order to mitigate the impact of the other options at this junction. The Preferred Option can be considered as a combination of Options DS3, 4 and 5 and brings significant improvement to all junctions.

When considering the Preferred Option, it should be noted:

- Four lanes are required on both motorway bridges
- Increasing Allbrook Way to two lanes southbound would be required to accommodate demand at 2036 in the PM peak
- A signalised access to the Care Home on Otterbourne Hill can be accommodated. This junction was not tested in the other options.



Appendix A. TEMPro Growth Factors

Dataset Version: 72 Checked RS 2018-06-04
Result Type: Trip ends by time period
Base Year: 2018
Future Year: 2036
Trip Purpose Group: All purposes
Trip End Type: Origin/Destination
Transport Mode: Car Driver
Alternative Assumptions Applied: No

Time Period: Weekday AM peak period (0700 - 0959)
TEMPRO Growth Factor

Area Description		All purposes	
Level	Name	Origin	Destination
E02004712	Eastleigh 001	1.1518	1.1492
E02004713	Eastleigh 002	1.1509	1.1511
E02004714	Eastleigh 003	1.1561	1.1426
E02004715	Eastleigh 004	1.1675	1.1473
E02004716	Eastleigh 005	1.1599	1.1589
E02004717	Eastleigh 006	1.1897	1.1463
E02004718	Eastleigh 007	1.1790	1.1496
E02004719	Eastleigh 008	1.1295	1.1448
E02004827	Test Valley 014	1.0751	1.1321
E02004837	Winchester 009	1.1852	1.1472
E02004838	Winchester 010	1.1815	1.1584

NTM Adjustment Factors
Version : RTF15
Area Type Urban
Road Type Principal
Growth Factor including both TEMPRO and NTM

2018-2036	AM Peak (0700-0959)	
Level	Area	Local Growth Figure
E02004712	Eastleigh 001	1.181310423
E02004713	Eastleigh 002	1.181823813
E02004714	Eastleigh 003	1.180129626
E02004715	Eastleigh 004	1.188395205
E02004716	Eastleigh 005	1.190448765
E02004717	Eastleigh 006	1.199279074
E02004718	Eastleigh 007	1.195479988
E02004719	Eastleigh 008	1.16760291
E02004827	Test Valley 014	1.1332
E02004837	Winchester 009	1.19743087
E02004838	Winchester 010	1.201281295

Time Period: Weekday PM peak period (1600 - 1859)
TEMPRO Growth Factor

Area Description		All purposes	
Level	Name	Origin	Destination
E02004712	Eastleigh 001	1.1545	1.1554
E02004713	Eastleigh 002	1.1478	1.1483
E02004714	Eastleigh 003	1.1421	1.1553
E02004715	Eastleigh 004	1.1468	1.1619
E02004716	Eastleigh 005	1.1579	1.1589
E02004717	Eastleigh 006	1.1474	1.1779
E02004718	Eastleigh 007	1.1476	1.1669
E02004719	Eastleigh 008	1.1398	1.1310
E02004827	Test Valley 014	1.1112	1.0785
E02004837	Winchester 009	1.1515	1.1802
E02004838	Winchester 010	1.1631	1.1763

Growth Factor including both TEMPRO and NTM

2018-2036	PM peak (1600-1859)	
Level	Area	Local Growth Figure
E02004712	Eastleigh 001	1.185879594
E02004713	Eastleigh 002	1.178794812
E02004714	Eastleigh 003	1.179462219
E02004715	Eastleigh 004	1.185263526
E02004716	Eastleigh 005	1.189421985
E02004717	Eastleigh 006	1.193785801
E02004718	Eastleigh 007	1.188241188
E02004719	Eastleigh 008	1.165806045
E02004827	Test Valley 014	1.242
E02004837	Winchester 009	1.197071497
E02004838	Winchester 010	1.2010246

Average of Eastleigh and adjacent zones:

Final Factors:

Peak Period	**2018-2036**	
AM Peak	**1.1833**	
PM peak	**1.1915**	

Box 1	
Selection	
Base Year	2018
Forecast Year 1	2036
Forecast Year 2	2036
Area	SouthEast

Box 2	
Factor Type	Road/Vehicle
Road	Principle
Vehicle	Rigid
Forecast Year 1: 2036	1.062
Forecast Year 2: 2036	1.062

Notes

*HGV factor is combined Rigid and Artic growth.

A dash (-) output indicates that the base level of traffic was 0bvkm.
It is suggested that different road/area/vehicle types are compared against the 'all traffic' values to highlight any odd results.

Forecast Year 1: 2036		Vehicle Type						
		Car	**LGV**	**Rigid**	**Artic**	**HGV***	**PSV**	**All Traffic**
Road Type	**Motorway**	1.152	1.441	1.083	1.302	1.210	0.981	1.192
	Trunk	1.153	1.432	1.080	1.306	1.191	0.977	1.192
	Principle	1.146	1.433	1.062	1.483	1.167	0.971	1.183
	Minor	1.148	1.437	1.059	2.178	1.123	0.968	1.191
	All	1.149	1.436	1.072	1.338	1.188	0.972	1.189
	HA InterUrban	-	-	-	-	-	-	-
Area Type	**London**	-	-	-	-		-	-
	Large Urban	1.137	1.434	1.066	1.436	1.142	0.901	1.180
	Other Urban	1.144	1.435	1.069	1.389	1.151	0.981	1.182
	Rural	1.153	1.437	1.073	1.331	1.196	0.981	1.194
	All	1.149	1.436	1.072	1.338	1.188	0.972	1.189

Forecast Year 2: 2036		Vehicle Type						
		Car	**LGV**	**Rigid**	**Artic**	**HGV***	**PSV**	**All Traffic**
Road Type	**Motorway**	1.152	1.441	1.083	1.302	1.210	0.981	1.192
	Trunk	1.153	1.432	1.080	1.306	1.191	0.977	1.192
	Principle	1.146	1.433	1.062	1.483	1.167	0.971	1.183
	Minor	1.148	1.437	1.059	2.178	1.123	0.968	1.191
	All	1.149	1.436	1.072	1.338	1.188	0.972	1.189
	HA InterUrban	-	-	-	-	-	-	-
Area Type	**London**	-	-	-	-		-	-
	Large Urban	1.137	1.434	1.066	1.436	1.142	0.901	1.180
	Other Urban	1.144	1.435	1.069	1.389	1.151	0.981	1.182
	Rural	1.153	1.437	1.073	1.331	1.196	0.981	1.194
	All	1.149	1.436	1.072	1.338	1.188	0.972	1.189

Forecast Year 1: 2036		Area Type		
		Urban	**Rural**	**All**
Road Type	**Motorway**	-	1.192	1.192
	Trunk	1.178	1.198	1.192
	Principle	1.176	1.191	1.183
	Minor	1.186	1.198	1.191
	All	1.181	1.194	1.189

Forecast Year 2: 2036		Area Type		
		Urban	**Rural**	**All**
Road Type	**Motorway**	-	1.192	1.192
	Trunk	1.178	1.198	1.192
	Principle	1.176	1.191	1.183
	Minor	1.186	1.198	1.191
	All	1.181	1.194	1.189

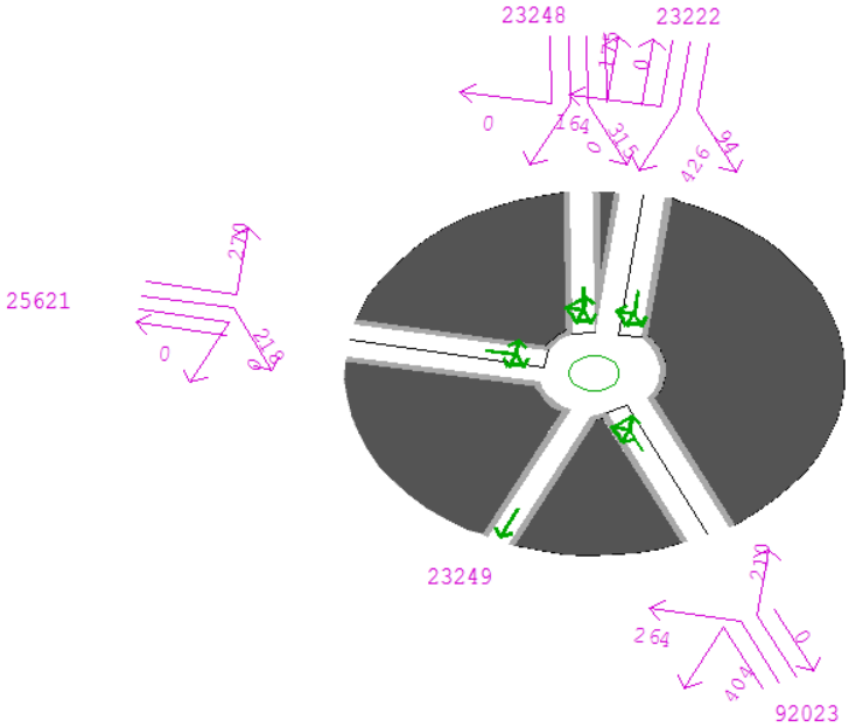
To Use:

1. Select Base Year, Forecast Years and Area in Box 1.
2. Use full output tables, or pick up specific factors using Box 2.
3. In Box 2 select the factor type and the choose the required road, vehicle or area type.

Appendix B. SRTM (2036 DCY DM and DIU Interim DS) Turning Data

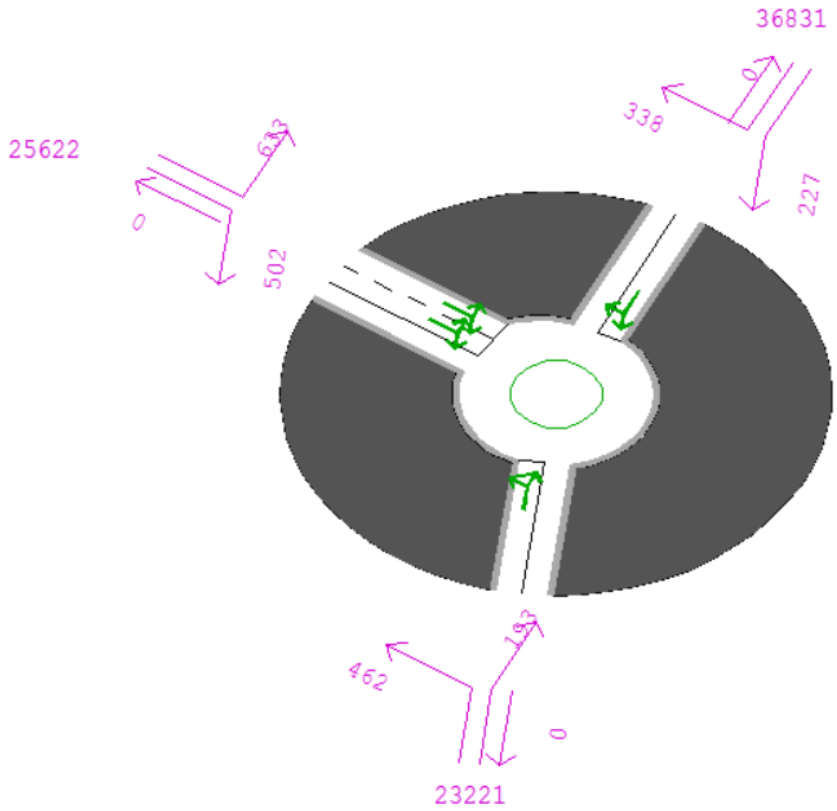
AM

41- Allbrook Way / M3 J12 SB roundabout 2036 AM (PCUs) DCY Do Minimum



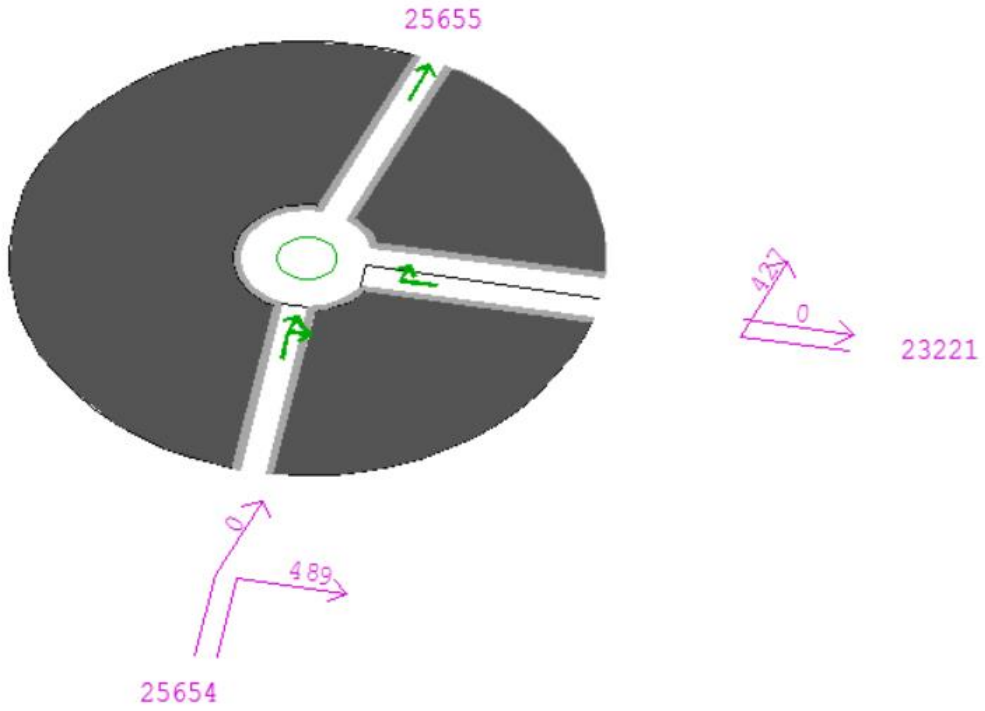
42- Winchester Road / Otterbourne Hill roundabout 2036 AM (PCUs)

DCY Do Minimum



54- M3 J12 NB / A335 roundabout 2036 AM (PCUs)

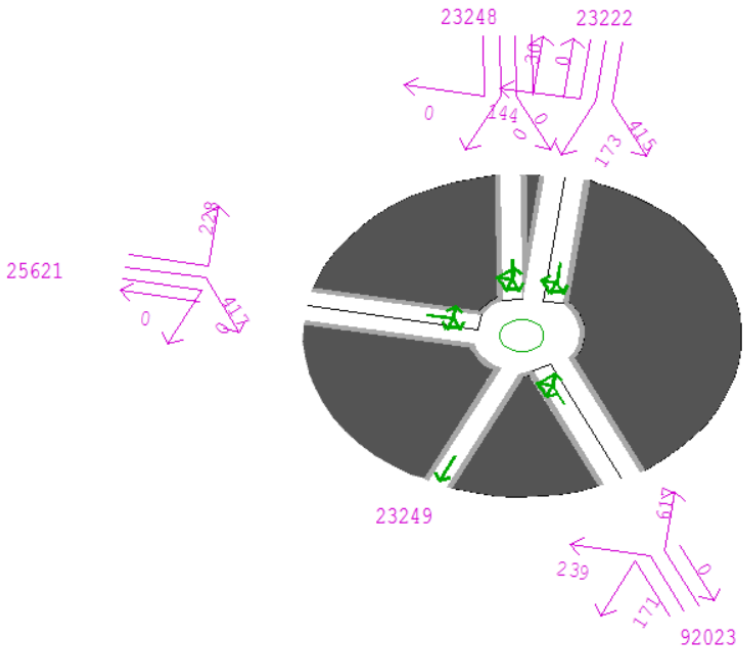
DCY Do Minimum



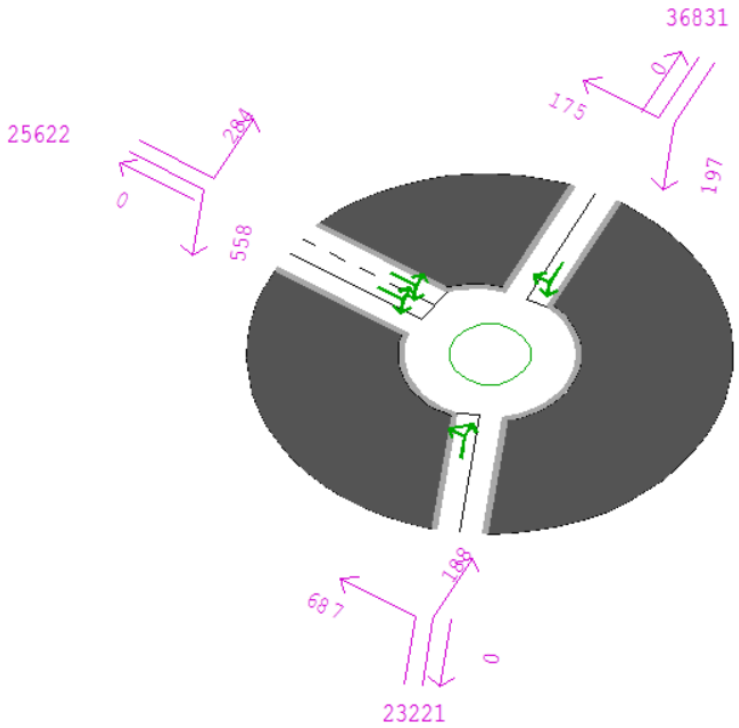
PM

41- Allbrook Way / M3 J12 SB roundabout 2036 PM (PCUs)

DCY Do Minimum

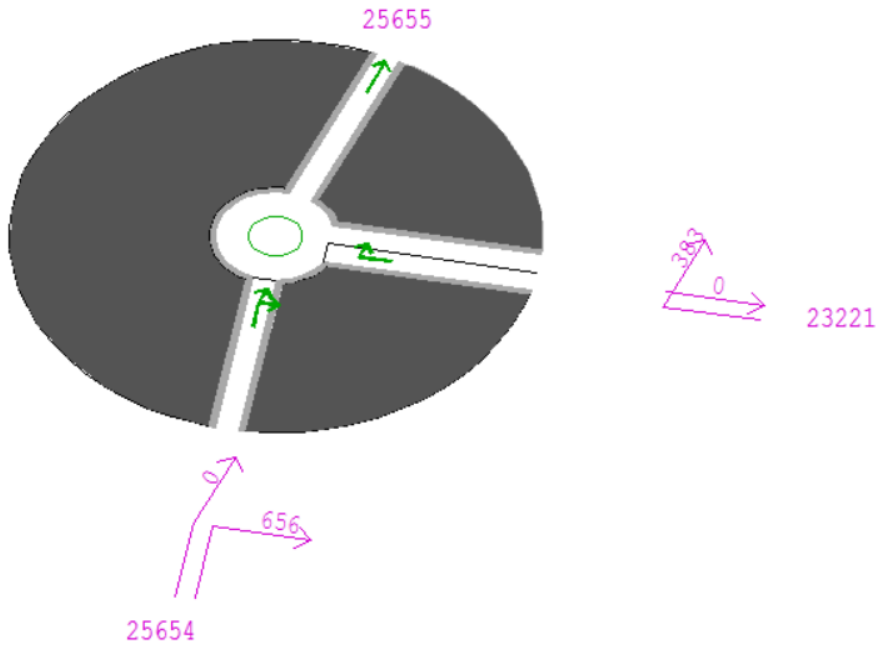


42- Winchester Road / Otterbourne Hill roundabout 2036 PM (PCUs) DCY Do Minimum



54- M3 J12 NB / A335 roundabout 2036 PM (PCUs)

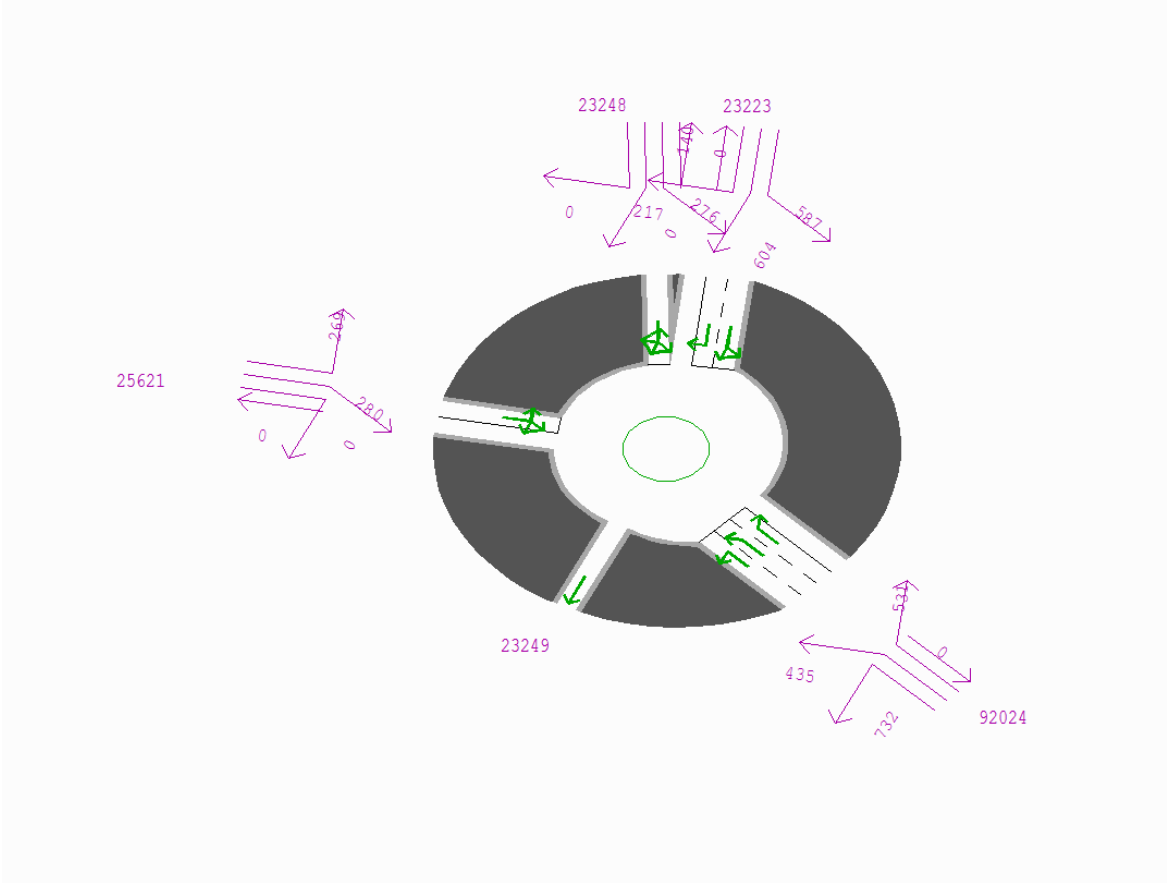
DCY Do Minimum



AM

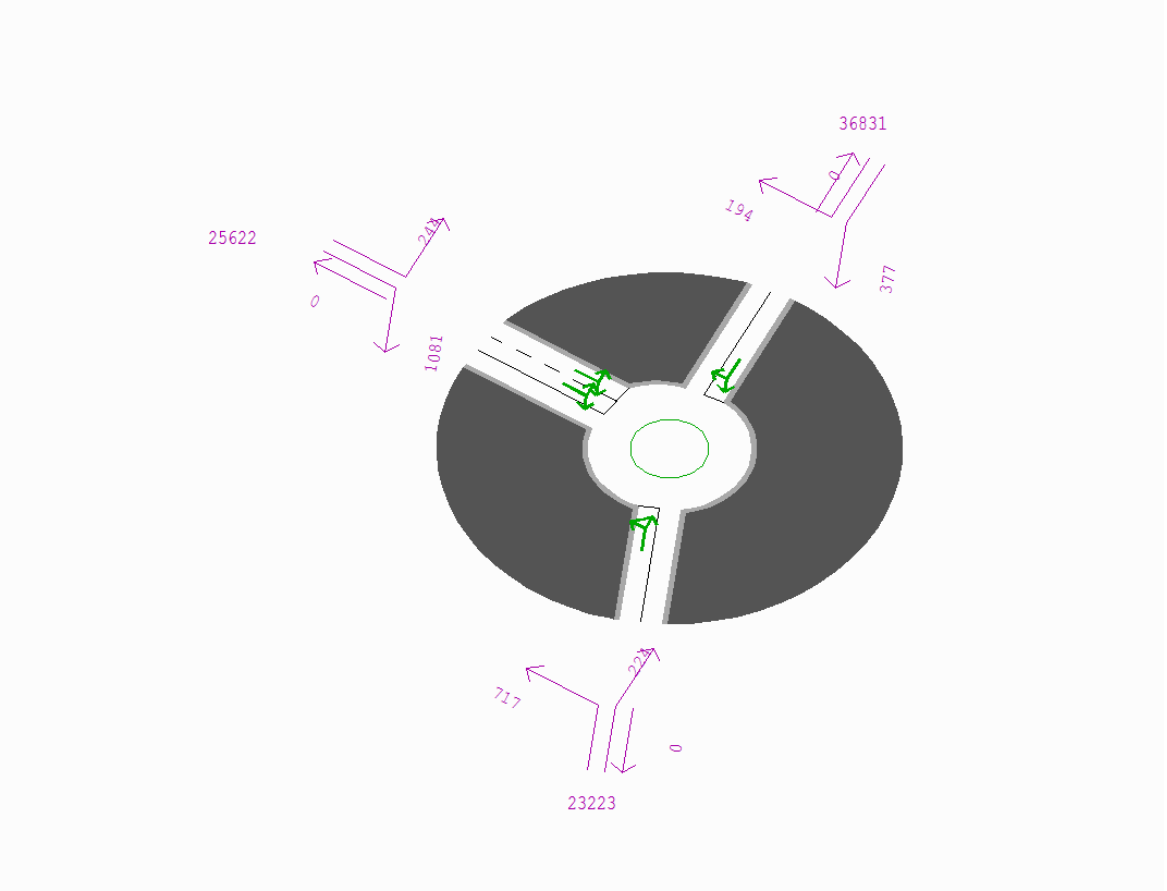
41- Allbrook Way / M3 J12 SB roundabout 2036 AM (PCUs)

DIU Interim DS



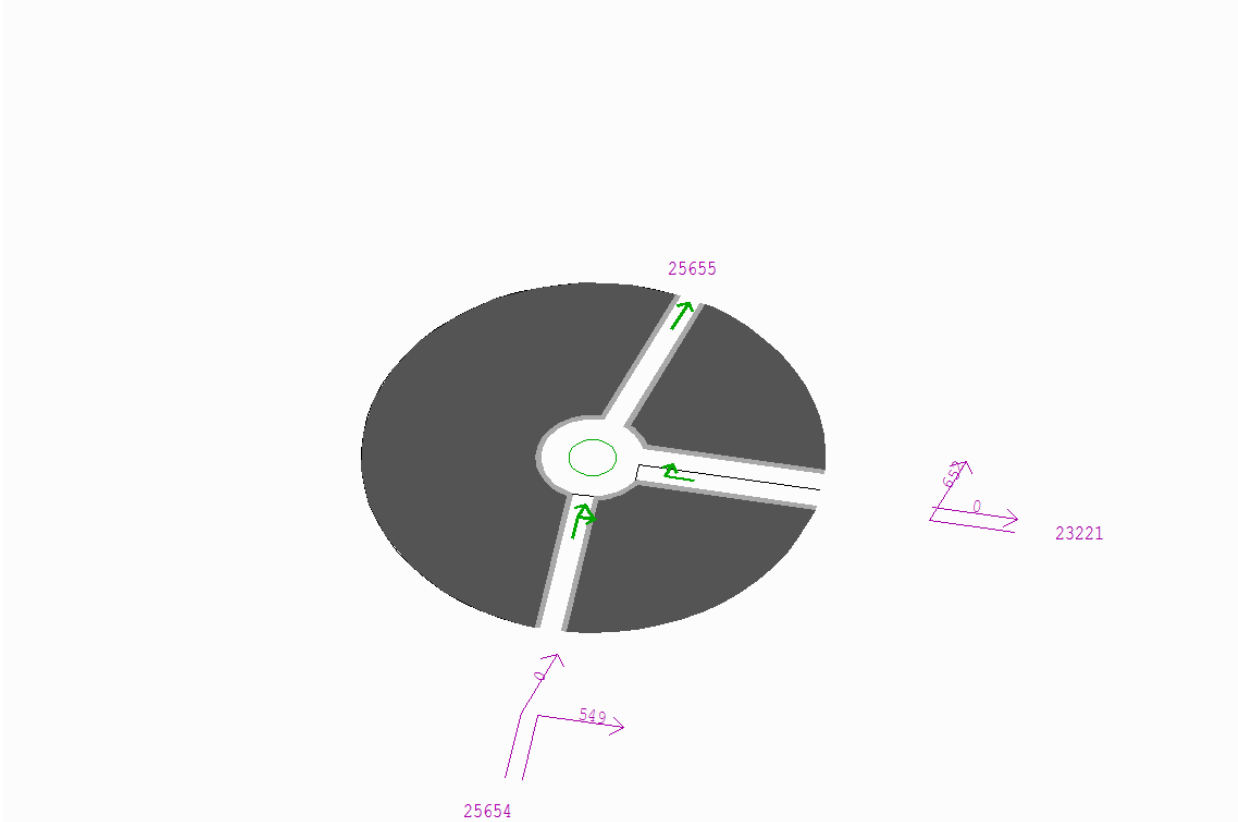
42- Winchester Road / Otterbourne Hill roundabout 2036 AM (PCUs)

DIU Interim DS



54- M3 J12 NB / A335 roundabout 2036 AM (PCUs)

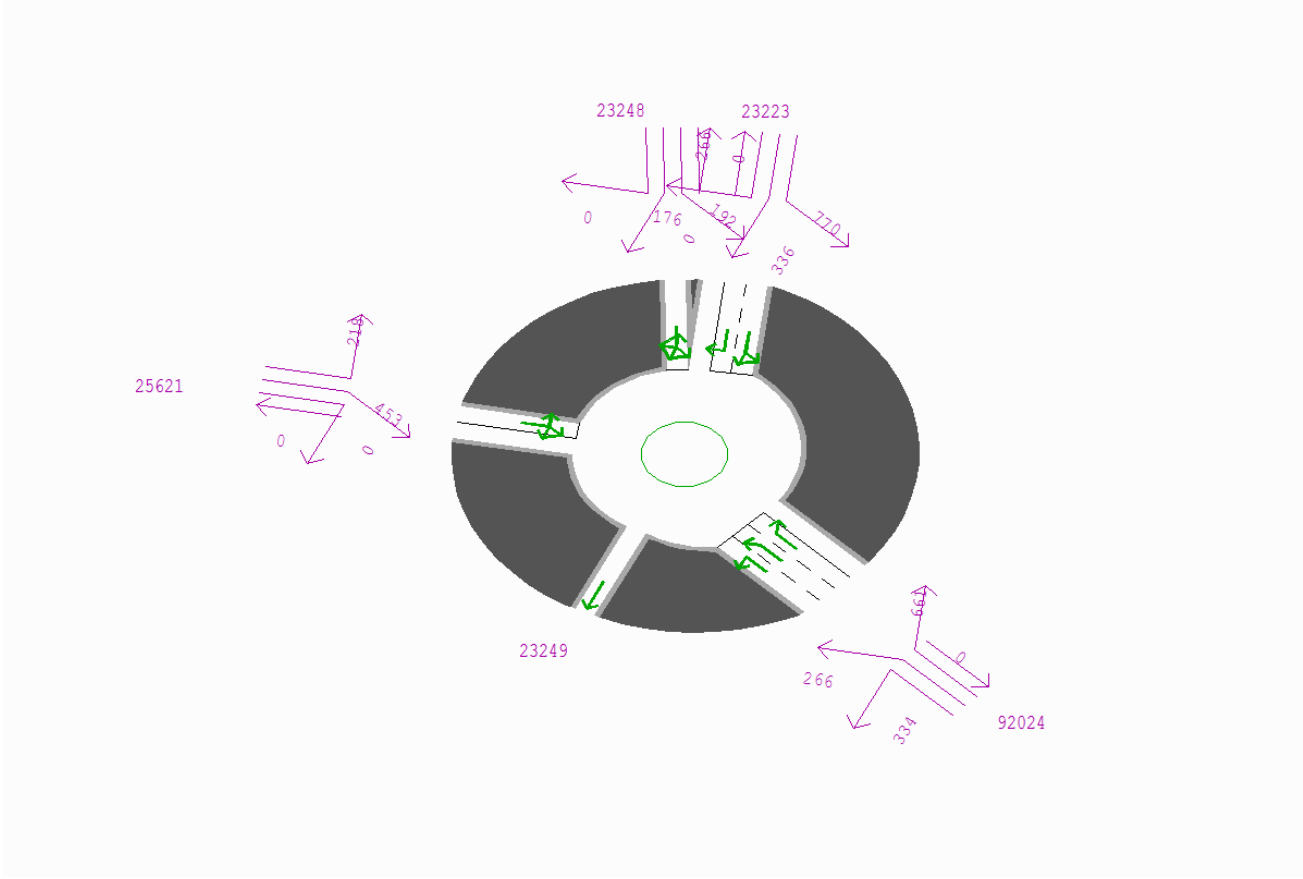
DIU Interim DS



PM

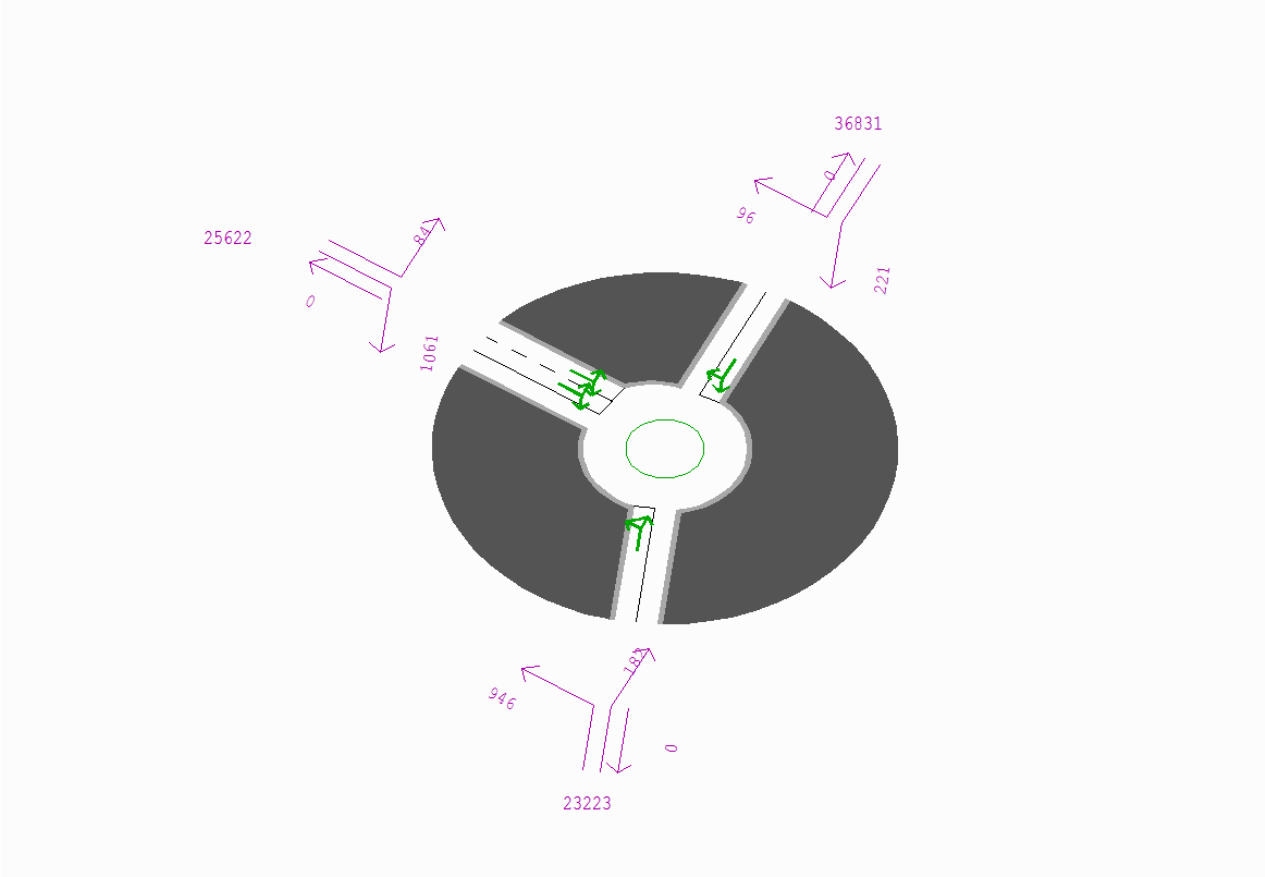
41- Allbrook Way / M3 J12 SB roundabout 2036 PM (PCUs)

DIU Interim DS



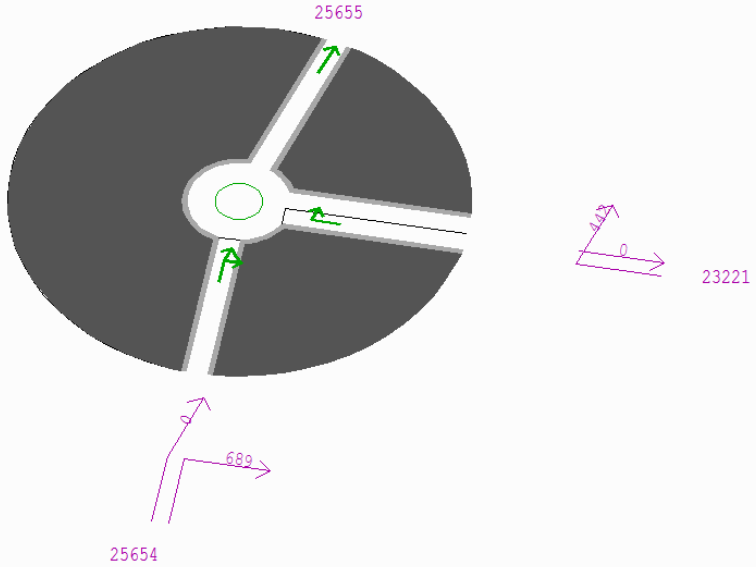
42- Winchester Road / Otterbourne Hill roundabout 2036 PM (PCUs)

DIU Interim DS



54- M3 J12 NB / A335 roundabout 2036 PM (PCUs)

DIU Interim DS



Appendix C. SRTM (2015 DKF Baseline, 2036 DOP DM and 2036 DPP DS3) Turning Data

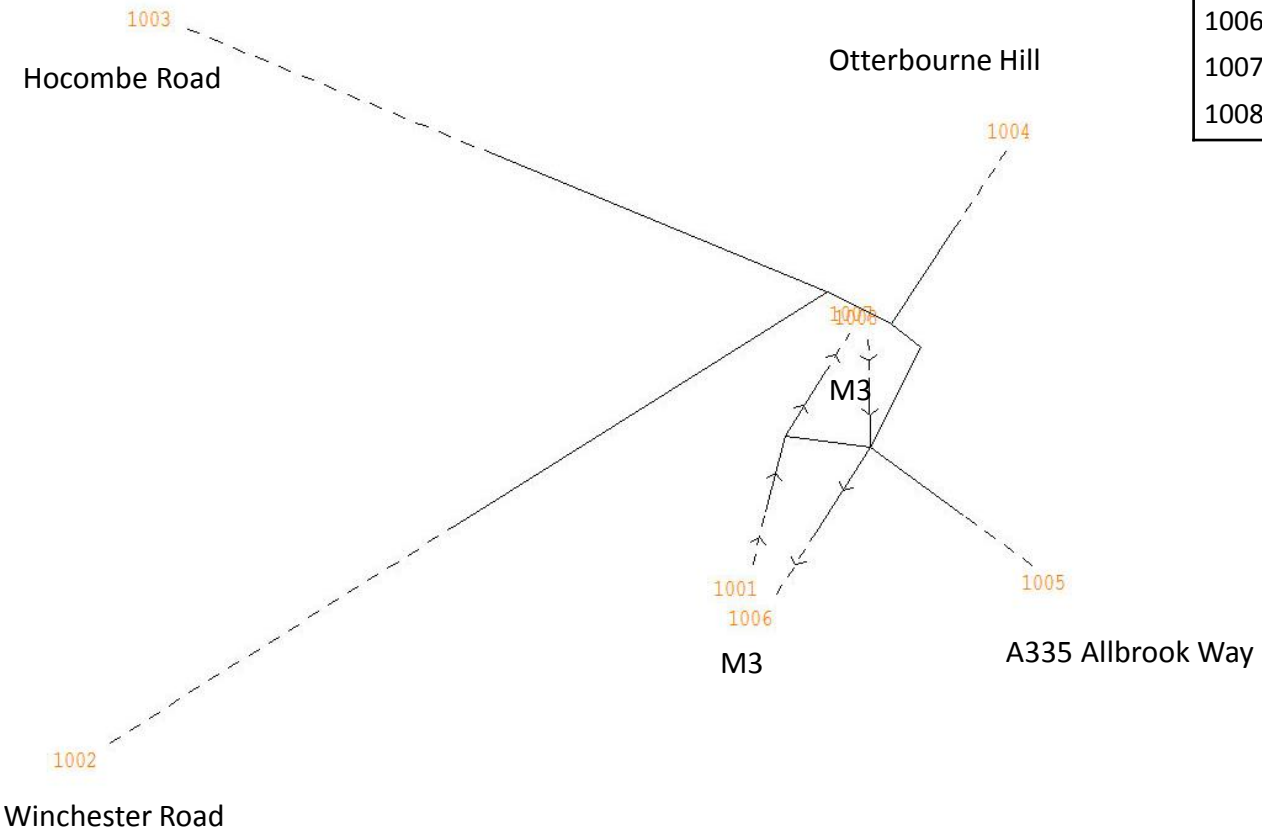
M3 J12 Cordons DKF, DOP, DPP

Base	2015 DKF	Baseline
2036 DM	2036 DOP	Baseline
2036 DS	2036 DPP	Do Something 3

SRTM User Classes:
UC1 – Car Business
UC2 – Car Non-Work
UC3 – LGV
UC4 – HGV

DKF 2015 Baseline

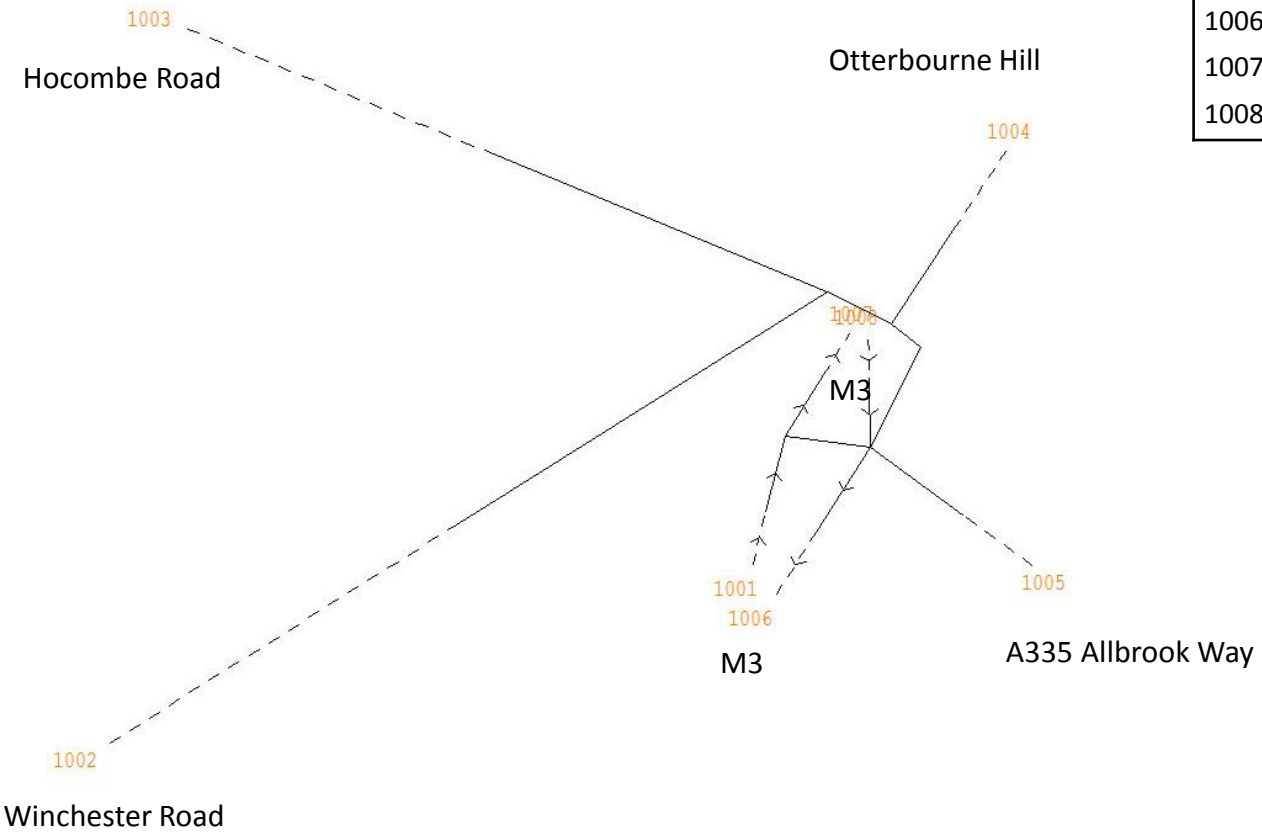
Baseline DKF 2015 AM – UC1 M3 J12



AM	1001	1002	1003	1004	1005	1006	1007	1008
1001	0	7	3	7	7	0	0	0
1002	0	0	0	21	0	0	5	0
1003	0	0	0	11	0	0	2	0
1004	0	11	6	0	0	15	0	0
1005	0	5	5	1	0	23	49	0
1006	0	0	0	0	0	0	0	0
1007	0	0	0	0	0	0	0	0
1008	0	17	4	1	113	0	0	0

Zone	Name
1001	M3 North Bound Off slip
1002	Winchester Road
1003	Hocombe Road
1004	Otterbourne Hill
1005	A335 Allbrook Way
1006	M3 South Bound On slip
1007	M3 North Bound On slip
1008	M3 South Bound Off slip

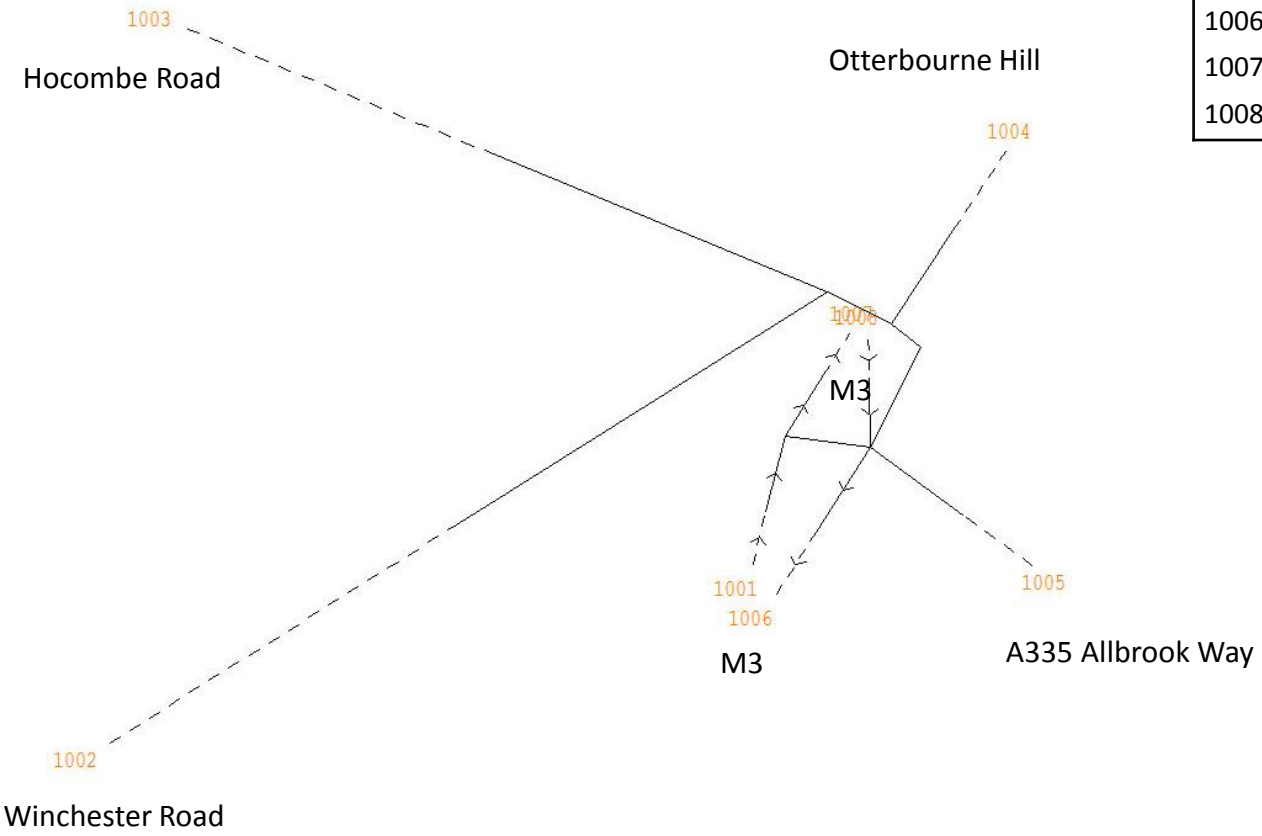
Baseline DKF 2015 AM – UC2 M3 J12



AM	1001	1002	1003	1004	1005	1006	1007	1008
1001	0	50	24	117	46	0	0	0
1002	0	0	0	225	0	0	170	0
1003	0	0	0	122	0	80	55	0
1004	0	106	55	0	0	328	0	0
1005	0	62	45	5	0	171	244	0
1006	0	0	0	0	0	0	0	0
1007	0	0	0	0	0	0	0	0
1008	0	61	21	5	194	0	0	0

Zone	Name
1001	M3 North Bound Off slip
1002	Winchester Road
1003	Hocombe Road
1004	Otterbourne Hill
1005	A335 Allbrook Way
1006	M3 South Bound On slip
1007	M3 North Bound On slip
1008	M3 South Bound Off slip

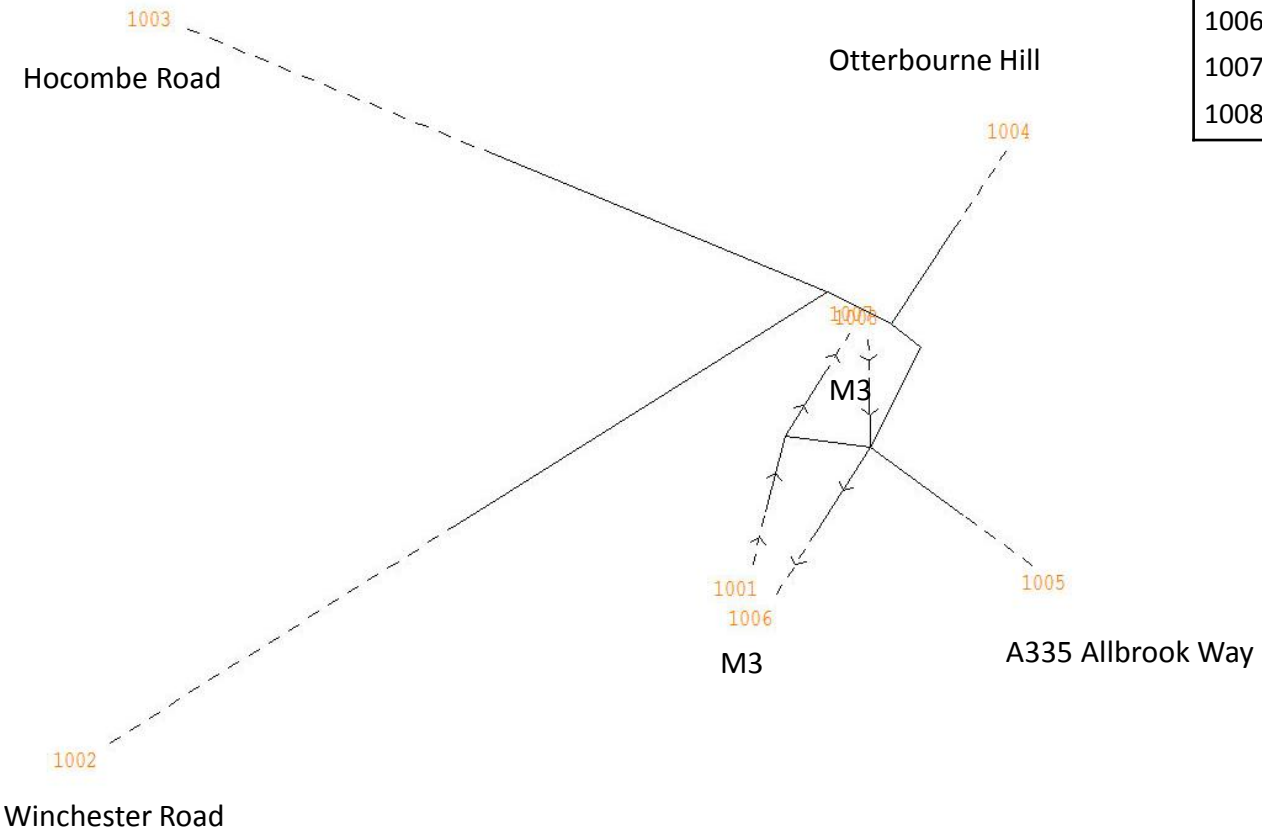
Baseline DKF 2015 AM – UC3 M3 J12



AM	1001	1002	1003	1004	1005	1006	1007	1008
1001	0	21	2	37	31	0	0	0
1002	0	0	0	12	0	0	4	0
1003	0	0	0	20	0	0	1	0
1004	0	13	3	0	0	18	0	0
1005	0	6	16	8	0	6	92	0
1006	0	0	0	0	0	0	0	0
1007	0	0	0	0	0	0	0	0
1008	0	9	1	22	31	0	0	0

Zone	Name
1001	M3 North Bound Off slip
1002	Winchester Road
1003	Hocombe Road
1004	Otterbourne Hill
1005	A335 Allbrook Way
1006	M3 South Bound On slip
1007	M3 North Bound On slip
1008	M3 South Bound Off slip

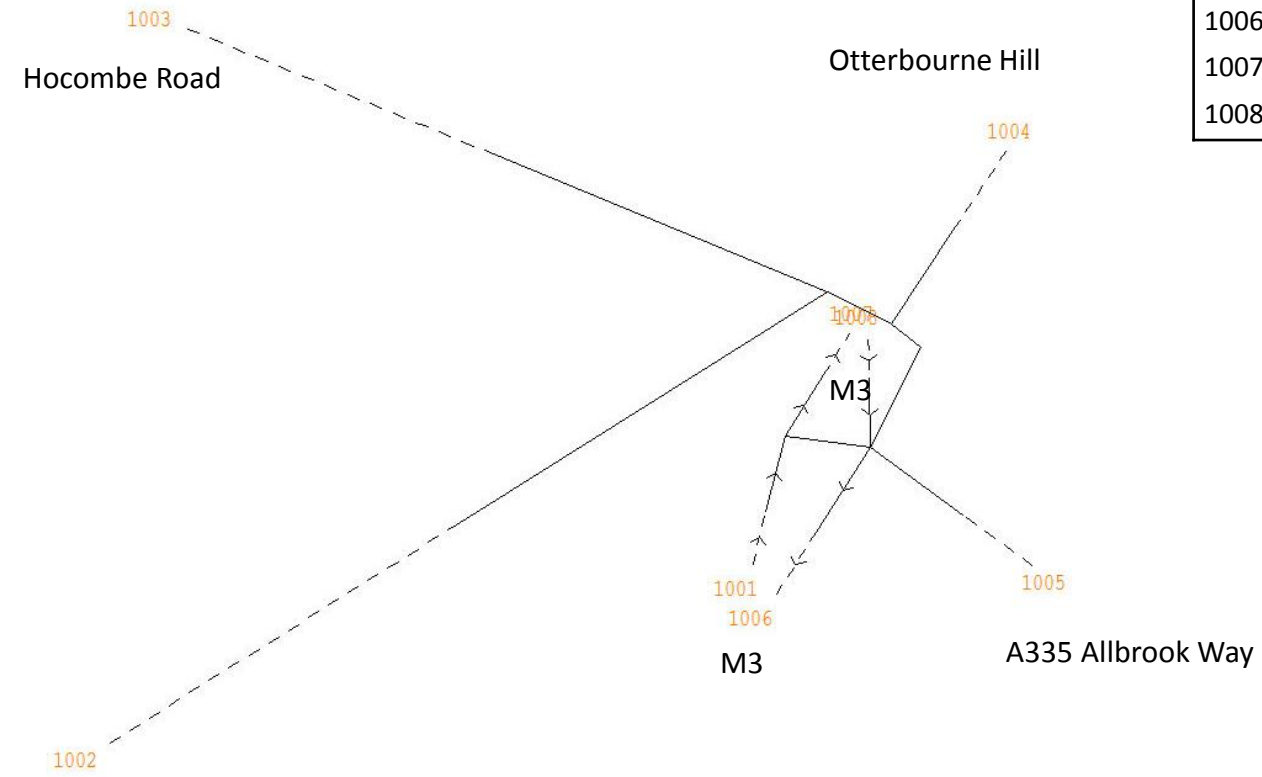
Baseline DKF 2015 AM – UC4 M3 J12



AM	1001	1002	1003	1004	1005	1006	1007	1008
1001	0	0	0	139	0	0	0	0
1002	0	0	0	9	0	0	91	0
1003	0	0	0	2	0	0	11	0
1004	0	5	2	0	0	10	1	0
1005	0	0	3	10	0	0	69	0
1006	0	0	0	0	0	0	0	0
1007	0	0	0	0	0	0	0	0
1008	0	30	4	0	13	0	0	0

Zone	Name
1001	M3 North Bound Off slip
1002	Winchester Road
1003	Hocombe Road
1004	Otterbourne Hill
1005	A335 Allbrook Way
1006	M3 South Bound On slip
1007	M3 North Bound On slip
1008	M3 South Bound Off slip

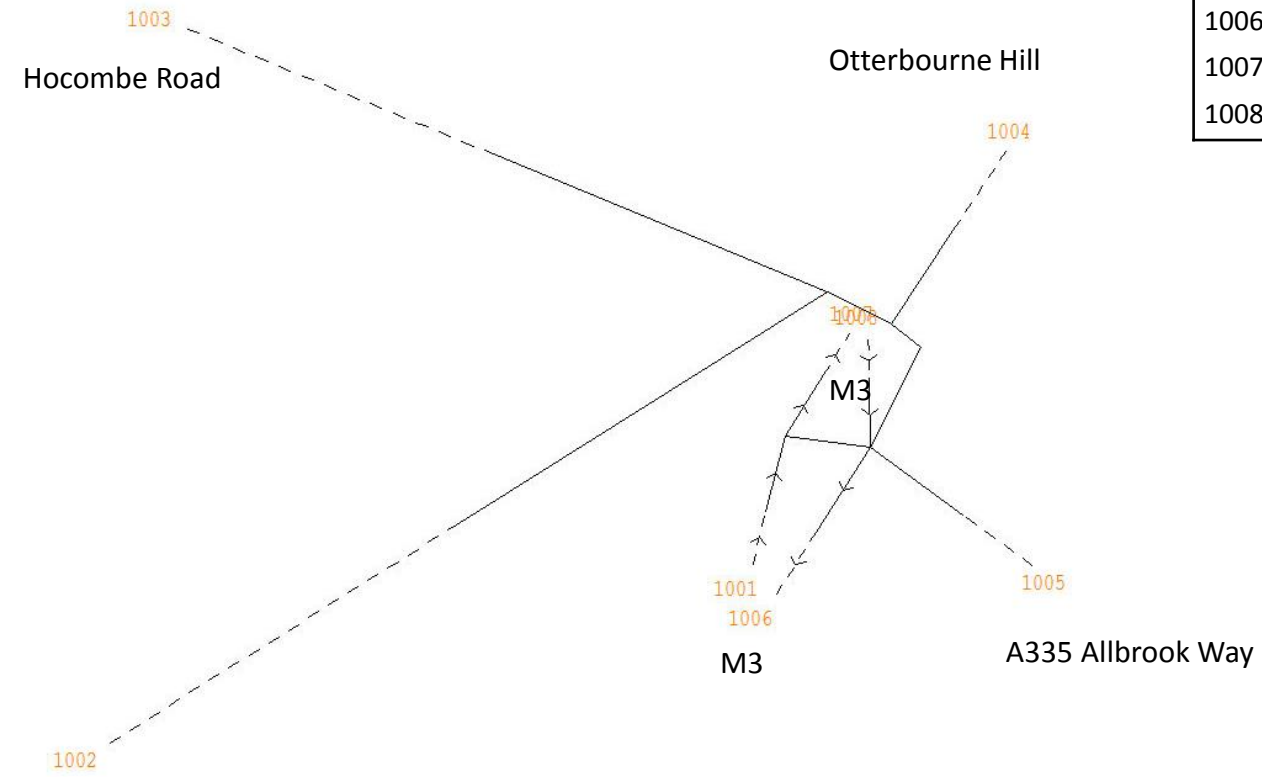
Baseline DKF 2015 PM – UC1 M3 J12



PM	1001	1002	1003	1004	1005	1006	1007	1008
1001	0	7	6	5	19	0	0	0
1002	0	0	0	10	3	2	5	0
1003	0	0	0	4	4	11	1	0
1004	0	13	5	0	0	14	0	0
1005	0	4	8	3	0	14	35	0
1006	0	0	0	0	0	0	0	0
1007	0	0	0	0	0	0	0	0
1008	0	29	28	0	6	0	0	0

Zone	Name
1001	M3 North Bound Off slip
1002	Winchester Road
1003	Hocombe Road
1004	Otterbourne Hill
1005	A335 Allbrook Way
1006	M3 South Bound On slip
1007	M3 North Bound On slip
1008	M3 South Bound Off slip

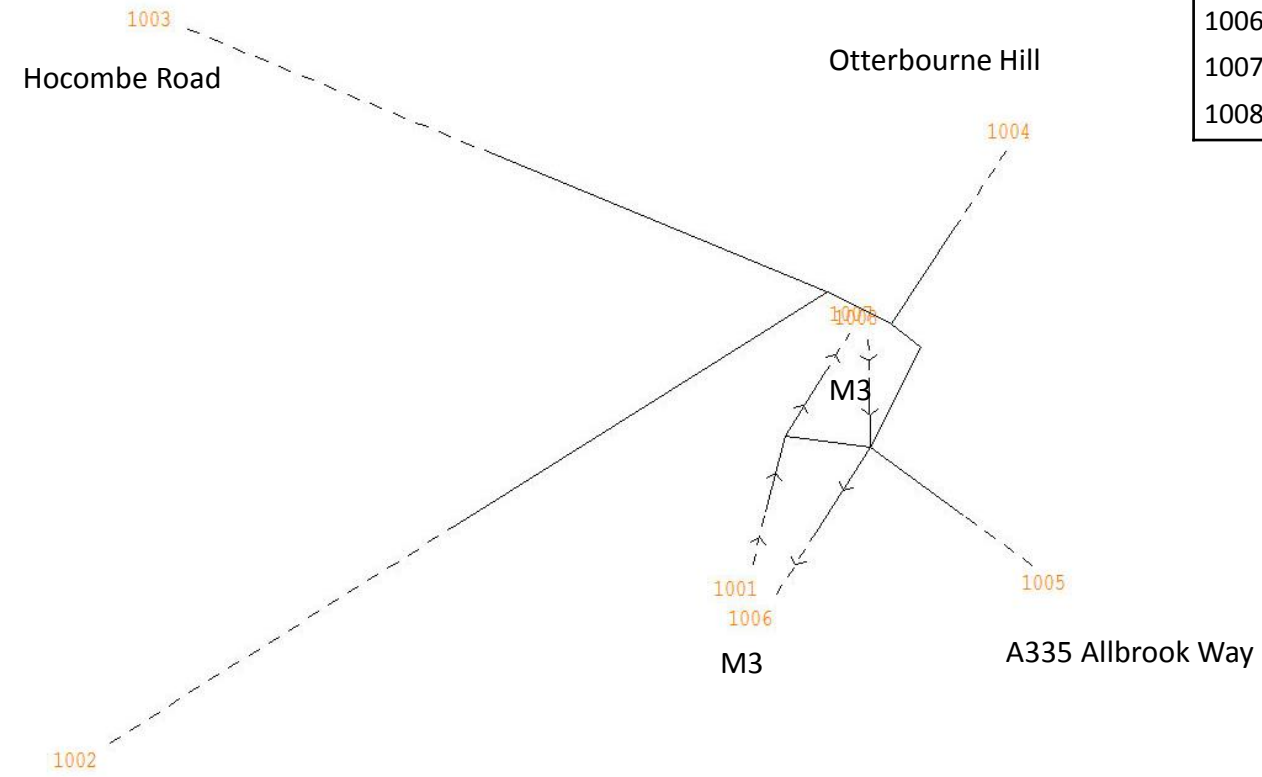
Baseline DKF 2015 PM – UC2 M3 J12



PM	1001	1002	1003	1004	1005	1006	1007	1008
1001	0	57	69	116	202	0	0	0
1002	0	0	0	117	46	89	77	0
1003	0	0	0	57	64	80	22	0
1004	0	193	73	0	1	301	3	0
1005	0	71	94	44	0	188	268	0
1006	0	0	0	0	0	0	0	0
1007	0	0	0	0	0	0	0	0
1008	0	227	208	0	14	0	0	0

Zone	Name
1001	M3 North Bound Off slip
1002	Winchester Road
1003	Hocombe Road
1004	Otterbourne Hill
1005	A335 Allbrook Way
1006	M3 South Bound On slip
1007	M3 North Bound On slip
1008	M3 South Bound Off slip

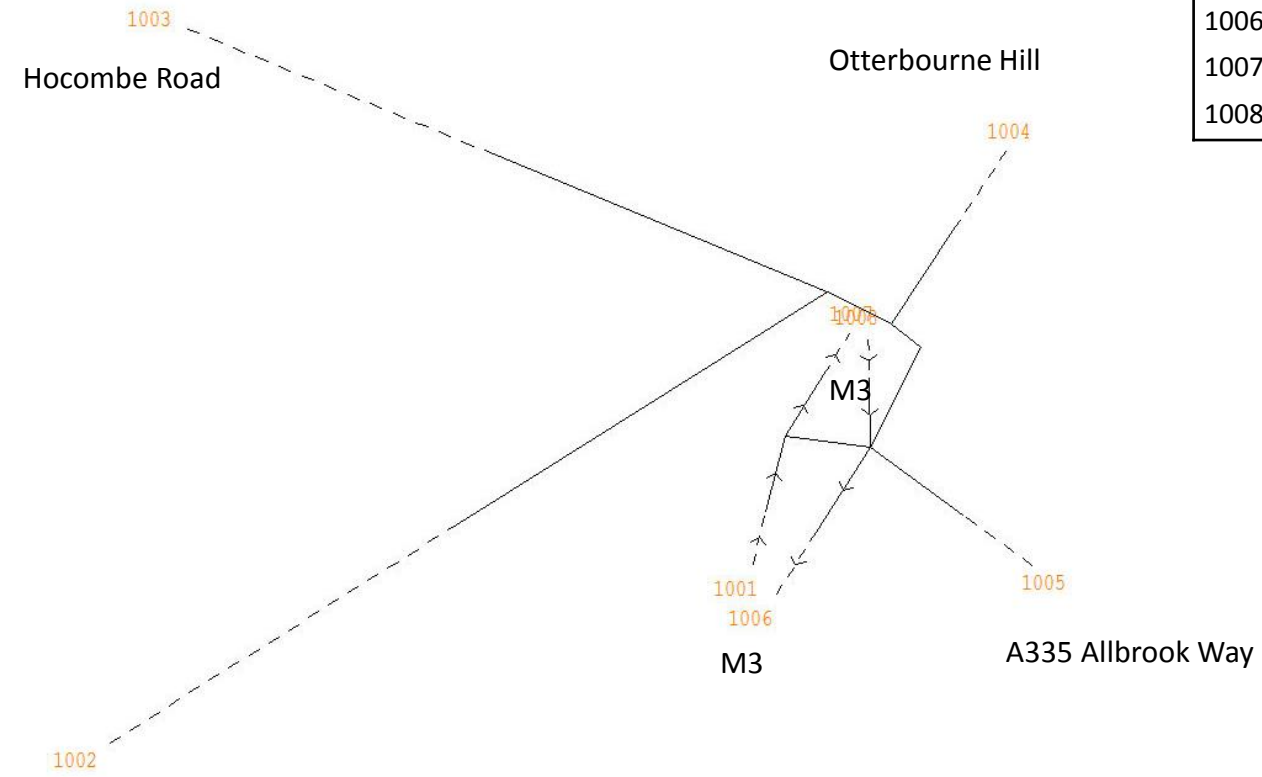
Baseline DKF 2015 PM – UC3 M3 J12



PM	1001	1002	1003	1004	1005	1006	1007	1008
1001	0	18	7	30	43	0	0	0
1002	0	0	0	6	3	0	18	0
1003	0	0	0	3	12	0	6	0
1004	0	14	5	0	0	3	0	0
1005	0	3	6	4	0	1	68	0
1006	0	0	0	0	0	0	0	0
1007	0	0	0	0	0	0	0	0
1008	0	8	6	0	10	0	0	0

Zone	Name
1001	M3 North Bound Off slip
1002	Winchester Road
1003	Hocombe Road
1004	Otterbourne Hill
1005	A335 Allbrook Way
1006	M3 South Bound On slip
1007	M3 North Bound On slip
1008	M3 South Bound Off slip

Baseline DKF 2015 PM – UC4 M3 J12

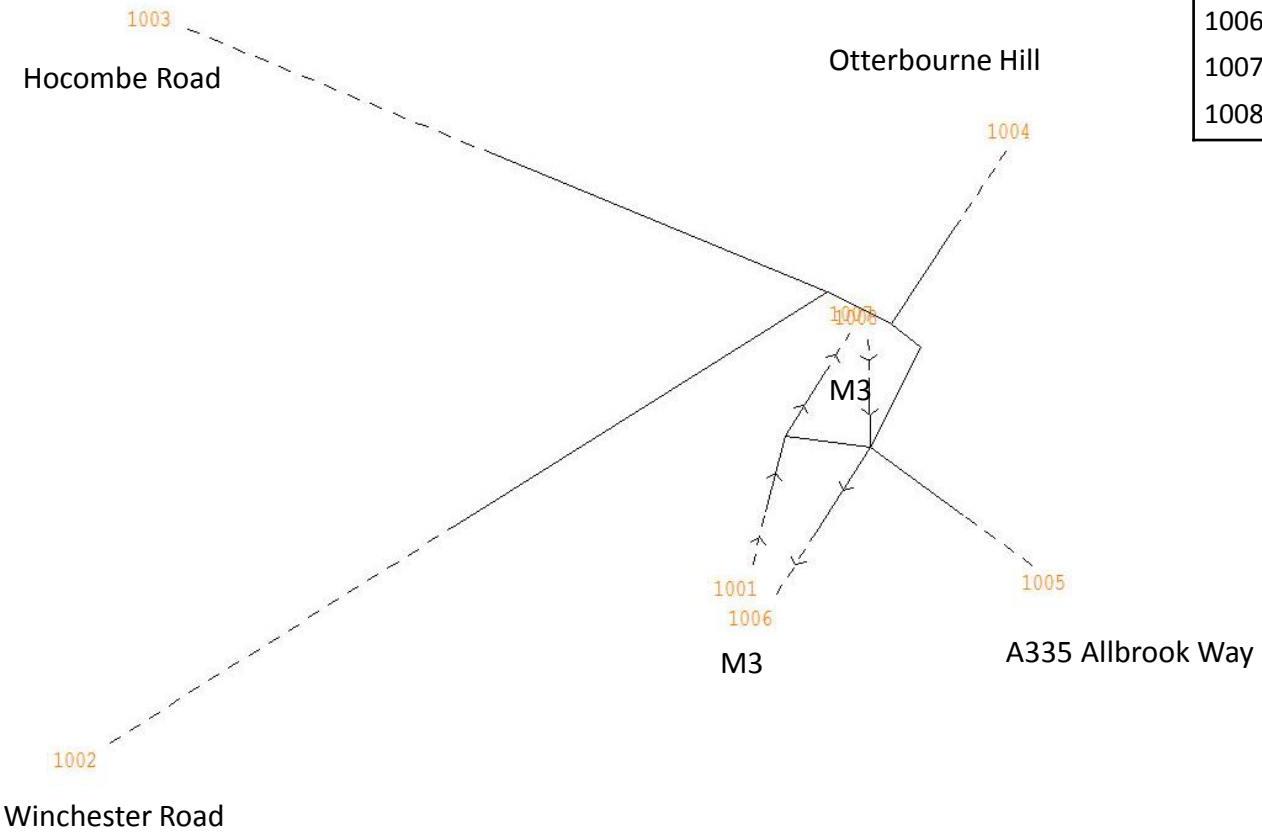


PM	1001	1002	1003	1004	1005	1006	1007	1008
1001	0	0	0	6	11	0	0	0
1002	0	0	0	3	0	0	38	0
1003	0	0	0	3	1	0	6	0
1004	0	9	3	0	0	3	0	0
1005	0	0	1	6	0	0	26	0
1006	0	0	0	0	0	0	0	0
1007	0	0	0	0	0	0	0	0
1008	0	11	3	0	6	0	0	0

Zone	Name
1001	M3 North Bound Off slip
1002	Winchester Road
1003	Hocombe Road
1004	Otterbourne Hill
1005	A335 Allbrook Way
1006	M3 South Bound On slip
1007	M3 North Bound On slip
1008	M3 South Bound Off slip

DOP 2036 Baseline

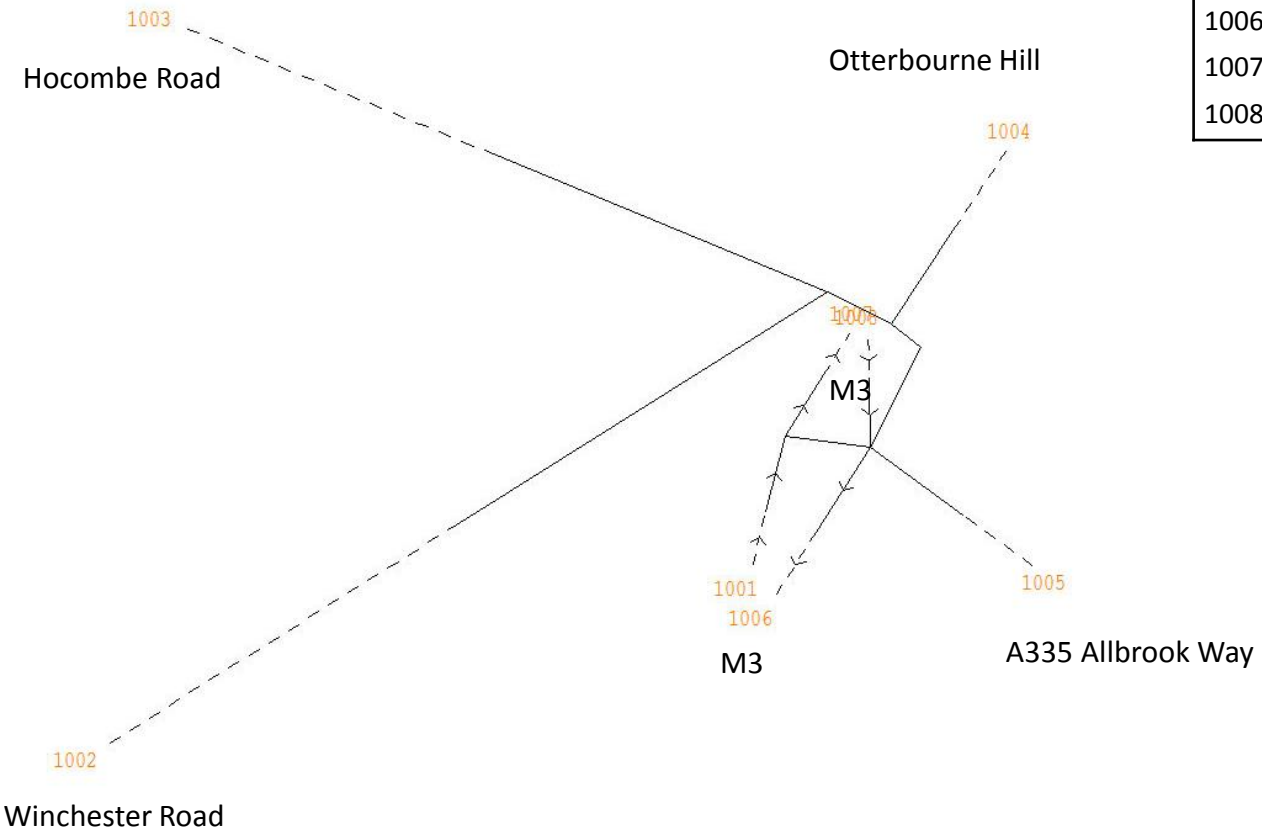
Baseline DOP 2036 AM – UC1 M3 J12



AM	1001	1002	1003	1004	1005	1006	1007	1008
1001	0	8	7	14	9	0	0	0
1002	0	0	0	20	0	6	5	0
1003	0	0	0	14	0	15	1	0
1004	0	13	7	0	0	13	0	0
1005	0	5	6	0	0	24	30	0
1006	0	0	0	0	0	0	0	0
1007	0	0	0	0	0	0	0	0
1008	0	17	4	0	99	0	0	0

Zone	Name
1001	M3 North Bound Off slip
1002	Winchester Road
1003	Hocombe Road
1004	Otterbourne Hill
1005	A335 Allbrook Way
1006	M3 South Bound On slip
1007	M3 North Bound On slip
1008	M3 South Bound Off slip

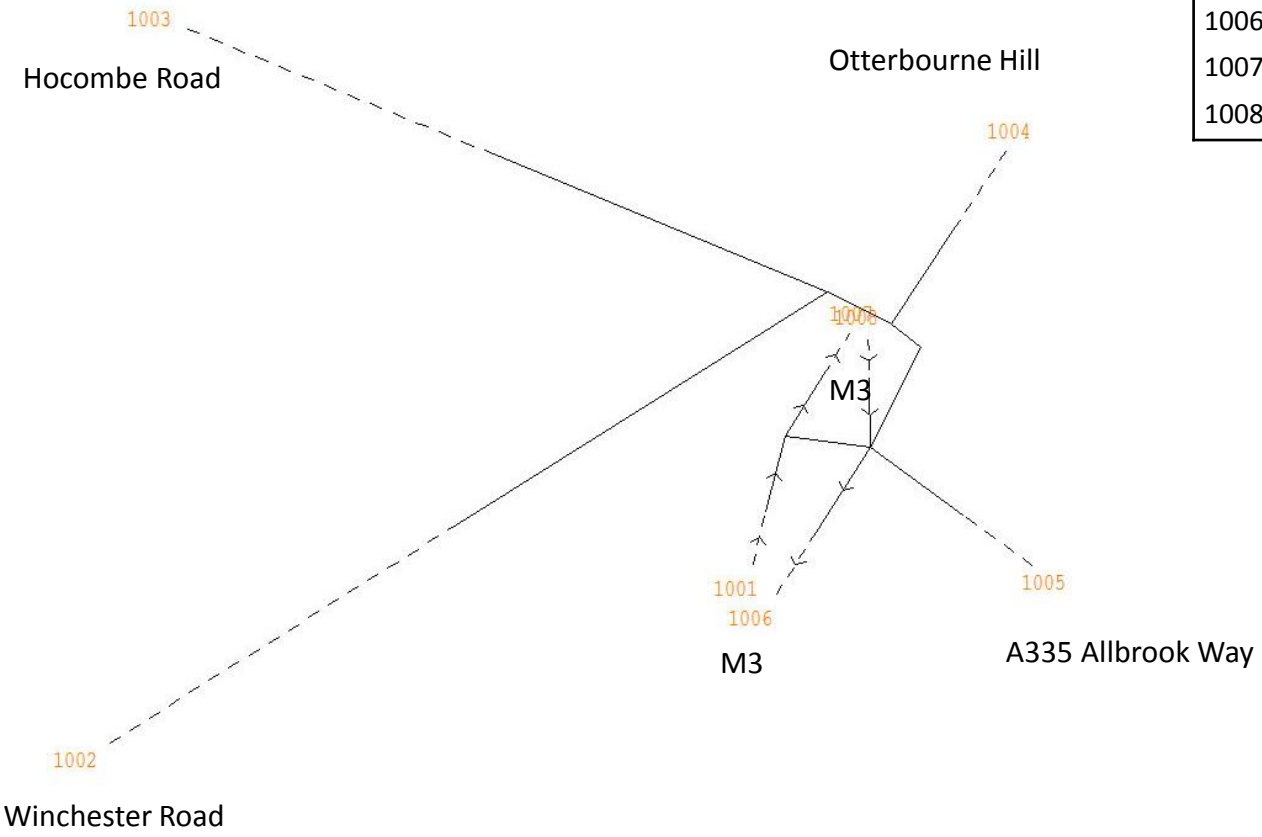
Baseline DOP 2036 AM – UC2 M3 J12



AM	1001	1002	1003	1004	1005	1006	1007	1008
1001	0	50	58	114	49	0	0	0
1002	0	0	0	202	0	33	111	0
1003	0	0	0	138	0	91	51	0
1004	0	110	65	0	0	324	0	0
1005	0	53	55	1	0	199	143	0
1006	0	0	0	0	0	0	0	0
1007	0	0	0	0	0	0	0	0
1008	0	56	19	4	209	0	0	0

Zone	Name
1001	M3 North Bound Off slip
1002	Winchester Road
1003	Hocombe Road
1004	Otterbourne Hill
1005	A335 Allbrook Way
1006	M3 South Bound On slip
1007	M3 North Bound On slip
1008	M3 South Bound Off slip

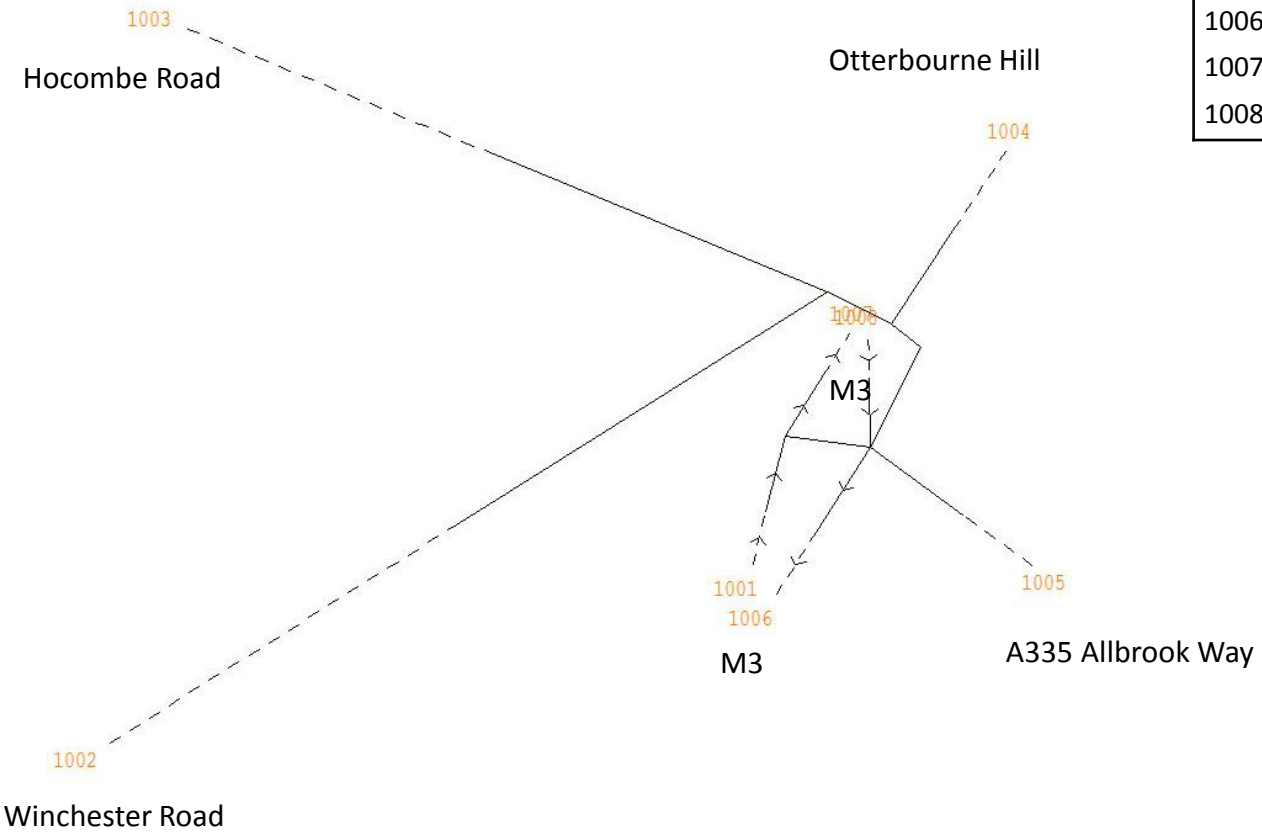
Baseline DOP 2036 AM – UC3 M3 J12



AM	1001	1002	1003	1004	1005	1006	1007	1008
1001	0	29	3	57	35	0	0	0
1002	0	0	0	22	0	0	4	0
1003	0	0	0	34	0	0	1	0
1004	0	17	8	0	0	40	0	0
1005	0	12	43	0	0	18	173	0
1006	0	0	0	0	0	0	0	0
1007	0	0	0	0	0	0	0	0
1008	0	14	1	0	44	0	0	0

Zone	Name
1001	M3 North Bound Off slip
1002	Winchester Road
1003	Hocombe Road
1004	Otterbourne Hill
1005	A335 Allbrook Way
1006	M3 South Bound On slip
1007	M3 North Bound On slip
1008	M3 South Bound Off slip

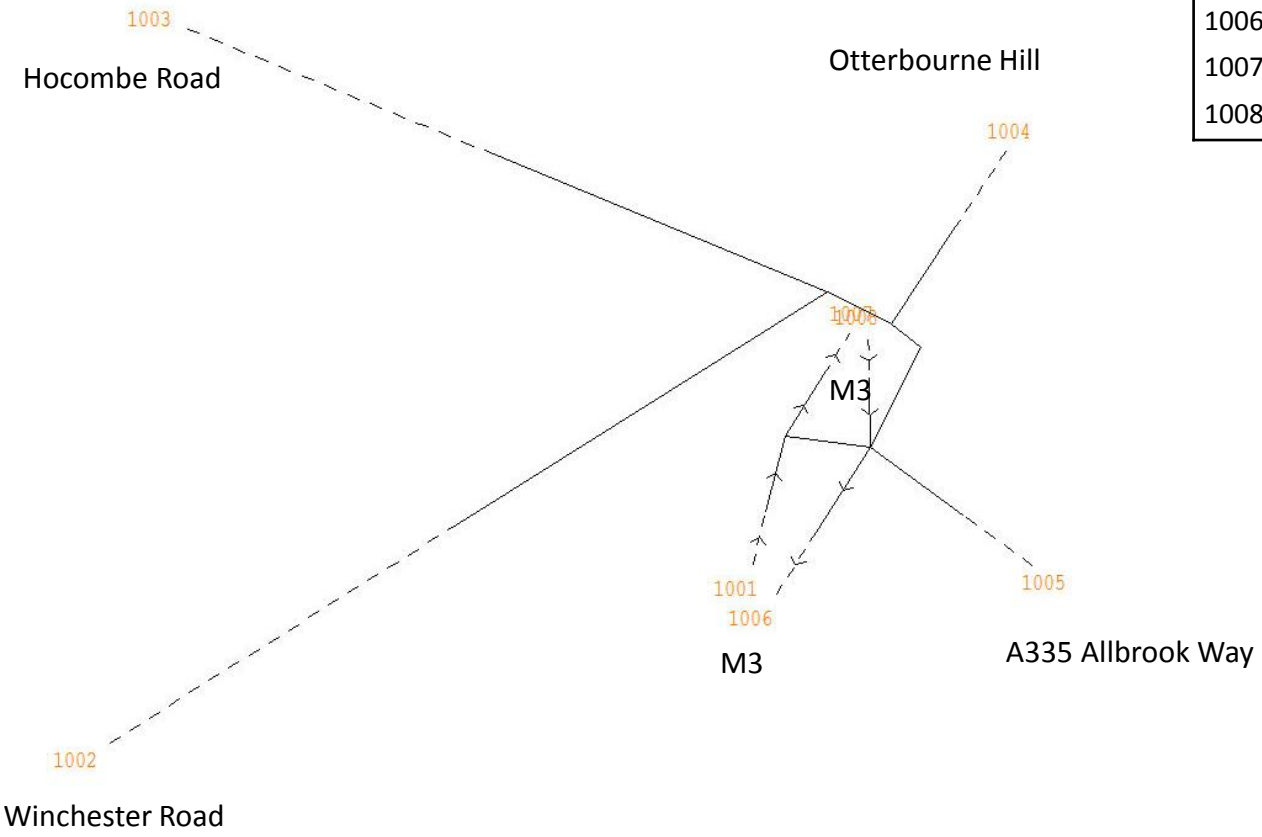
Baseline DOP 2036 AM – UC4 M3 J12



AM	1001	1002	1003	1004	1005	1006	1007	1008
1001	0	0	0	167	0	0	0	0
1002	0	0	0	11	0	0	74	0
1003	0	0	0	3	0	0	13	0
1004	0	11	2	0	0	8	1	0
1005	0	0	6	1	0	0	76	0
1006	0	0	0	0	0	0	0	0
1007	0	0	0	0	0	0	0	0
1008	0	34	4	0	15	0	0	0

Zone	Name
1001	M3 North Bound Off slip
1002	Winchester Road
1003	Hocombe Road
1004	Otterbourne Hill
1005	A335 Allbrook Way
1006	M3 South Bound On slip
1007	M3 North Bound On slip
1008	M3 South Bound Off slip

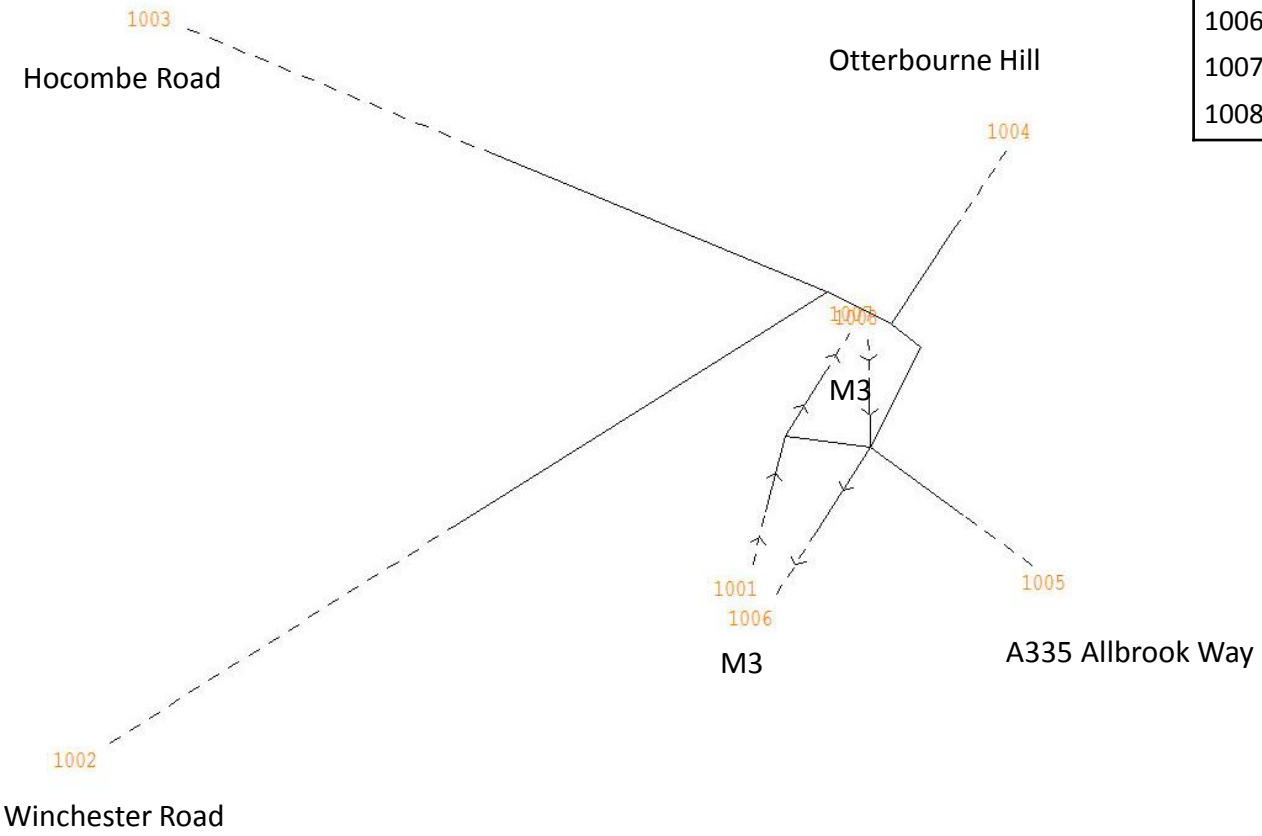
Baseline DOP 2036 PM – UC1 M3 J12



PM	1001	1002	1003	1004	1005	1006	1007	1008
1001	0	7	10	6	18	0	0	0
1002	0	0	0	10	2	14	2	0
1003	0	0	0	6	3	14	0	0
1004	0	11	5	0	0	27	0	0
1005	0	2	7	0	0	15	14	0
1006	0	0	0	0	0	0	0	0
1007	0	0	0	0	0	0	0	0
1008	0	24	26	1	4	0	0	0

Zone	Name
1001	M3 North Bound Off slip
1002	Winchester Road
1003	Hocombe Road
1004	Otterbourne Hill
1005	A335 Allbrook Way
1006	M3 South Bound On slip
1007	M3 North Bound On slip
1008	M3 South Bound Off slip

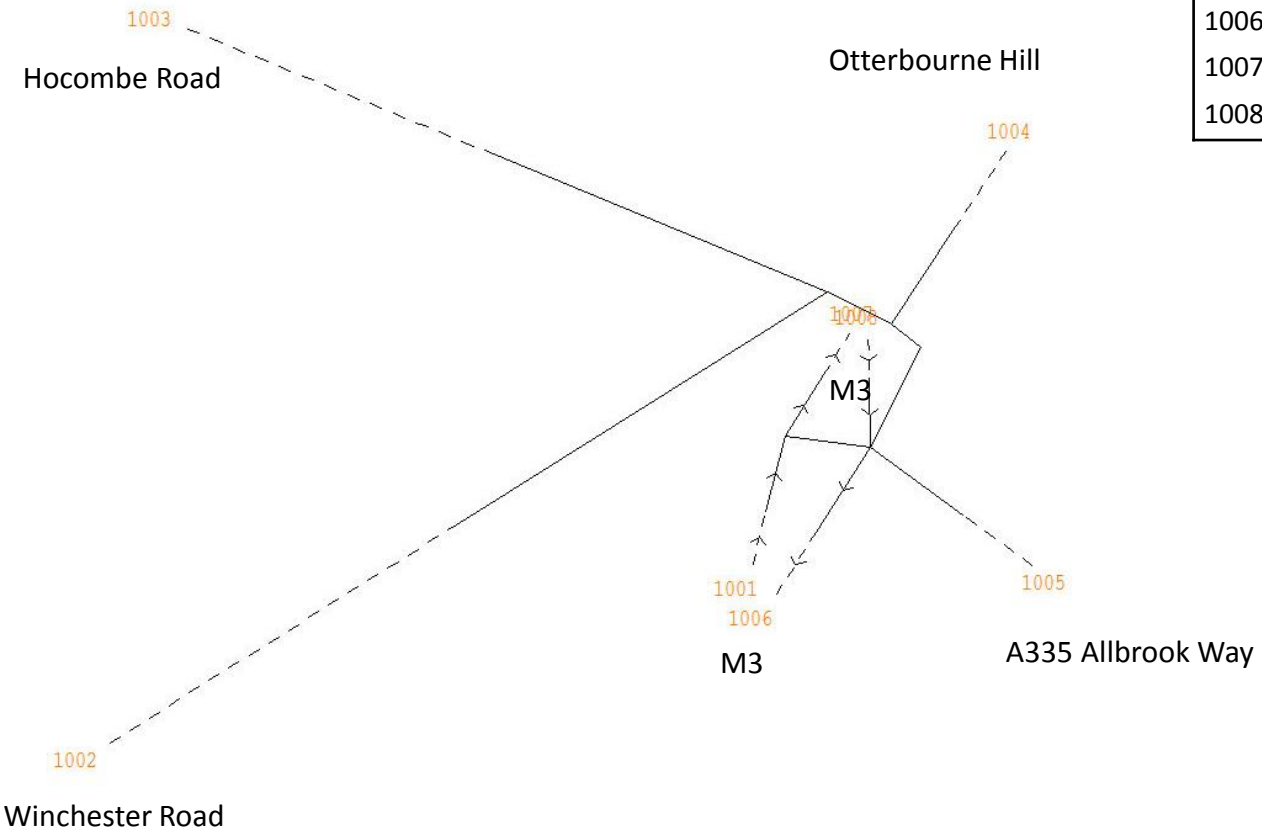
Baseline DOP 2036 PM – UC2 M3 J12



PM	1001	1002	1003	1004	1005	1006	1007	1008
1001	0	65	95	126	185	0	0	0
1002	0	0	0	184	1	95	47	0
1003	0	0	0	130	2	110	16	0
1004	0	161	64	0	0	415	4	0
1005	0	40	78	0	0	161	333	0
1006	0	0	0	0	0	0	0	0
1007	0	0	0	0	0	0	0	0
1008	0	228	232	6	30	0	0	0

Zone	Name
1001	M3 North Bound Off slip
1002	Winchester Road
1003	Hocombe Road
1004	Otterbourne Hill
1005	A335 Allbrook Way
1006	M3 South Bound On slip
1007	M3 North Bound On slip
1008	M3 South Bound Off slip

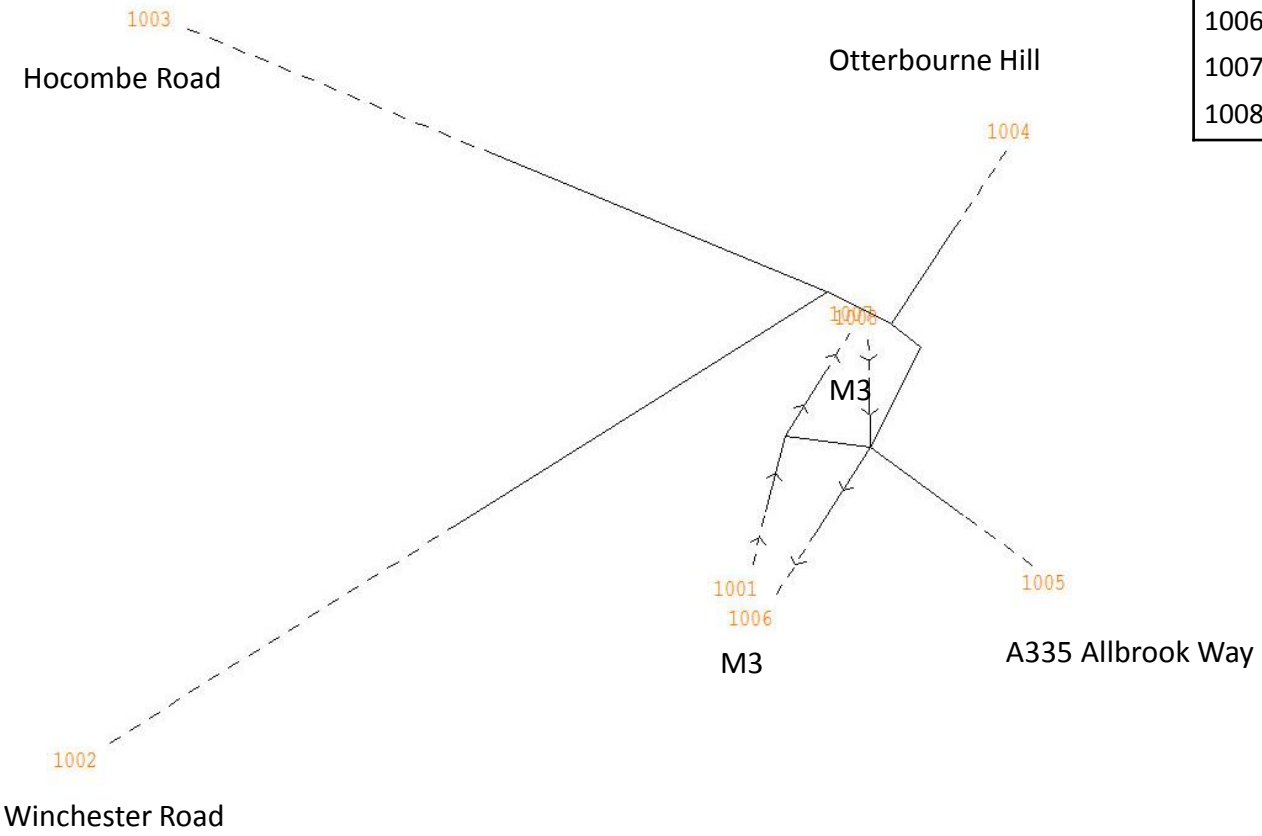
Baseline DOP 2036 PM – UC3 M3 J12



PM	1001	1002	1003	1004	1005	1006	1007	1008
1001	0	27	12	47	41	0	0	0
1002	0	0	0	36	5	3	11	0
1003	0	0	0	8	16	2	6	0
1004	0	18	7	0	0	7	0	0
1005	0	4	10	0	0	1	102	0
1006	0	0	0	0	0	0	0	0
1007	0	0	0	0	0	0	0	0
1008	0	10	8	0	9	0	0	0

Zone	Name
1001	M3 North Bound Off slip
1002	Winchester Road
1003	Hocombe Road
1004	Otterbourne Hill
1005	A335 Allbrook Way
1006	M3 South Bound On slip
1007	M3 North Bound On slip
1008	M3 South Bound Off slip

Baseline DOP 2036 PM – UC4 M3 J12

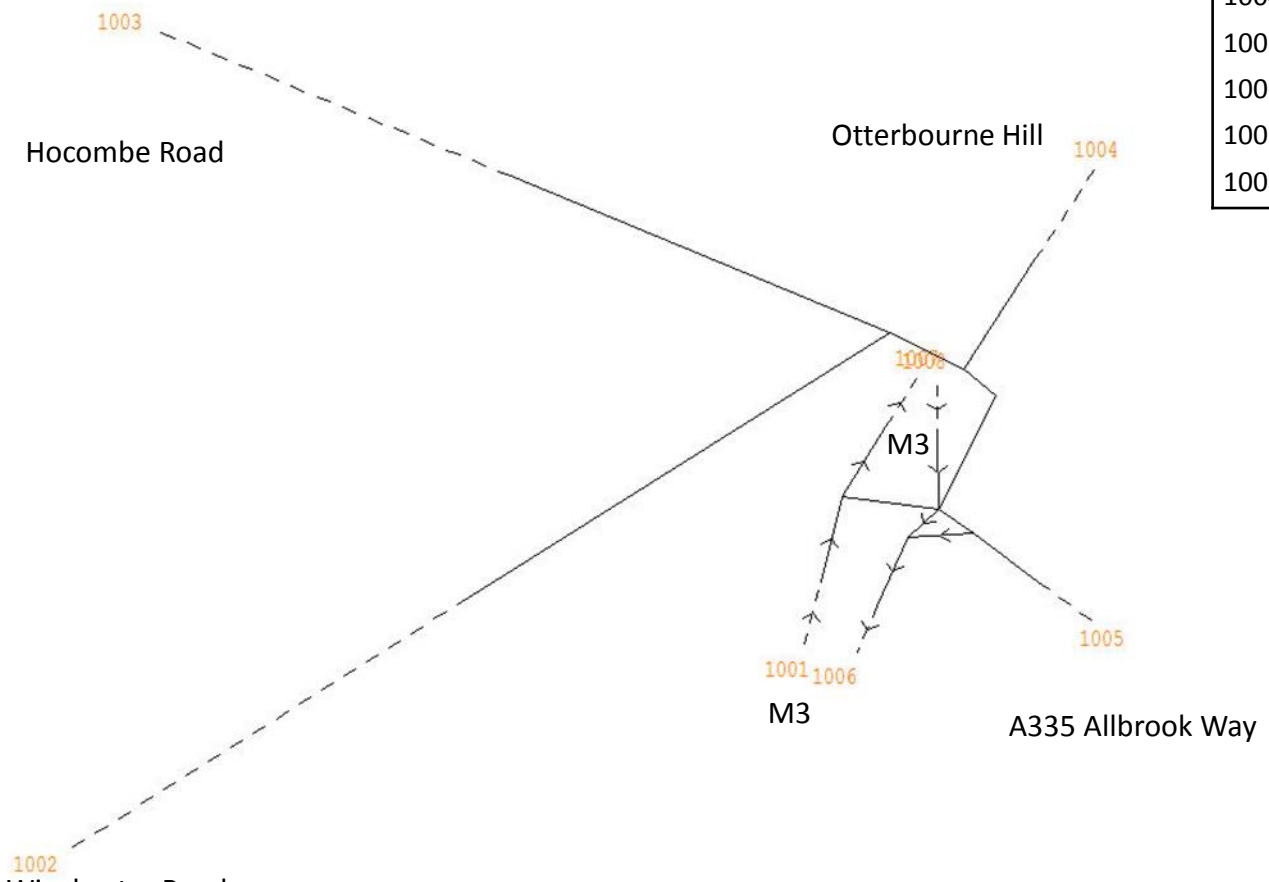


PM	1001	1002	1003	1004	1005	1006	1007	1008
1001	0	0	0	9	0	0	0	0
1002	0	0	0	17	0	0	22	0
1003	0	0	0	4	0	0	7	0
1004	0	12	4	0	0	3	0	0
1005	0	0	2	0	0	0	30	0
1006	0	0	0	0	0	0	0	0
1007	0	0	0	0	0	0	0	0
1008	0	10	2	0	2	0	0	0

Zone	Name
1001	M3 North Bound Off slip
1002	Winchester Road
1003	Hocombe Road
1004	Otterbourne Hill
1005	A335 Allbrook Way
1006	M3 South Bound On slip
1007	M3 North Bound On slip
1008	M3 South Bound Off slip

DPP 2036 Baseline

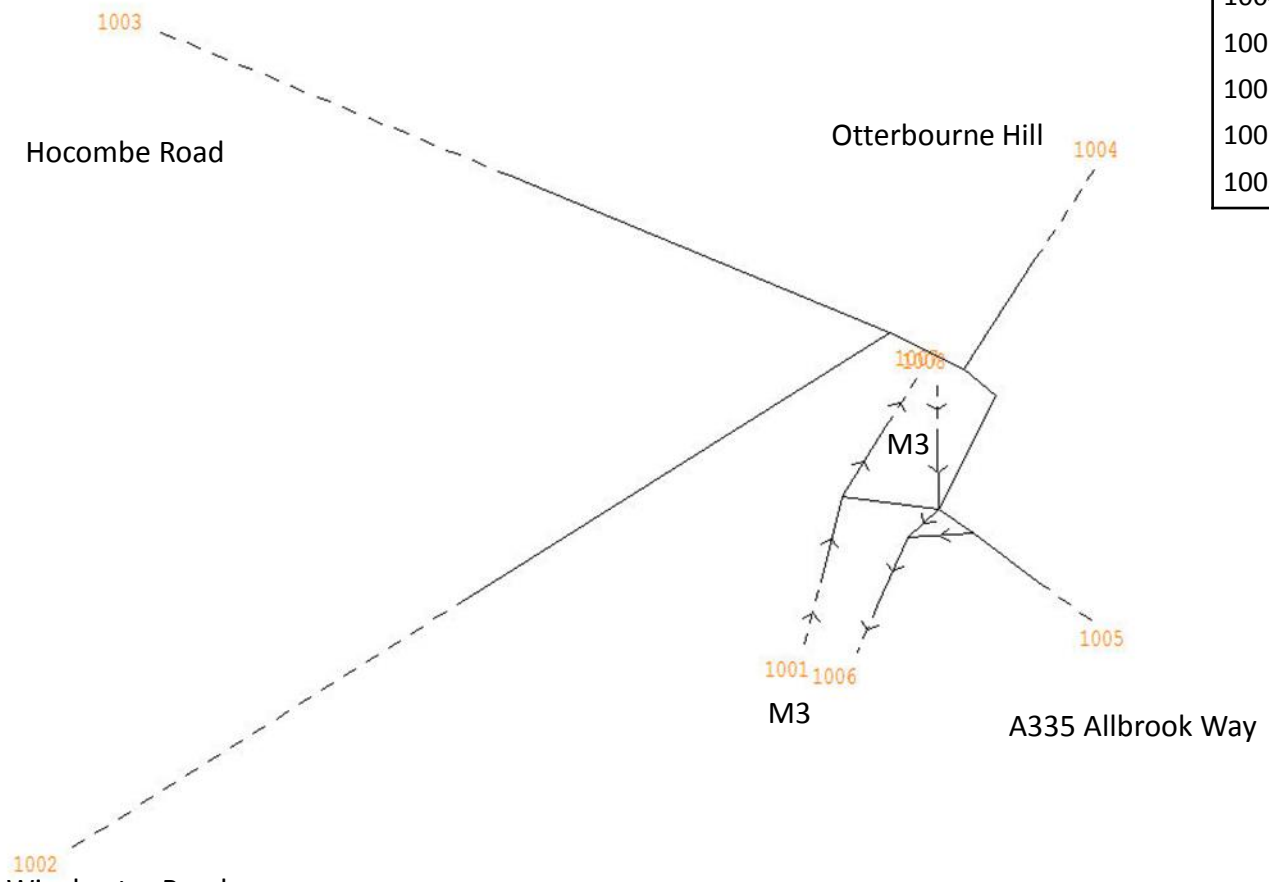
Baseline DPP 2036 AM – UC1 M3 J12



AM	1001	1002	1003	1004	1005	1006	1007	1008
1001	0	8	8	13	16	0	0	0
1002	0	0	0	7	18	11	9	0
1003	0	0	0	1	18	31	2	0
1004	0	1	0	0	0	17	0	0
1005	0	18	14	3	0	59	17	0
1006	0	0	0	0	0	0	0	0
1007	0	0	0	0	0	0	0	0
1008	0	16	4	0	91	0	0	0

Zone	Name
1001	M3 North Bound Off slip
1002	Winchester Road
1003	Hocombe Road
1004	Otterbourne Hill
1005	A335 Allbrook Way
1006	M3 South Bound On slip
1007	M3 North Bound On slip
1008	M3 South Bound Off slip

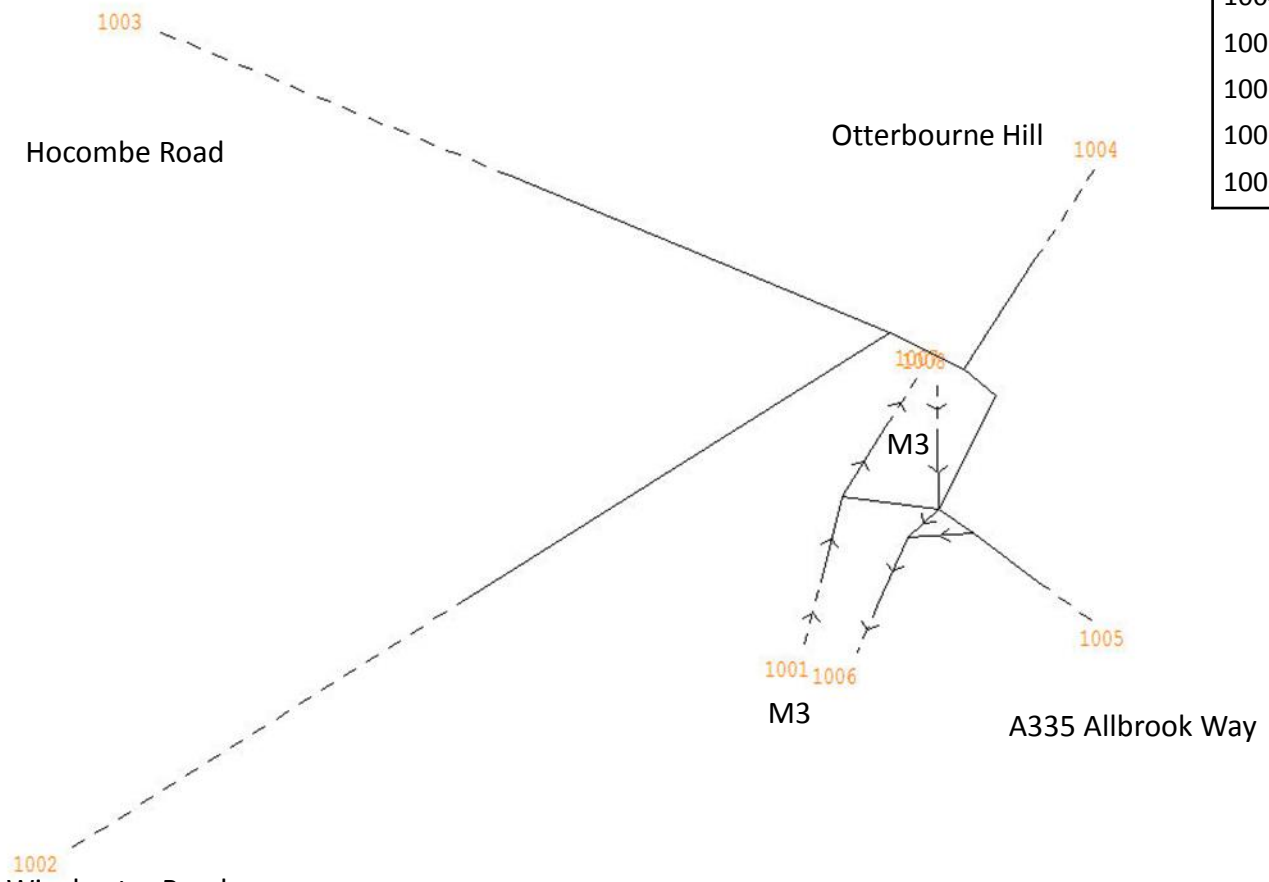
Baseline DPP 2036 AM – UC2 M3 J12



AM	1001	1002	1003	1004	1005	1006	1007	1008
1001	0	50	62	117	104	0	0	0
1002	0	0	0	71	204	75	245	0
1003	0	0	0	10	182	224	66	0
1004	0	25	4	0	0	354	0	0
1005	0	187	163	19	0	494	250	0
1006	0	0	0	0	0	0	0	0
1007	0	0	0	0	0	0	0	0
1008	0	70	19	2	193	0	0	0

Zone	Name
1001	M3 North Bound Off slip
1002	Winchester Road
1003	Hocombe Road
1004	Otterbourne Hill
1005	A335 Allbrook Way
1006	M3 South Bound On slip
1007	M3 North Bound On slip
1008	M3 South Bound Off slip

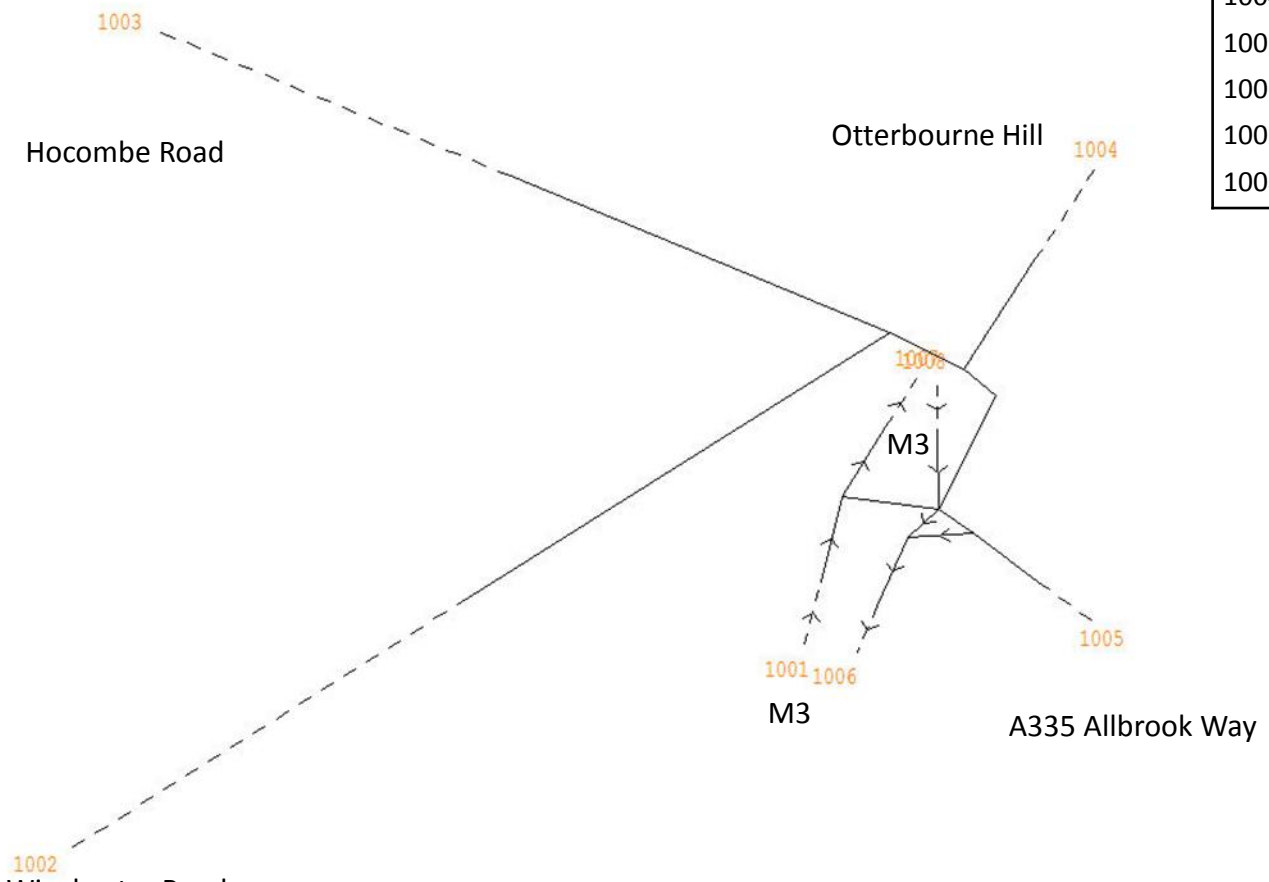
Baseline DPP 2036 AM – UC3 M3 J12



AM	1001	1002	1003	1004	1005	1006	1007	1008
1001	0	31	3	57	42	0	0	0
1002	0	0	0	3	29	10	11	0
1003	0	0	0	0	60	16	2	0
1004	0	2	0	0	0	47	0	0
1005	0	23	51	15	0	23	138	0
1006	0	0	0	0	0	0	0	0
1007	0	0	0	0	0	0	0	0
1008	0	14	1	0	44	0	0	0

Zone	Name
1001	M3 North Bound Off slip
1002	Winchester Road
1003	Hocombe Road
1004	Otterbourne Hill
1005	A335 Allbrook Way
1006	M3 South Bound On slip
1007	M3 North Bound On slip
1008	M3 South Bound Off slip

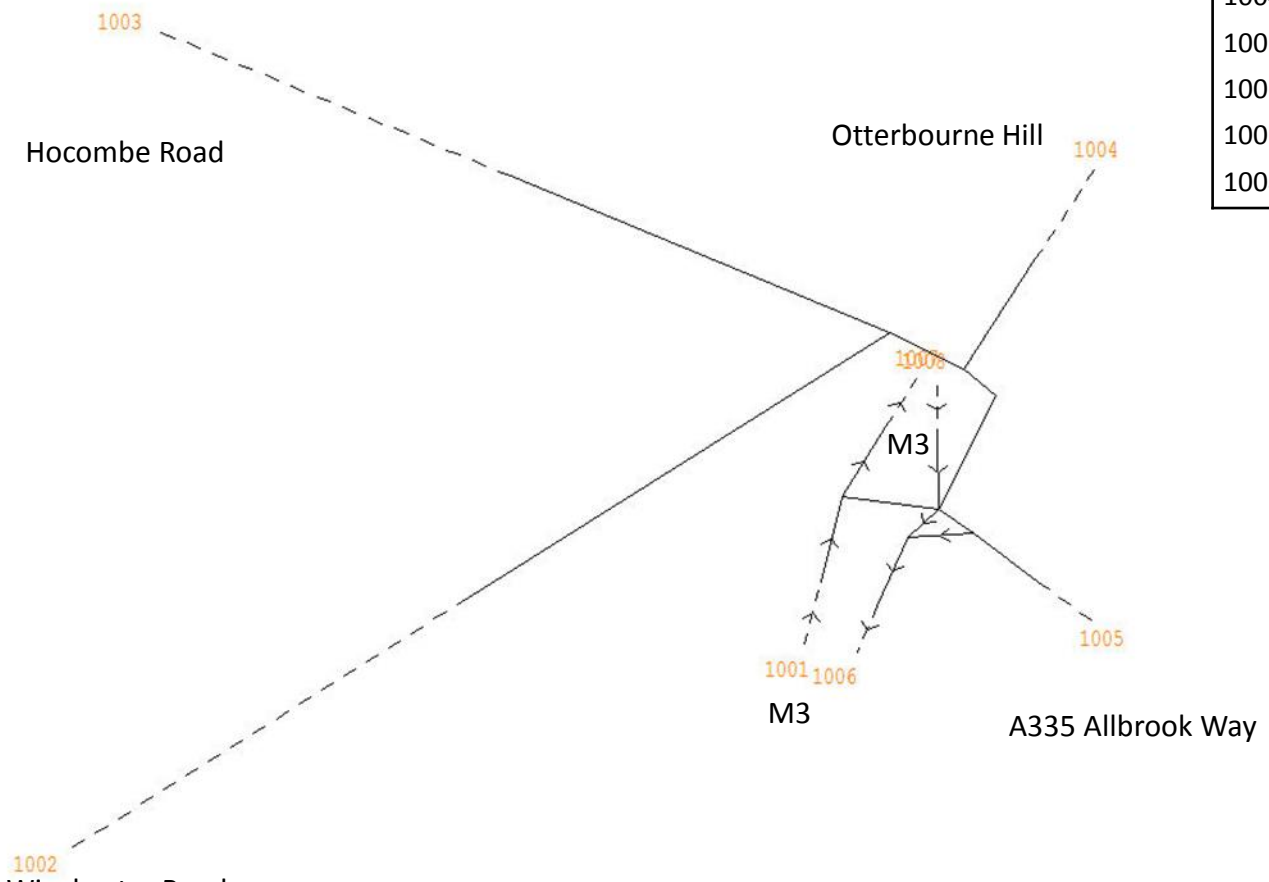
Baseline DPP 2036 AM – UC4 M3 J12



AM	1001	1002	1003	1004	1005	1006	1007	1008
1001	0	0	0	150	22	0	0	0
1002	0	0	0	7	7	5	113	0
1003	0	0	0	0	9	0	13	0
1004	0	3	0	0	0	21	1	0
1005	0	4	8	3	0	10	79	0
1006	0	0	0	0	0	0	0	0
1007	0	0	0	0	0	0	0	0
1008	0	34	4	0	14	0	0	0

Zone	Name
1001	M3 North Bound Off slip
1002	Winchester Road
1003	Hocombe Road
1004	Otterbourne Hill
1005	A335 Allbrook Way
1006	M3 South Bound On slip
1007	M3 North Bound On slip
1008	M3 South Bound Off slip

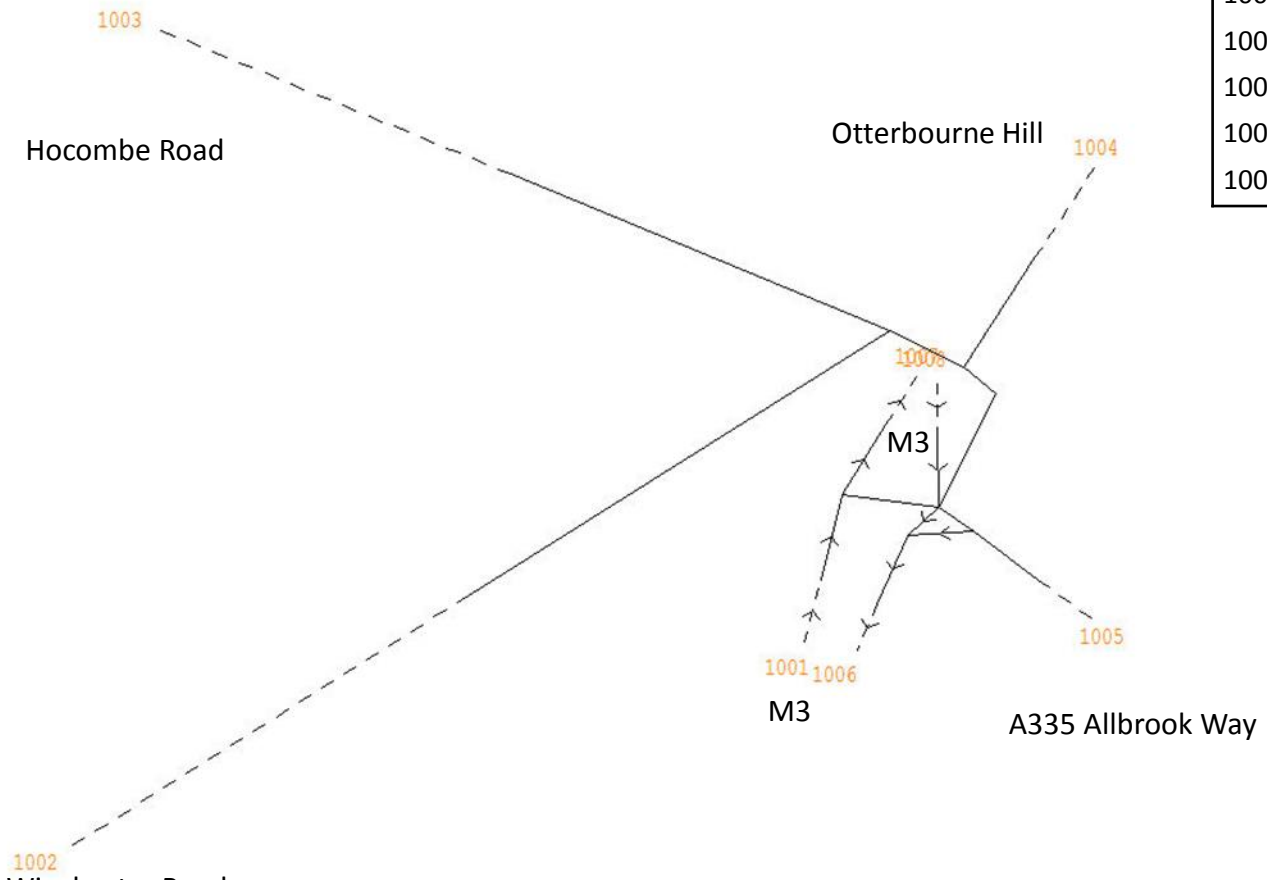
Baseline DPP 2036 PM – UC1 M3 J12



PM	1001	1002	1003	1004	1005	1006	1007	1008
1001	0	6	6	5	30	0	0	0
1002	0	0	0	2	16	19	5	0
1003	0	0	0	0	14	29	1	0
1004	0	2	0	0	3	18	0	0
1005	0	8	12	3	0	32	31	0
1006	0	0	0	0	0	0	0	0
1007	0	0	0	0	0	0	0	0
1008	0	23	25	1	4	0	0	0

Zone	Name
1001	M3 North Bound Off slip
1002	Winchester Road
1003	Hocombe Road
1004	Otterbourne Hill
1005	A335 Allbrook Way
1006	M3 South Bound On slip
1007	M3 North Bound On slip
1008	M3 South Bound Off slip

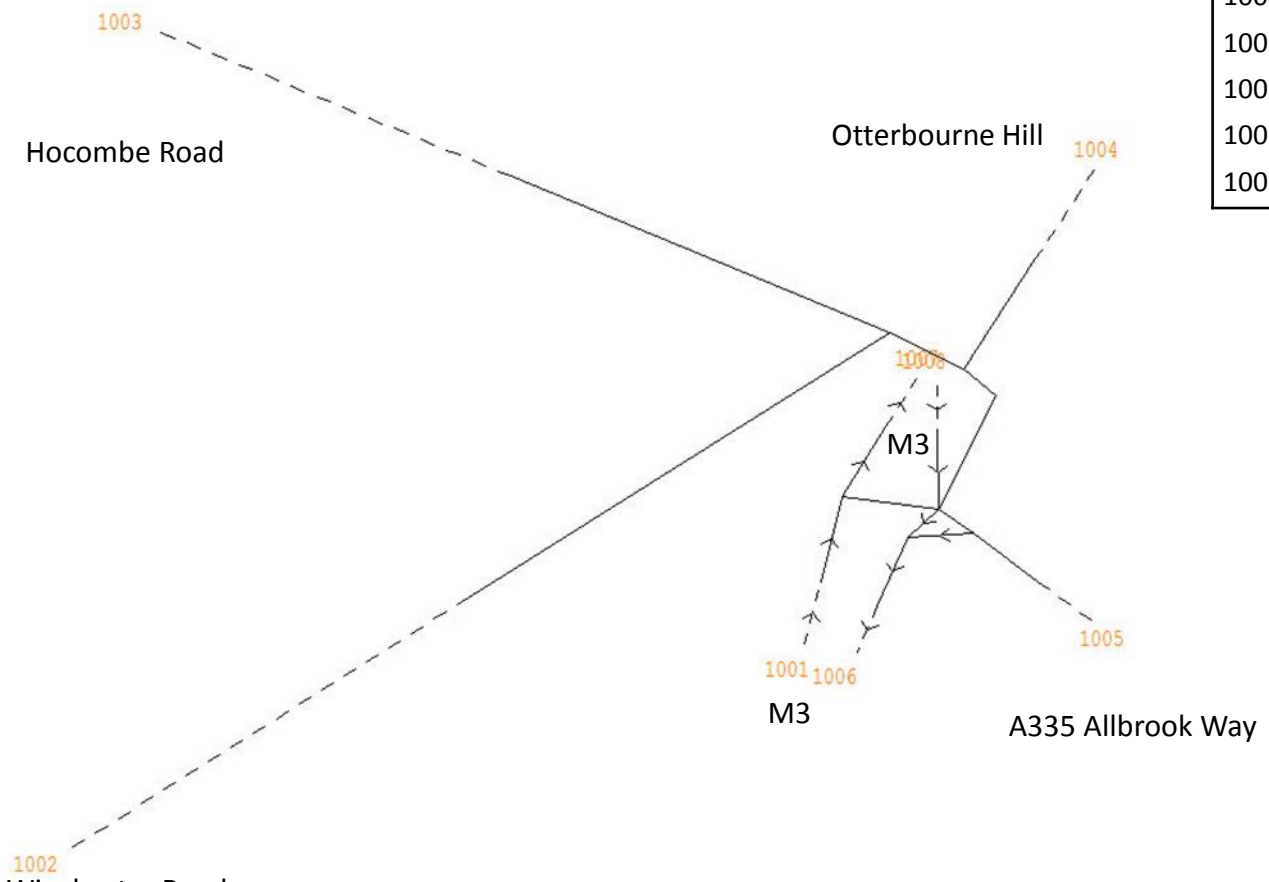
Baseline DPP 2036 PM – UC2 M3 J12



PM	1001	1002	1003	1004	1005	1006	1007	1008
1001	0	52	60	100	373	0	0	0
1002	0	0	0	42	265	147	114	0
1003	0	0	0	9	212	290	32	0
1004	0	42	12	0	52	300	6	0
1005	0	140	160	61	0	370	394	0
1006	0	0	0	0	0	0	0	0
1007	0	0	0	0	0	0	0	0
1008	0	186	216	6	34	0	0	0

Zone	Name
1001	M3 North Bound Off slip
1002	Winchester Road
1003	Hocombe Road
1004	Otterbourne Hill
1005	A335 Allbrook Way
1006	M3 South Bound On slip
1007	M3 North Bound On slip
1008	M3 South Bound Off slip

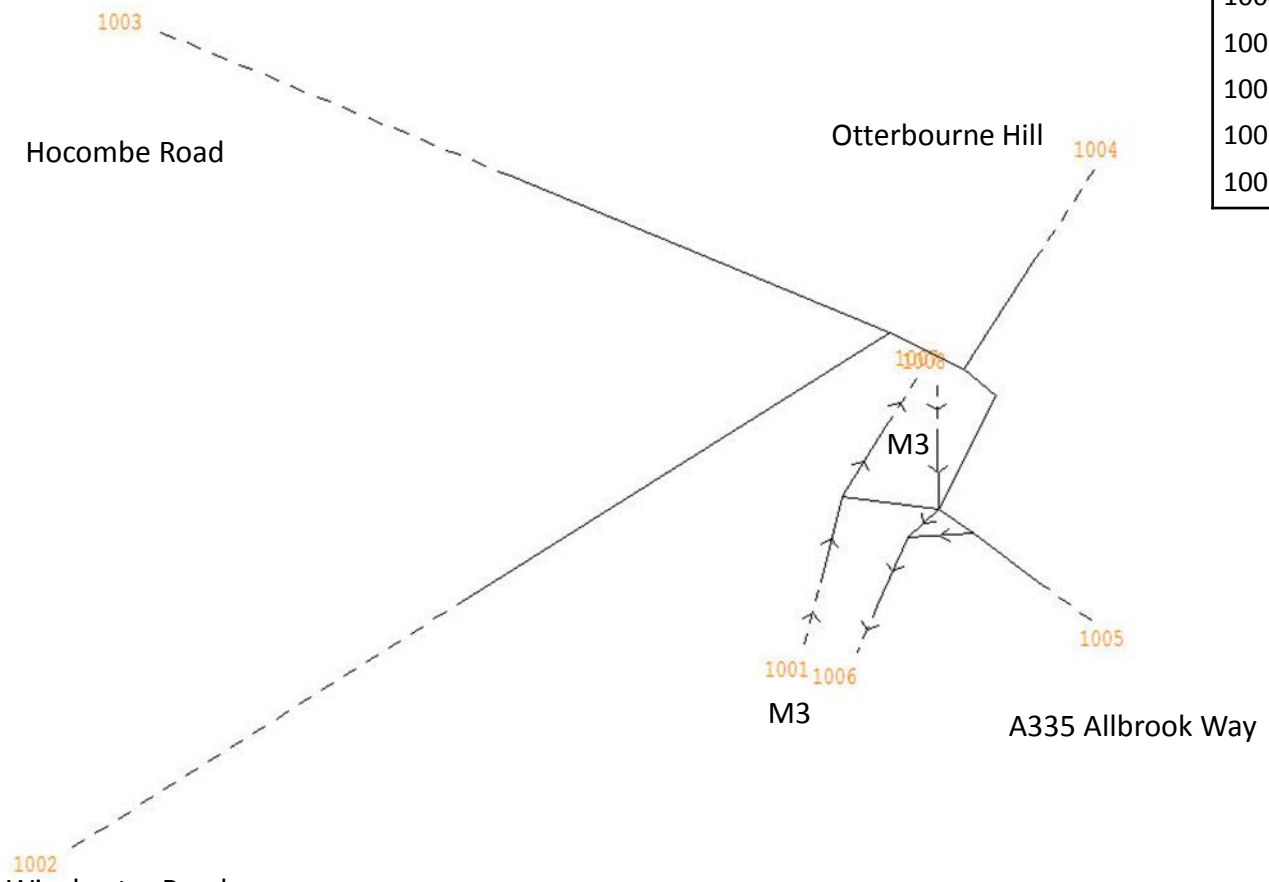
Baseline DPP 2036 PM – UC3 M3 J12



PM	1001	1002	1003	1004	1005	1006	1007	1008
1001	0	1	11	45	46	0	0	0
1002	0	0	0	2	39	9	30	0
1003	0	0	0	0	39	21	10	0
1004	0	4	1	0	5	8	0	0
1005	0	12	17	6	0	7	104	0
1006	0	0	0	0	0	0	0	0
1007	0	0	0	0	0	0	0	0
1008	0	10	8	0	10	0	0	0

Zone	Name
1001	M3 North Bound Off slip
1002	Winchester Road
1003	Hocombe Road
1004	Otterbourne Hill
1005	A335 Allbrook Way
1006	M3 South Bound On slip
1007	M3 North Bound On slip
1008	M3 South Bound Off slip

Baseline DPP 2036 PM – UC4 M3 J12

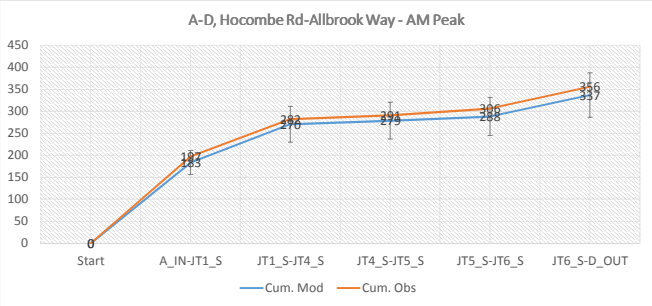


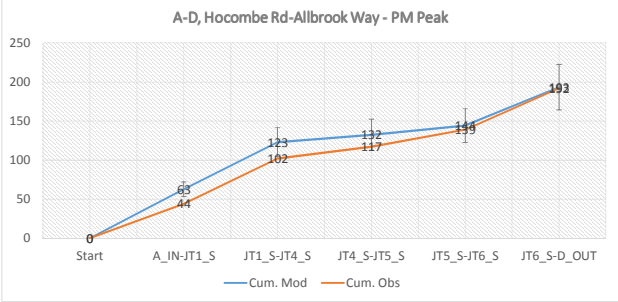
PM	1001	1002	1003	1004	1005	1006	1007	1008
1001	0	0	0	6	14	0	0	0
1002	0	0	0	1	6	2	48	0
1003	0	0	0	0	6	0	7	0
1004	0	8	1	0	3	3	0	0
1005	0	2	6	7	0	10	30	0
1006	0	0	0	0	0	0	0	0
1007	0	0	0	0	0	0	0	0
1008	0	10	3	0	2	0	0	0

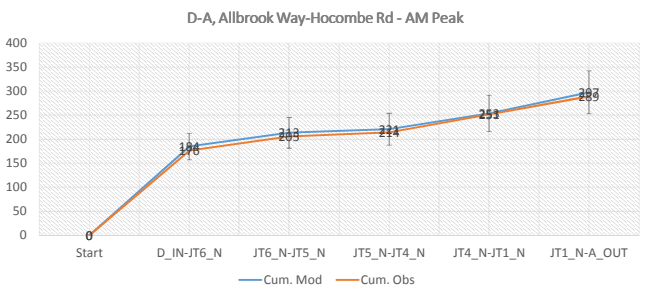
Zone	Name
1001	M3 North Bound Off slip
1002	Winchester Road
1003	Hocombe Road
1004	Otterbourne Hill
1005	A335 Allbrook Way
1006	M3 South Bound On slip
1007	M3 North Bound On slip
1008	M3 South Bound Off slip

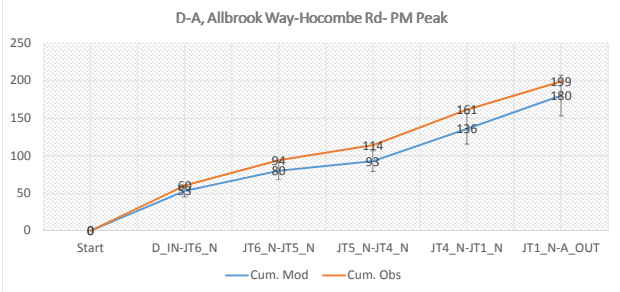
Appendix D. Calibration/Validation Results

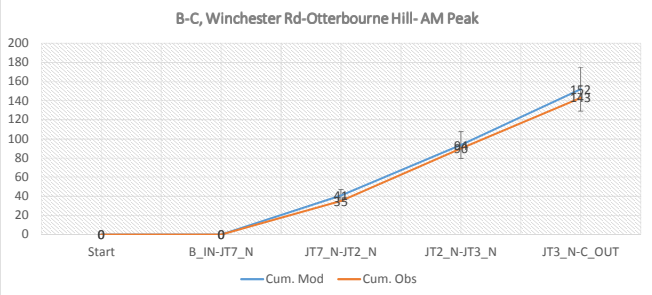
Journey Time Validation charts - Cumulative journey time (seconds)
-Observed vs Modelled 2018 AM and PM Peaks

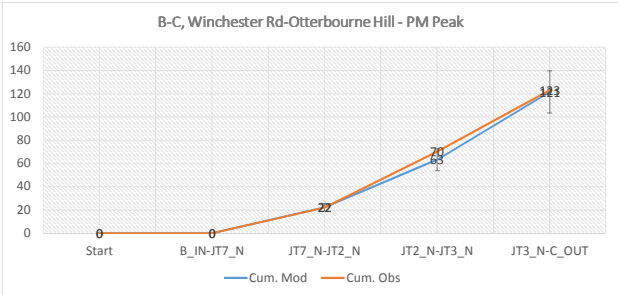


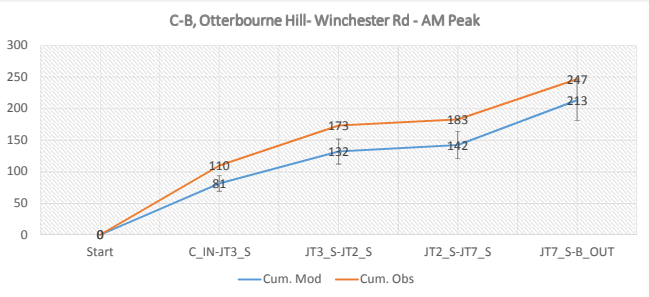


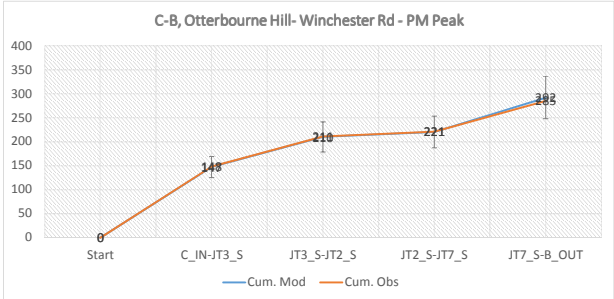


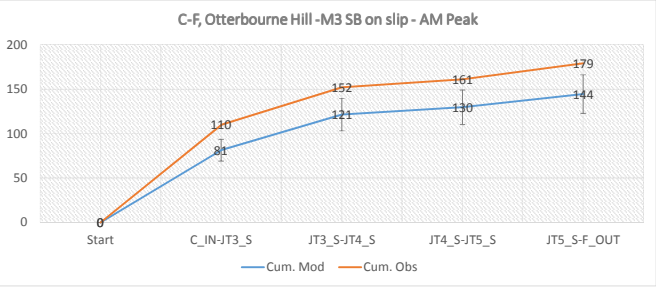


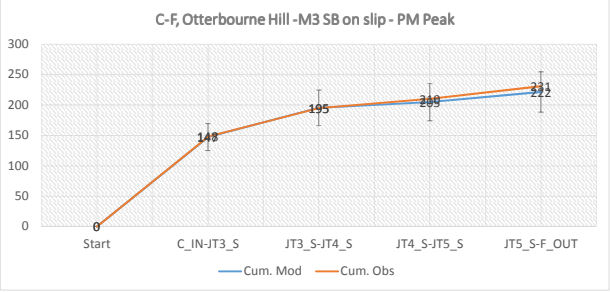




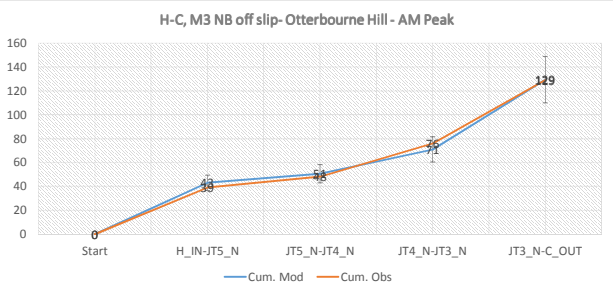


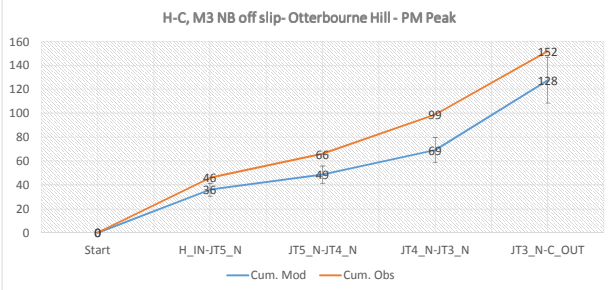


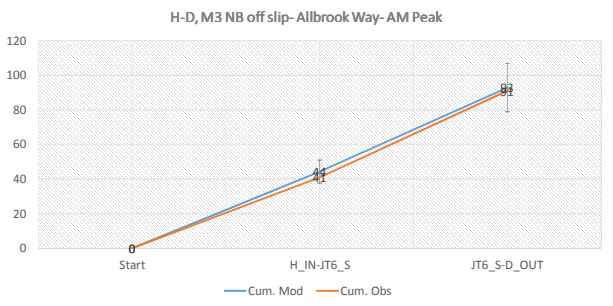


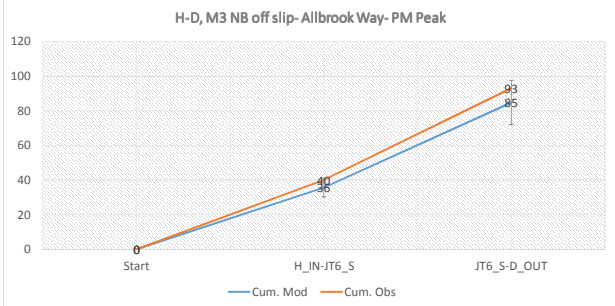


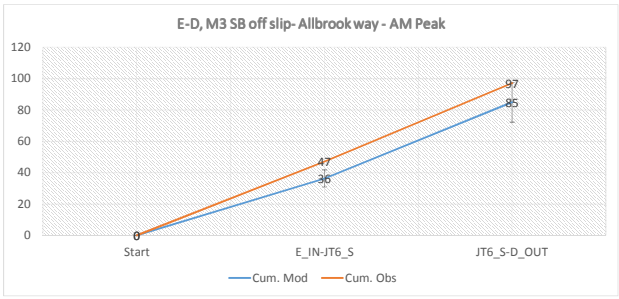
Journey Time Validation charts - Cumulative journey time (seconds)
-Observed vs Modelled 2018 AM and PM Peaks

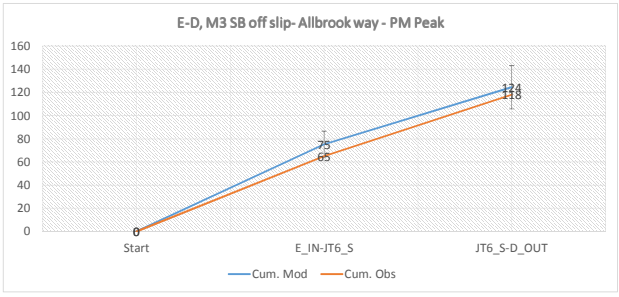


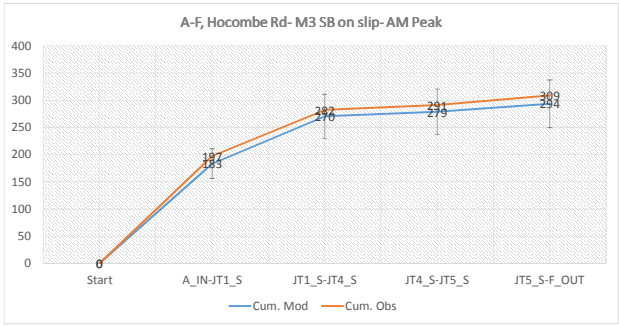


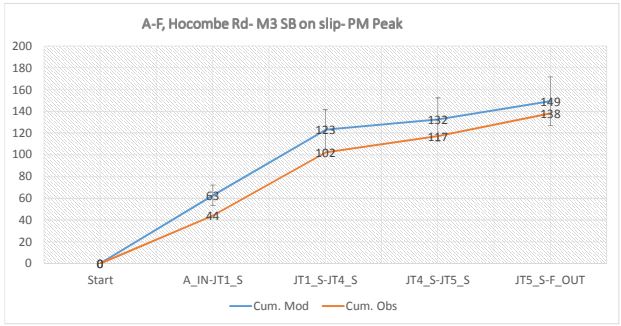




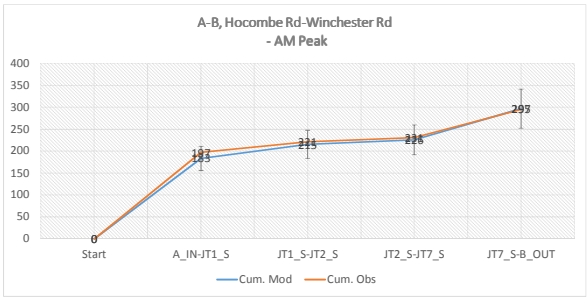


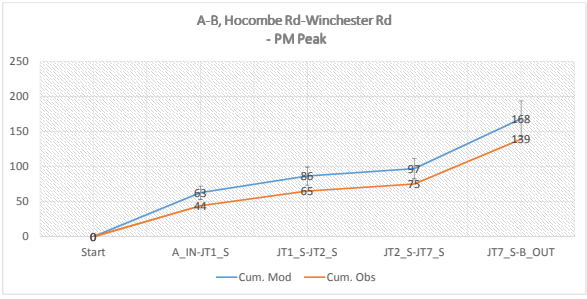


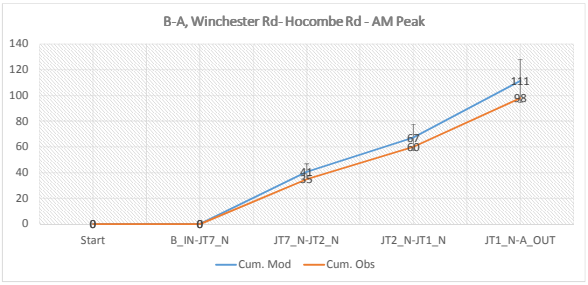


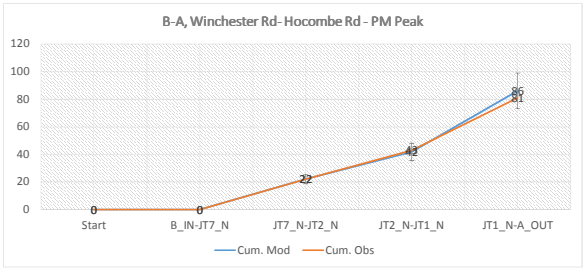


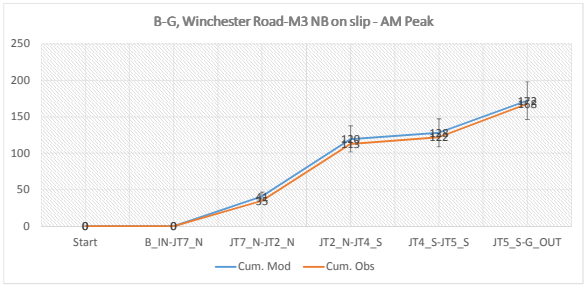
Journey Time Validation charts - Cumulative journey time (seconds)
-Observed vs Modelled 2018 AM and PM Peaks

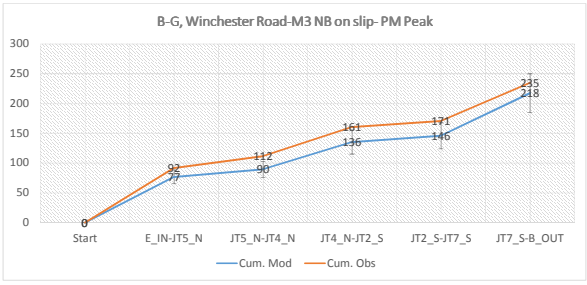


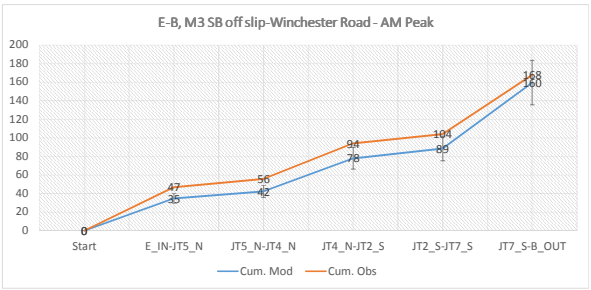


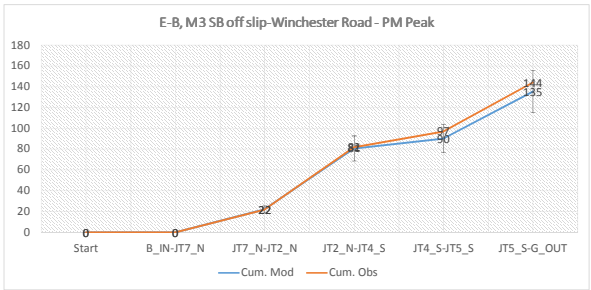


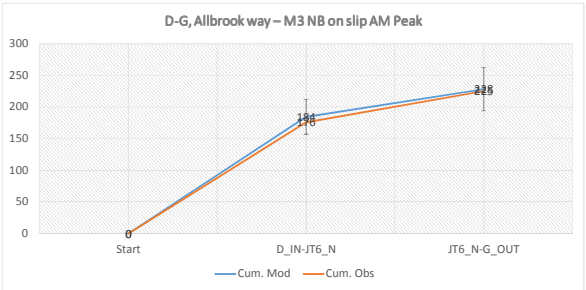


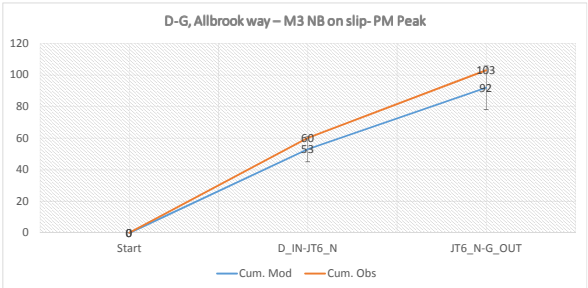












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