Pell Frischmann

Land North of A4 Bath Road, Theale

VISSIM Traffic Modelling Report

Final Report – 7 July 2024

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1. Introduction

1.1. Overview

1.1.1. Pell Frischmann is commissioned by Panattoni (the 'applicant') and its transport consultants, David Tucker Associates (DTA), to provide micro-simulation traffic modelling support in connection with resubmitting a planning application for a proposed commercial development on Land to the North of A4 Bath Road, Theale, West Berkshire (the 'site').

1.1.2. The Local Planning Authority (LPA) and Local Highways Authority (LHA) is West Berkshire Council (WBC) and the Highways Authority responsible for the Strategic Road Network (SRN), including the M4 motorway mainline carriageway and slip roads, is National Highways (NH), formerly Highways England (HE).

1.2. Background

1.2.1. The proposed description of development is as follows:

"Full planning application for the construction of 2 employment units for flexible uses within Class E (light industrial), B2 and/or B8 of the Use Classes Order (including ancillary office provision) with associated enabling works, access, parking and landscaping".

1.2.2. The original VISSIM model of the local area was based on 2019 traffic flows and pre Covid. The VISSIM model has recently been updated with 2023 traffic flows in connection with a separate planning application for the proposed residential development on Land to the East of Pincents Lane (north of the IKEA Reading store) on behalf of U+I (Pincents Lane) Ltd. Permission from the Client to reuse the updated model has been obtained.

1.2.3. In September 2021, PF undertook VISSIM modelling for the proposals at the site are for the development of new B2 / B8 employment units on land to the north of the A4 Bath Road in Theale. The trip generation was based on 15,800 square metres (sqm). The new proposal at the site is for the development of Class E (Light Industrial)/ B2 / B8 employment units. The development will provide two units as follows: Unit 1: 4,893sqm; and Unit 2: 4,700sqm.

1.2.4. DTA have provided PF with their Transport Assessment (TA), dated August 2023 which has provide the trip generation for their proposed site. At the time of writing the TA the 2023 VISSIM model was still in the process of being validated.

1.3. VISSIM Model Process

1.3.1. VISSIM is a 'microscopic traffic flow simulation' ('micro-simulation') model based on 'car following and lane change logic'. VISSIM can analyse vehicular traffic including bus/tram, pedestrian and bicycle operations under constraints such as lane configuration, traffic composition, traffic signals, and bus/tram stops. VISSIM does not follow the conventional 'link/node' modelling system, but utilises a 'link/connector' system that enables complex geometry to be modelled. The link/connector system also permits different traffic controls (signal, give way or stop) to be utilised anywhere in the model.

1.3.2. VISSIM is also capable of modelling vehicle actuation traffic control utilising the Vehicle Actuated Programming (VAP) module as well as MOVA using the PCMOVA module from the Transport Research Laboratory (TRL). Therefore, it is the most appropriate tool for the modelling of complex geometry and traffic controls (give way and traffic signal) operating within the study area.

1.3.3. The Local Model Validation Report (LMVR) for the 2023 Base models was completed in November 2023.

2. Development Proposals and Committed Developments

2.1. Introduction

2.1.1. This chapter of the report presents the committed development sites, the existing proposed residential developments and the Panattoni proposed commercial development.

2.2. Proposed Development

2.2.1. The proposals at the site are for the development of new Class E (Light Industrial)/ B2 / B8 employment units on land to the north of the A4 in Theale. The development will provide two units as follows: Unit 1: 4,893sqm; and Unit 2: 4,700sqm.

2.2.2. The trip generation as provided by DTA, the applicant's transport consultants, has been calculated and **Tables 2.1 and 2.2** shows the arrivals and departures to the proposed site. The trip distribution is included at **Appendix B** of this report for reference.

Table 2.1 – Proposed Commercial Development Vehicle Trip Rates

Time Period	Total Vehicle Trip Rates per 100 sqm			HGV Vehicle Trip Rates per 100 sqm		
	Arrivals	Departures	Total	Arrivals	Departures	Total
08:00-09:00	0.414	0.159	0.573	0.025	0.020	0.045
17:00-18:00	0.116	0.368	0.484	0.014	0.010	0.024
Daily	3.18	3.102	6.282	0.286	0.275	0.561

Table 2.2 – Proposed Commercial Development Vehicle Trips

Time Period	Total Vehicle Generation			HGV Generation		
	Arrivals	Departures	Total	Arrivals	Departures	Total
08:00-09:00	40	15	55	2	2	4
17:00-18:00	11	35	47	1	1	2
Daily	307	299	606	28	27	54

2.3. Proposed Development Traffic Assignment

2.3.1. The Journey to Work Census 2011 data was used by DTA to determine the likely distribution of these trips. The site is located within West Berkshire 009 and the proposed distribution of employment traffic is shown in Table 2.3.

Table 2.3 – Traffic Distribution

Road Link	Proportion
M4 West	18%
A4 East	7%
M4 East	37%
A4 West	27%
Royal Avenue	1%
Charrington Road (South)	1%
Old Bath Road	7%
Charrington Road (North)	1%

2.3.2. Based on the trip generation and distribution assumptions above, the majority of traffic will route to/from the M4 with a further split of traffic on the A4 to the west and into Reading to the east.

2.4. Committed Developments Sites

2.4.1. Consistent with the previous assessments, the following three committed development sites have been considered and reflected in the 2023 forecast future year traffic flows:

- **Dorking Way (WBC planning application reference no: 17/02904/OUTMAJ):** Restaurant/pub with 150 covers with associated parking and landscaping and installation of plant at roof level; and outline permission for 28 residential units. *This application was rejected.*

- **Brunel Road (WBC planning application reference no: 17/01589/COMIND):** Demolition of the existing building and redevelopment of the site to provide four new building with a combined area of 10,935 m^2 for use within classes B1(c), B2 and B8 of the 1987 Use Classes Order plus ancillary offices and associated access, parking, servicing and landscaping schemes. *This is now open and in use by Amazon.*

- **'The Green, Lakeside Theale' (WBC planning application reference no. 15/02842/OUTMAJ)** – Outline application for a residential development of up to 325 houses and apartments (including 70 extra-care units) with associated access, parking, amenity space and landscaping. *This has not yet been built and the same flows will be applied.*

- **Land North of Bath Road:** a planning application for a proposed commercial development (B2/B8 employment units) on Land to the North of A4 Bath Road, Theale. *This has not yet been built and although the size of the development has changed the same flows will be applied for robustness.*

- **Land West of Dorking Way:** The 'Land West of Dorking Way' development (applicant: Bellway Homes Ltd) (WBC planning application reference no: 19/01544/FULEXT), for a residential development comprising 199 residential dwellings, on land to the east of the M4 Junction 12 / A4 Bath Road roundabout has now been built out. *At the time of the traffic surveys based on information from a telephone call with Bellway Homes Ltd it was previously estimated that approximately 70% of the developed has been built out and occupied, therefore leading to the assumption that approximately 70% of the development is included within the 2023 baseline traffic surveys. Therefore, only 30% of the development has been manually added as a committed development.*

2.5. Committed Development Traffic Assignment

2.5.1. Traffic associated with the above four committed development sites has been assigned in the same was as presented in the Pell Frischmann January 2019 TA and subsequent VISSIM modelling reports. This is as follows:

- For the 'Green, Lakeside Theale' committed, the TA submitted as part of the outline planning application did not provide details of a distribution other than to indicate that 25% of traffic would remain local (i.e. within Theale). It was therefore assumed that The Green would have comparative trip rates to that of the residential aspect of the Land East of Pincents Lane proposed development and would follow a similar distribution along the network. Therefore, of the remaining 75% of vehicles traveling onto the wider network (beyond Theale), 62.5% were calculated to travel east towards the A4/M4 junction where vehicles were distributed following the same distribution as the Pincents Lane proposed development.

- For the 'Land North of Bath Road', David Tucker Associates provided PF with the traffic generation and distribution.

- For the 'Land West of Dorking Way', information relating to traffic generation, distribution and assignment for the weekday (Friday) AM and PM peak hours and Saturday peak hour, was previously provided by i-Transport, who prepared the TA for this development. It is understood that these parameters were discussed and agreed with WBC Highways Development Control. The same distribution will be used but with 30% of the development traffic applied.

2.6. TEMPro Growth

2.6.1. The following TEMPro growth factors have been applied to observed 2023 traffic flows (based on the March 2023 traffic surveys), uplifting to 2033 future assessment year. The growth factors taken from DTA's TA are as follows:

- Weekday (AM peak) - 1.0578
- Weekday (PM peak) - 1.0598

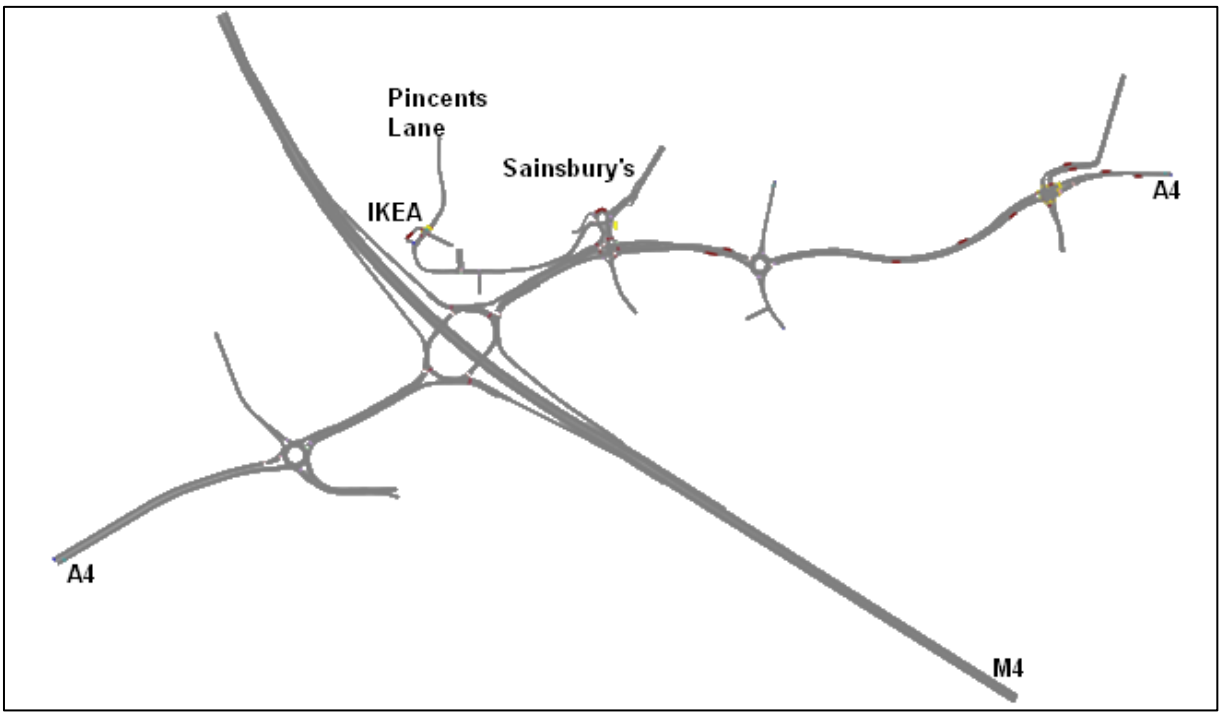
2.6.2. Consistent with previous traffic modelling, TEMPro background traffic growth has not been applied to traffic on Pincents Lane, where the majority of traffic is expected to be associated with the existing IKEA store, or to traffic entering/exiting the Sainsbury's retail park and petrol filling station (PFS). Background traffic growth has also been reduced to below TEMPro growth levels on parts of the network, where appropriate, to avoid double counting, i.e. where sites such as 'Land West of Dorking Way' are WBC Local Plan allocated sites and have therefore already been taking account of in TEMPro background traffic growth, and where allocated committed development sites have also been included separately (which are also taken account of in TEMPro background traffic growth).

3. Modelling Assessment

3.1. Model Network Extent

3.1.1. The VISSIM 2023 Base model network, which is the same as the 2019 Base model network albeit for a northern extension to cover the IKEA and Dunelm car park entry/exit points on Pincents Lane, is shown in Figure 3.1 below.

Figure 3.1 - 2023 VISSIM Base Model Network Extent



3.1.2. Three junctions have been added in the Base model network during the review of the highway infrastructure. They are listed below:

- Ikea car park entry and exit / Pincents Lane junction (signalised);
- Ikea car park entry and exit / Pincents Lane junction (non-signalised); and,
- Dunelm car park entry and exit / Pincents Lane junction (non-signalised).

3.1.3. In addition to the new junctions above, the rest of the network remains the same as per the 2019 Base model, with the following junctions included:

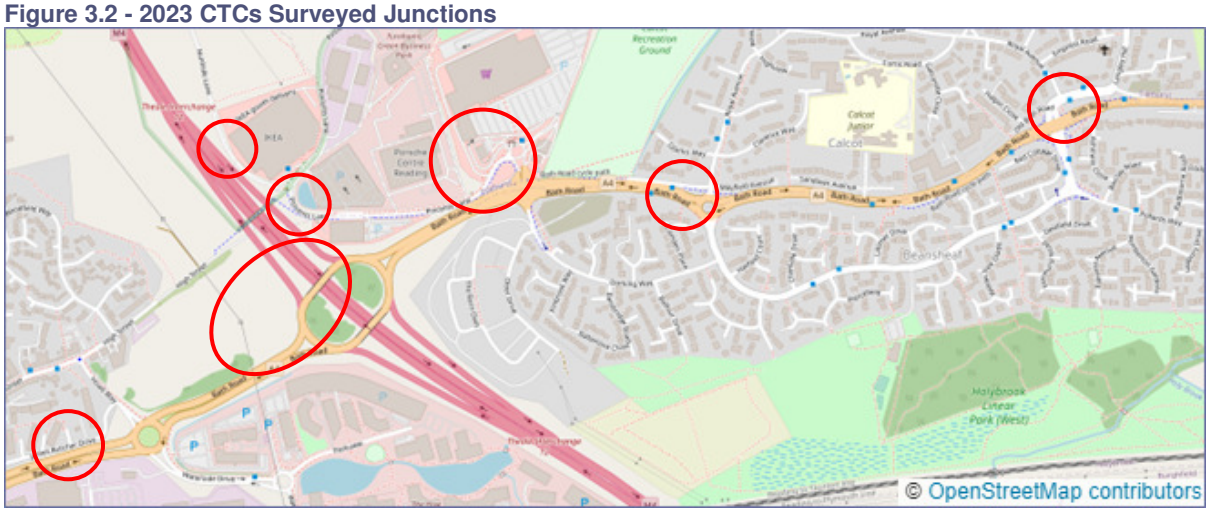
- A4 Bath Road / Waterside Drive / Hoad Way roundabout (non-signalised);
- M4 Junction 12 / A4 Bath Road roundabout (signalised);
- A4 Bath Road / Calcot Interchange / Dorking Way junction (signalised);
- Calcot Interchange / Pincents Lane / McDonald's / Sainsbury's retail car park gyratory (non-signalised);
- A4 Bath Road / Royal Avenue / Charrington Road roundabout (non-signalised); and,
- A4 Bath Road / Old Bath Road (Langley Hill) / Charrington Road junction (signalised).

3.2. Traffic Surveys

3.2.1. Classified Traffic Counts (CTCs)

3.2.1. Manual classified turning counts (CTCs) at junctions were collected on Friday 10th, Saturday 11th and Sunday 12th March 2023. The junctions are highlighted in the Figure 3.2 below.

Figure 3.2 - 2023 CTCs Surveyed Junctions



3.2.2. The following peak hours as determined by the 2023 traffic surveys are to be modelled in the VISSIM model:

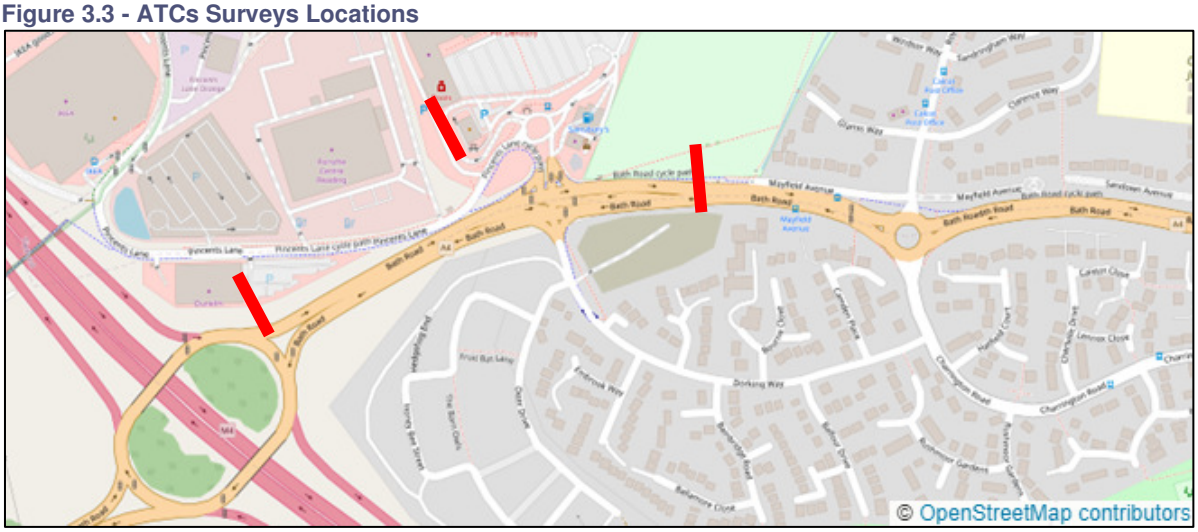
- Weekday AM Peak: 07:30 – 08:30; and
- Weekday PM Peak: 16:30 – 17:30.

3.2.3. In addition, a 'warm up' period of 15 minutes and a 'cool down' period of 15 minutes has been modelled. These are added to allow traffic to enter the model network and leave by the end, so that the intervening peak period is representative of conditions whereby traffic is already on the network.

3.2.2. Automated Traffic Counters (ATCs)

3.2.4. Automated Traffic Counters (ATCs) surveys were also carried out to record two-way traffic volumes, speeds and vehicle classifications over a continuous 24 hour for a 14-day period at 3 locations as shown in Figure 3.3 below.

Figure 3.3 - ATCs Surveys Locations



3.2.5. The ATCs surveys were recorded from 1st to 14th March 2023 to coincide with the CTCs surveyed periods.

3.2.3. Queue Length

3.2.6. Queue length surveys were collected at the junctions, as listed in section 3.1.2 and 3.1.3, on the same dates as CTCs surveys were collected. It was recorded for the same time periods on the dates for a 5-minute interval.

3.2.4. Journey Time

3.2.7. Journey time surveys were carried out on the same dates (10th, 11th and 12th March 2023) covering the following time periods for both cars and buses:

- Friday AM 07:00 – 10:00; and
- Friday PM 16:00 – 19:00.

3.2.8. Four routes for cars defined within the surveys are shown in Figures 3.4 and 3.5 below.

Figure 3.4 - Car Journey Time Routes 1 & 2

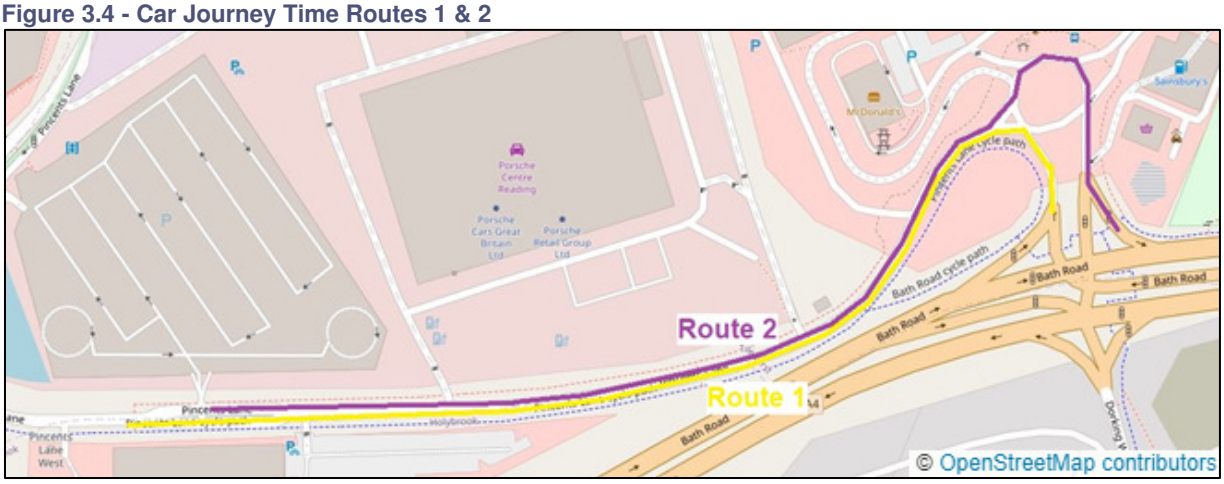
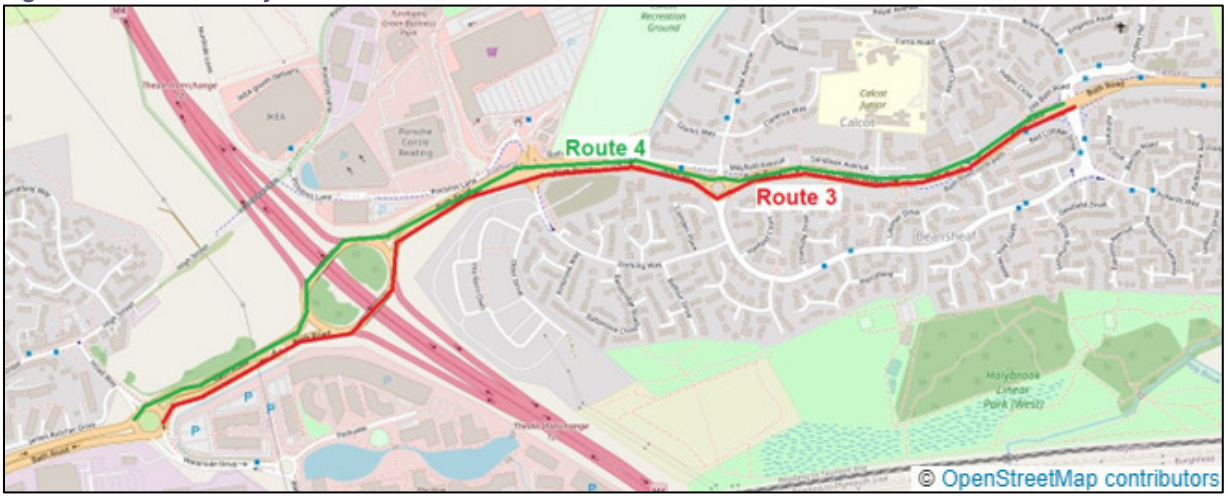
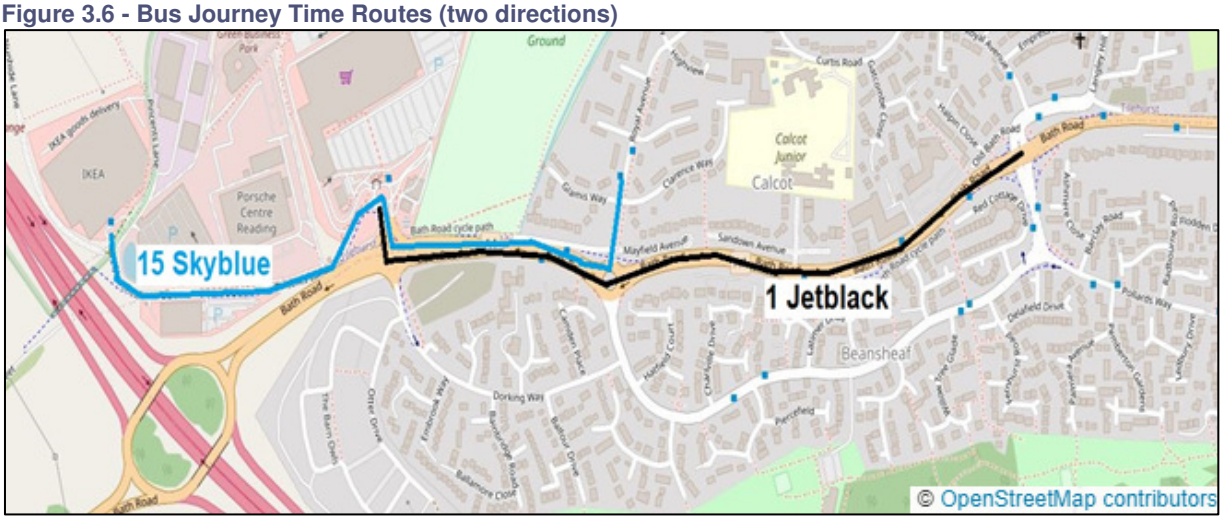


Figure 3.5 - Car Journey Time Routes 3 & 4



3.2.9. Two bus routes, '1 Jet Black' and '15 Sky Blue', were also surveyed for Journey Time in both directions as shown in Figure 3.6 below.

Figure 3.6 - Bus Journey Time Routes (two directions)



3.3. Assessment Scenarios

3.3.1. The following scenarios are modelled:

- 2023 Base Year – Observed March 2023 traffic flows;
- Do Minimum (DM) 2033 Forecast Future Year Base 'without proposed development' – 2023 Base + TEMPro background traffic growth + Committed Developments (including 'Land West of Dorking Way') + 'Land East of Pincents Lane'; and
- Do Something (DS) 2033 Forecast Future Year (FY) 'with proposed development' – 2019 Base + TEMPro background traffic growth + Committed Developments (including 'Land West of Dorking Way') + 'Land East of Pincents Lane' + Land to the North of A4 Bath Road.

4. Model Development

4.1.1. Model Set-up Details

4.1.1. Table 4.1 below lists the modelling set-up details.

Table 4.1 – Modelling Details

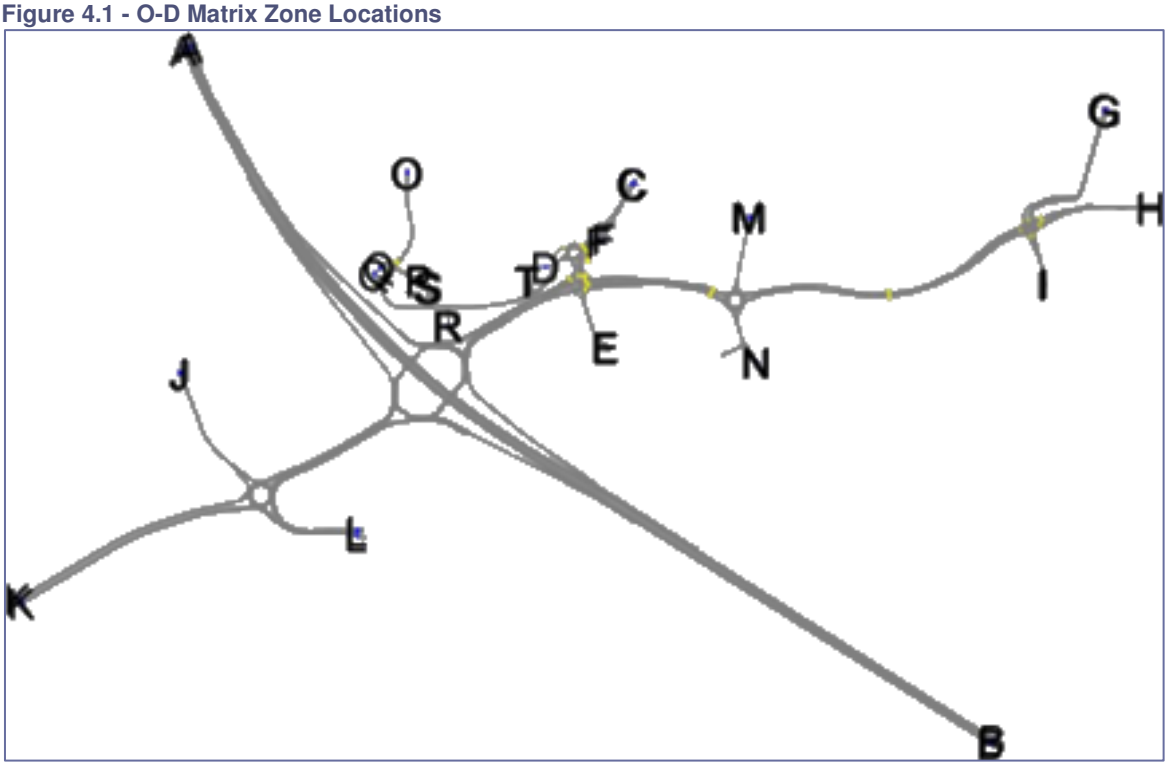
VISSIM Version Used	
VISSIM 2020 – 13	
Peak Hour Period	
AM 07:30 – 08:30, PM 16:30 – 17:30	
Warmup / Cool-down Period	
15 minutes / 15 minutes	
Driving Behaviour	
Link Behaviour:	Wiedemann 99 / Wiedemann 74
Average Standstill Distance:	1.2m / 2.0m
Look Ahead Distance:	0 – 250m / 40m – 250m
Look Back Distance:	0 – 150m / 20m – 150m
Vehicle Classes	
Lights and HGVs	
VISSIM Traffic Assignment	
Dynamic Assignment	

4.1.2. Traffic Input / Routing

4.1.2. Given that dynamic assignment has been used for the VISSIM models, Origin to Destination (O-D) matrices have been produced based on the surveyed CTCs for AM peak and PM peak. The matrices are separated into Lights and HGVs for each peak.

4.1.3. Matrix estimation has been carried out in LinSig for each peak hour (1 hour) to balance the traffic flows on the modelled highway network for Lights and HGVs. A factor has been calculated for the 15-minutes warm up and cool down period matrix for Lights and HGVs respectively, the calculation is based on the surveyed CTCs where a percentage (15 minute traffic / peak hour traffic) is obtained for each peak hour. The factor has been applied to each peak hour matrix to obtain the warm up and cool down period matrices. The origin and destination zones corresponding to the LinSig matrix estimation is shown in Figure 4.1 below.

Figure 4.1 - O-D Matrix Zone Locations



4.1.3. Public Transport

4.1.4. The following bus routes are coded in the VISSIM models:

- 1 Jet Black
- 15 Sky Blue
- 26 Yellow

4.1.5. Bus frequency was obtained from the Timetables published on the Reading Buses website and replicated in the models. Bus dwell time was recorded on site for each bus routes and coded in the models.

4.1.4. Signal Timings

4.1.6. Four signalised junctions including M4 junction 12 were coded in the models. They are as following:

- TN024: A4 Bath Road / Langley Hill;
- TN037: A4 Bath Road / Pincents Lane;
- TN038: Pincents Lane / Ikea Car Park exit; and,
- M4 junction 12.

4.1.7. The first three listed junctions operate with Microprocessor Optimised Vehicle Actuation (MOVA)[1] system. Signal information, such as MOVA dataset, link diagram, traffic signal controller specifications was provided by WBC and coded in the VISSIM models.

4.1.8. In order to run the VISSIM models with MOVA control, PCMOVA[2] has been used. It is a software developed by TRL to allow MOVA to be connected to microsimulation modelling such as VISSIM.

4.1.9. At the time of the traffic surveys, the M4 junction 12 was operating with temporary fixed signal timings. Signal information was also provided by WBC and coded in the VISSIM models accordingly.

4.1.10. Two standalone signalised pedestrian crossings are also coded in the VISSIM models as puffin crossings based on the signal information provided by WBC. The crossings operate on pedestrian

[1] MOVA is developed by TRL https://trlsoftware.com/products/traffic-control/mova/
[2] PCMOVA is developed by TRL https://trlsoftware.com/products/junction-signal-design/pcmova/

demand (push button) and with the pedestrian demand levels calibrated against the surveyed pedestrian phase call rate.

4.1.5. Network Performance

4.1.11. Network performance statistics have been collected from all scenarios for weekday AM and weekday PM. A comparison between each scenario is shown in Table 4.2 and Table 4.3.

Table 4.2 - Network Performance Comparison AM Peak

Statistic	Base 2023	DN 2033	DS 2033
Delay Average (seconds)	66.6	92.3	93.6
Speed Average (mph)	28.4	24.5	24.3
Latent Demand (vehicles)	0	4	4

Table 4.3 - Network Performance Comparison PM Peak

Statistic	Base 2023	DN 2033	DS 2033
Delay Average (seconds)	61.9	68.8	68.4
Speed Average (mph)	28.4	27.2	27.3
Latent Demand (vehicles)	0	0	0

4.1.12. The tables above show very similar average delay and speed on the whole network between DM 2033 and DS 2033 scenarios in each peak. It indicates that the potential impact on the local highway network is negligible.

4.1.6. Journey Time

4.1.13. Journey time (JT) results for cars on the same routes as 2023 Base VISSIM models have been collected from the Future year 2033 VISSIM models. The four routes are shown in Figure 4.2 and Figure 4.3.

Figure 4.2 - Car Journey Time Routes 1 & 2

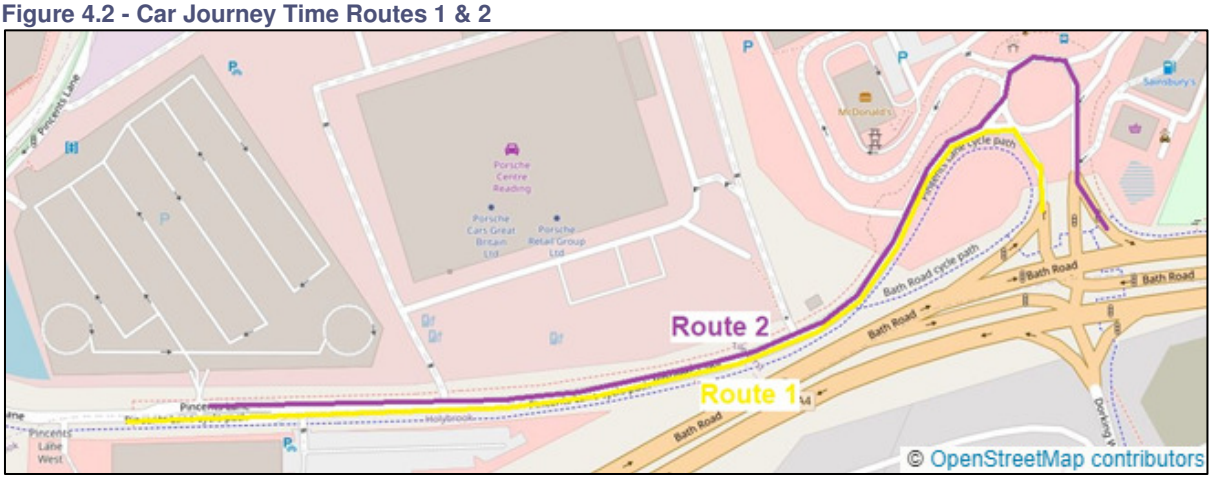
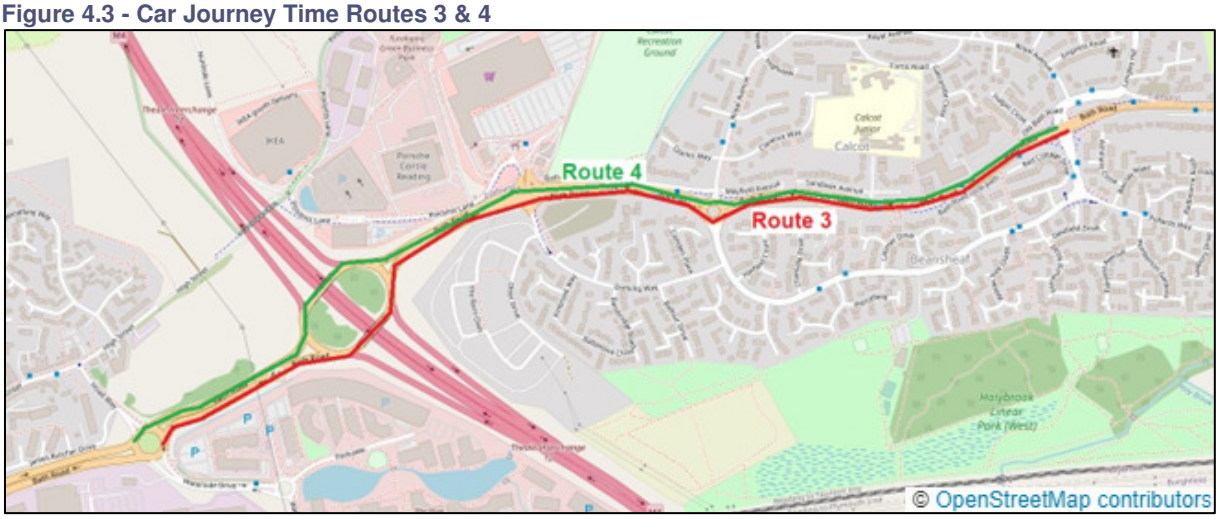


Figure 4.3 - Car Journey Time Routes 3 & 4



4.1.14. The journey time comparison expressed in seconds for cars is presented in Table 4.4 and Table 4.5.

Table 4.4 - Car Journey Time Comparison AM Peak

JT section	Base 2023	DN 2033	DS 2033
Yellow Route 1 WB	30	30	30
Purple Route 2 EB	49	48	49
Red Route 3 WB	180	184	185
Green Route 4 EB	209	238	241

Table 4.5 - Car Journey Time Comparison PM Peak

JT section	Base 2023	DN 2033	DS 2033
Yellow Route 1 WB	31	31	31
Purple Route 2 EB	58	59	61
Red Route 3 WB	168	174	173
Green Route 4 EB	199	201	204

4.1.15. The above comparisons show that between the DN and DS scenarios in both peak there are negligible increases in journey times, with the biggest increase of 3 seconds between DN and DS scenarios in both peak on the A4 Bath Road Eastbound (Green Route 4 EB).

4.1.7. Queue Length

4.1.16. A direct comparison of queue lengths between the observed and the modelled for the Base Year model validation is not recommended in TfL's MAP V4.0 and in DfT's Design Manual for Roads and Bridges (DMRB). However, comparing queue lengths between modelled scenarios can facilitate an understanding of the extent of any congestion that is occurring, provided reference is also made to other modelling parameters.

4.1.17. Table 4.6 below compares the average queue length between scenarios at the junction on the network.

Table 4.6 - Average Queue Length Comparison for the AM Peak (meters)

Junction	Base 2023	DN 2033	DS 2033
Dorking Way/A4	10.4	12.0	12.2
Sainsburys/ McDonalds Roundabout	0.3	0.4	0.4
Hoad Way/ Waterside Roundabout	1.8	16.4	22.5
M4/ Bath Road	12.2	27.6	28.0
Royal Avenue/ Charrington Road Roundabout	0.9	1.5	1.5
Old Bath Road/ Charrington	17.3	19.2	19.2
Dunelm Car Park/Multi-story Car Park	0.0	0.0	0.0
Ikea/Multi-story Car Park	0.1	0.1	0.1

Table 4.7 - Average Queue Length Comparison for the PM Peak (meters)

Junction	Base 2023	DN 2033	DS 2033
Dorking Way/A4	11.6	13.5	13.5
Sainsburys/ McDonalds Roundabout	4.2	5.6	6.0
Hoad Way/ Waterside Roundabout	2.7	6.7	7.2
M4/ Bath Road	8.1	10.9	10.5
Royal Avenue/ Charrington Road Roundabout	1.0	1.5	1.5
Old Bath Road/ Charrington	17.6	19.6	19.5
Dunelm Car Park/Multi-story Car Park	0.0	0.0	0.0
Ikea/Multi-story Car Park	0.3	0.4	0.4

4.1.18. The average queue length comparisons correspond to the journey time comparisons on the network where the eastbound direction is marginally delayed but with no significant increases between the DM and DS scenarios.

The Mean Maximum queue lengths have also been collected and compared between scenarios in Table 4.8 and

4.1.19. Table 4.9 below.

Table 4.8 - Mean Maximum Queue Length Comparison for the AM Peak (meters)

Junction	Base 2023	DN 2033	DS 2033
Dorking Way/A4	147.6	163.0	172.2
Sainsburys/ McDonalds Roundabout	39.0	42.9	42.3
Hoad Way/ Waterside Roundabout	94.6	299.4	353.7
M4/ Bath Road	142.7	435.7	420.9
Royal Avenue/ Charrington Road Roundabout	72.1	80.7	78.9
Old Bath Road/ Charrington	107.9	118.4	120.5
Dunelm Car Park/Multi-story Car Park	0.0	2.5	6.5
Ikea/Multi-story Car Park	27.3	25.9	26.0

Table 4.9 - Mean Maximum Queue Length Comparison for the PM Peak (meters)

Junction	Base 2023	DN 2033	DS 2033
Dorking Way/A4	134.5	149.8	145.0
Sainsburys/ McDonalds Roundabout	104.1	102.6	123.3
Hoad Way/ Waterside Roundabout	107.0	181.1	187.4
M4/ Bath Road	117.1	156.2	143.6
Royal Avenue/ Charrington Road Roundabout	74.4	83.1	73.7
Old Bath Road/ Charrington	144.9	164.9	175.8
Dunelm Car Park/Multi-story Car Park	16.3	17.9	18.8
Ikea/Multi-story Car Park	35.8	39.0	36.8

4.1.20. It again demonstrates that the proposed development has a negligible effect on the queue lengths on the network.

4.1.8. Level of Service (LOS)

4.1.21. The Level of Service for each major junction within the network has been extracted from the Forecast VISSIM models for each scenario.

4.1.22. A LOS of 'A' to 'C' suggests that the junction operates within the capacity (under 85% capacity), a LOS of 'D' suggests that the junction operates approaching its capacity (85%). A LOS of 'E' suggests that the junction operates at capacity, and a LOS of 'F' suggests that the junction operates over capacity.

4.1.23. Figures 4.4 & 4.5 display the LOS comparison between 2033 Do Nothing and Do Something scenarios for the AM and PM peaks. The LOS shown in the left circle is from DN scenario and the adjacent circle to the right represents the LOS for the DS scenario.

4.1.24. The overall junction LOS results suggest that all junctions within the network operate within capacity in both 2033 DN and DS scenarios, with a LOS of D reported on M4 Junction 12 in the AM peak in both scenarios. The detail of the junction's performance including delay per vehicle for all modelled scenarios is attached in **Appendix C**.

4.1.25. It is understood that this junction (M4 Junction 12) will be operating with MOVA in near future, which normally increases capacity at junctions.

Figure 4.4 - Overall Junction LOS Results Comparison between 2033 DN and DS AM Peak

Figure 4.5 - Overall Junction LOS Results Comparison between 2033 DN and DS PM Peak

5. Conclusions

5.1.1. Based on the Forecast VISSIM modelling result comparisons, including network performance statistics comparison, journey time comparison, queue length (average & mean maximum) and LOS comparison, it is concluded that the potential impact on the modelled highway network, caused by the commercial development proposed on Land to the North of A4 Bath Road, is negligible.

Appendix A – Pell Frischmann 'Local Model Validation Report' (LMVR) June 2023

Pell Frischmann

Land East of Pincents Lane, Tilehurst, West Berkshire

Local Model Validation Report (LMVR)

June 2023

Report Ref.		**Pincents Lane VISSIM LMVR V2.0**				
File Path		**\\Rsbgukfs01\lonengineering\1061--\106167 - Land East of Pincents Lane, Tilehurst\01 - WIP\Documents\Report\Pincents Lane VISSIM LMVR v2.0.docx**				
Rev	**Suit**	**Description**	**Date**	**Originator**	**Checker**	**Approver**
1.0		Draft	05-June-23	HQ	MH	MH
2.0		Draft	03-October-23	HQ	MH	MH
106167						

Prepared for

U and I (Pincents Lane) Ltd

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Contents

Figures

Tables

1 Introduction

1.1 Overview

1.1.1 Pell Frischmann was commissioned by U+I (Pincents Lane) Ltd ('U+I') to review and update the existing VISSIM micro-simulation modelling in connection with an outline planning application and proposals for a residential-led masterplan development (the 'proposed development') on Land to the east of Pincents Lane, Tilehurst, West Berkshire ('Land East of Pincents Lane' and the 'site'). The outline proposals are now for up to 165 residential dwellings (C3 Use Class) together with associated access arrangements and landscaping.

1.1.2 The existing VISSIM Base models were developed using traffic data collected in March 2019. The calibrated and validated Base VISSIM models together with a Local Model Validation Report (LMVR) were submitted to West Berkshire Council (WBC), in support of the planning application (ref: 19/00113/OUTMAJ).

1.1.3 The existing VISSIM 2019 Base models covering three peaks, AM Peak, PM peak and Saturday Peak, were audited by WBC's transport consultant WSP, and approved after having addressed WSP's comments. Upon the approved Based models, future scenarios 2023 VISSIM models were developed.

1.1.4 In order to reflect both the revised up-to-date 2023 traffic situation in the study area and the revised development proposals, Pell Frischmann have discussed with 'U+I' and agreed to update the existing VISSIM 2019 Base models with newly surveyed traffic data to form a new 2023 VISSIM Base modelling. Following that future scenarios 2028 VISSIM models will be developed.

1.1.5 VISSIM is a microscopic traffic flow simulation model based on car following and lane change logic. VISSIM can analyse vehicular traffic including bus / tram, pedestrian and bicycle operations under constraints such as lane configuration, traffic composition, traffic signals, and bus/tram stops. VISSIM does not follow the conventional link / node modelling system, but utilises a link / connector system that enables complex geometry to be modelled. The link / connector system also permits different traffic controls (signal, give way or stop) to be utilised anywhere in the model. VISSIM is also capable of modelling vehicle actuation traffic control utilising the Vehicle Actuated Programming (VAP) module as well as MOVA using the PCMOVA module from TRL. Therefore, it is the most appropriate tool for the modelling of complex geometry and traffic controls (give way and traffic signal) operating within the study area.

1.1.6 This LMVR presents the findings from the review of the highway network and calibration and validation of the new 2023 Base models.

2 VISSIM Modelling

2.1 Model Network Extent

2.1.1 The VISSIM 2023 Base model network is shown in Figure 2.1 below:

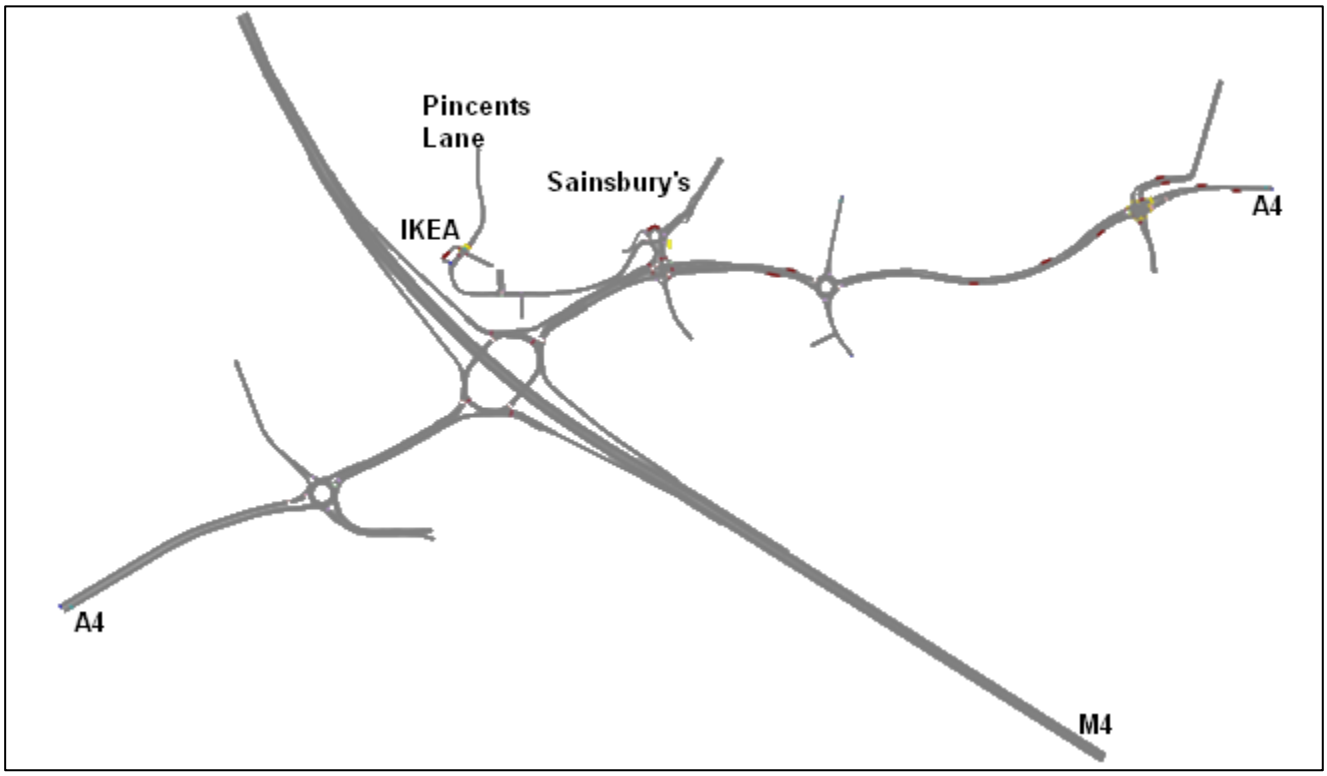


Figure 2.1- 2023 VISSIM Base Model Network Extent

2.1.2 Three junctions have been added in the Base model network during the review of the highway infrastructure. They are listed below:

- Ikea car park exit / Pincents Lane junction (signalised);
- Ikea car park access / Pincents Lane junction (non-signalised); and,
- Dunelm car park access / Pincents Lane junction (non-signalised).

2.1.3 In addition to the new junctions above, the rest of the network remains the same with the following junctions included:

- A4 Bath Road / Waterside Drive / Hoad way roundabout (non-signalised);
- M4 Junction 12 / A4 Bath Road roundabout (signalised);
- A4 Bath Road / Calcot Interchange / Dorking Way junction (signalised);
- Calcot Interchange / Pincents Lane / McDonald's / Sainsbury's retail car park gyratory (non-signalised);
- A4 Bath Road / Royal Avenue / Charrington Road roundabout (non-signalised); and,
- A4 Bath Road / Old Bath Road (Langley Hill) / Charrington Road junction (signalised).

2.2 Traffic Surveys

Classified Traffic Counts (CTCs)

2.2.1 Manual classified turning counts at junctions were collected on Friday 10th, Saturday 11th and Sunday 12th March 2023. The junctions are highlighted in the Figure 2.2 below:

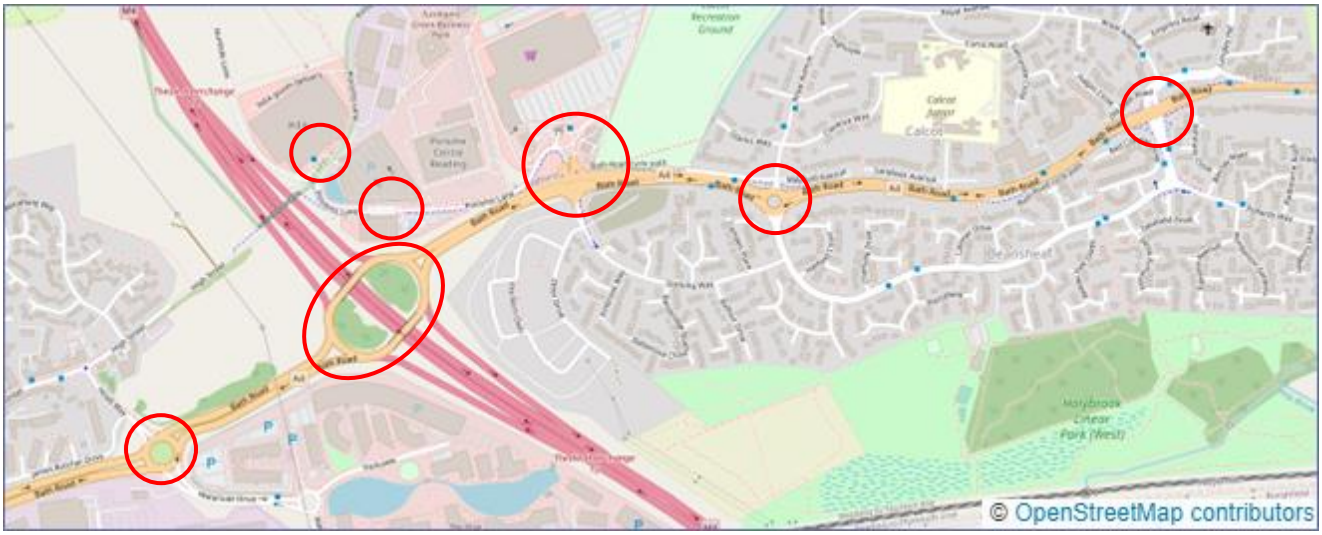


Figure 2.2 - 2023 CTCs Surveyed Junctions[1]

2.2.2 The time periods for the data collected for the CTCs are as follows:

- Friday AM 07:00 – 10:00;
- Friday PM 16:00 – 19:00;
- Saturday 09:00 – 22:00; and,
- Sunday 10:00 – 18:00.

2.2.3 The CTC surveys data was provided in 15-minute intervals and in the following vehicle categories:

- Car / Taxi;
- Light Goods Vehicles (LGVs);
- Other Good Vehicles Type 1 (OGV1);
- Other Goods Vehicles Type 2 (OGV2);
- Bus / Coach (PSV);
- Motorcycles (MCL); and,
- Pedal Cycles (PCL).

2.2.4 The following peak hours as determined by the 2023 traffic surveys are to be modelled in the VISSIM model:

- Weekday AM Peak: 07:30 – 08:30;
- Weekday PM Peak: 16:30 – 17:30; and,
- Saturday Pek: 12:00 – 13:00.

In addition, a warm up period of 15 minutes and a cool down period of 15 minutes has been modelled.

Automated Traffic Counters (ATCs)

2.2.5 Automated Traffic Counters (ATCs) surveys were also carried out to record two-way traffic volumes, speeds and vehicle classifications over a continuous 24 hour for a 14-day period at 3 locations as shown in Figure 2.3 below.

[1] Source: OpenStreetMap (http://www.openstreetmap.org/), © OpenStreetMap contributors (http://www.openstreetmap.org/copyright), March 2019; with Pell Frischmann annotations.

Figure 2.3 - ATCs Surveys Locations

2.2.6 The ATCs surveys were recorded from 1st to 14th March 2023 to coincide with the CTCs surveyed periods.

Queue Length

2.2.7 Queue length surveys were collected at the junctions, as listed in section 2.1.2 and 2.1.3, on the same dates as CTCs surveys were collected. It was recorded for the same time periods on the dates for a 5-minute interval.

Journey Time

2.2.8 Journey time surveys were carried out on the same dates (10th, 11th and 12th March 2023) covering the following time periods for both cars and buses:

- AM 07:00 – 10:00;
- PM 16:00 – 19:00;
- Saturday 11:00 – 14:00; and,
- Sunday 11:00 – 14:00.

2.2.9 Four routes for cars defined within the surveys are shown in Figures 2.4 and 2.5 below.

Figure 2.4 - Car Journey Time Routes 1 & 2

Figure 2.5 - Car Journey Time Routes 3 & 4

2.2.10 Two bus routes, 1 Jetblack and 15 Skyblue, were also surveyed for Journey Time in both directions as shown in Figure 2.6 below.

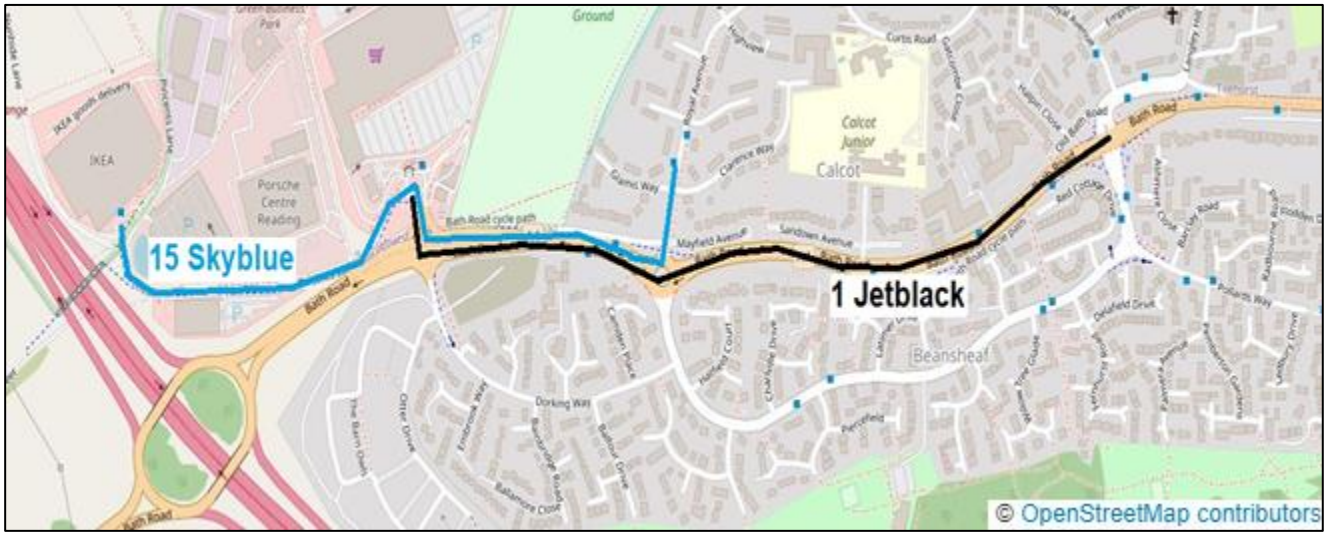


Figure 2.6 - Bus Journey Time Routes (two directions)

2.2.11 In accordance with DMRB Volume 12 Section 2 Part 1 Chapter 3, car journey time was collected using the 'moving observer method'. A minimum of eight runs per hour peak period was achieved for each route.

Pedestrian Crossing Call Rate (Demand Dependence)

2.2.12 The number of times the pedestrian phase was called at two standalone pedestrian crossings were also recorded on the same dates as the CTCs surveys. The two pedestrian crossings are listed as following:

- Site 1 Bath Road east of Cranbourne Avenue; and,
- Site 2 Bath Road west of roundabout with Royal Avenue.

2.3 Model Development

Model Set-up Details

2.3.1 Table 2.1 below lists the modelling set-up details.

Table 2.1 – Modelling Details

VISSIM Version Used	
VISSIM 2020 – 13	
Peak Hour Period	
AM 07:30 – 08:30, PM 16:30 – 17:30, Saturday 12:00 – 13:00	
Warmup / Cool-down Period	
15 minutes / 15 minutes	
Driving Behaviour	
Link Behaviour:	Wiedemann 99 / Wiedemann 74
Average Standstill Distance:	1.2m / 2.0m
Look Ahead Distance:	0 – 250m / 40m – 250m
Look Back Distance:	0 – 150m / 20m – 150m
Vehicle Classes	
Lights and HGVs	
VISSIM Traffic Assignment	
Dynamic Assignment	

Traffic Input / Routing

2.3.2 Given that dynamic assignment has been used for the VISSIM models, Origin to Destination (O-D) matrices have been produced based on the surveyed CTCs for AM peak, PM peak and Saturday peak. The matrices are separated into Lights and HGVs for each peak.

2.3.3 Matrix estimation has been carried out in LinSig for each peak hour (1 hour) to balance the traffic flows on the modelled highway network for Lights and HGVs. A factor has been calculated for the 15-minutes warm up and cool down period matrix for Lights and HGVs respectively, the calculation is based on the surveyed CTCs where a percentage (15 minute traffic / peak hour traffic) is obtained for each peak hour. The factor has been applied to each peak hour matrix to obtain the warm up and cool down period matrices. The origin and destination zones corresponding to the LinSig matrix estimation is shown in Figure 2.7 below:

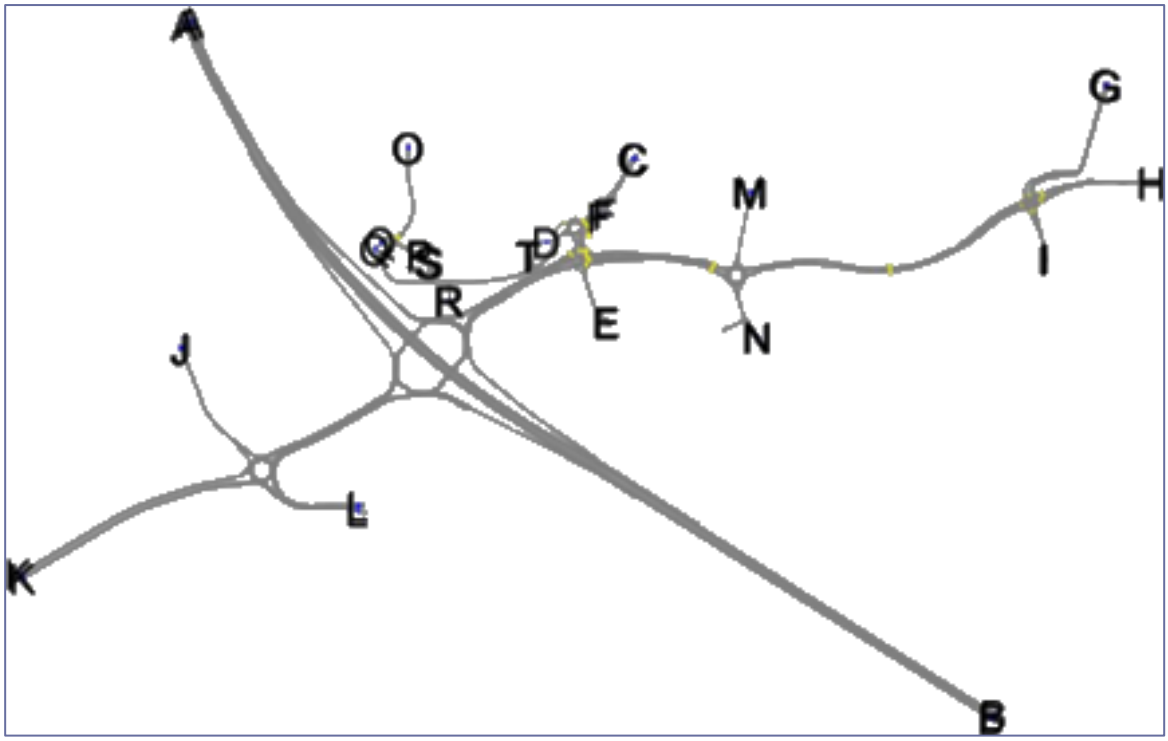


Figure 2.7 - O-D Matrix Zone Locations

Public Transport

2.3.4 The following bus routes are coded in the VISSIM models:

- 1 jetblack
- 15 sky blue
- 26 yellow

2.3.5 Bus frequency was obtained from the Timetables published on the Reading Buses website and replicated in the models. Bus dwell time was recorded on site for each bus routes and coded in the models.

Link Behaviour

2.3.6 The default urban (motorised) link behaviour type was adopted for the majority of the links in the model, it is based on the Wiedemann 74 car following model type. In order to replicate the observed merge and diverge driving behaviours, Wiedemann 99 car following type was chosen.

Speed Distribution

2.3.7 Speed distributions were recorded from the ATCs surveys that were undertaken on Friday 11th March and Saturday 12th March 2023.

2.3.8 The speed profiles were created based on the free flow speed between 10pm and 6am and were then replicated into the VISSIM models. The profiles were used for speed distributions and placed on the links at points where the road attributes changed.

Nodes and Edges

2.3.9 Nodes were added in the models for each junction where turning movements were possible. Turns that were unrealistic to represent in a dynamic assignment VISSIM modelling such as U-turns, were closed (so vehicles were unable to use the turn to improve convergence).

Priority Rules

2.3.10 Priority rules were added at locations where traffic needs to give way to other oncoming traffic, such as T-junctions, roundabout entries and yellow boxes.

Reduced Speed Areas (RSAs)

2.3.11 RSAs were added in the VISSIM models where traffic needs to slow down. The speed distribution chosen for each RSA was based upon the speed along the section of the road where it was located and the sharpness of the turn.

Conflict Areas

2.3.12 Conflict areas were also used in the VISSIM models to reflect give-way situations.

Signal Timings

2.3.13 Four signalised junctions including M4 junction 12 were coded in the models. They are as following:

- TN024 A4 Bath Road / Langley Hill;
- TN037 A4 Bath Road / Pincents Lane;
- TN038 Pincents Lane / Ikea Car Park exit; and,
- M4 junction 12.

2.3.14 The first three listed junctions operate with Microprocessor Optimised Vehicle Actuation (MOVA)[2] system. Signal information, such as MOVA dataset, link diagram, traffic signal controller specifications was provided by WBC and coded in the VISSIM models.

2.3.15 In order to run the VISSIM models with MOVA control, PCMOVA[3] has been used. It is a software developed by TRL to allow MOVA to be connected to microsimulation modelling such as VISSIM.

2.3.16 M4 junction 12 operates with temporary fixed signal timings. Signal information was also provided by WBC and coded in the VISSIM models accordingly.

2.3.17 Two standalone signalised pedestrian crossings are also coded in the VISSIM models as puffin crossings based on the signal information provided by WBC. The crossings operate on pedestrian demand (push button) and with the pedestrian demand levels calibrated against the surveyed pedestrian phase call rate.

[2] MOVA is developed by TRL https://trlsoftware.com/products/traffic-control/mova/
[3] PCMOVA is developed by TRL https://trlsoftware.com/products/junction-signal-design/pcmova/

3 Model Calibration and Validation

Calibration

3.1.1 The calibration process has been undertaken to adjust the model network to reflect the driving behaviour and traffic demand of the on-site situation. Turning counts were selected as a measure to be used to compare against observed conditions and achieve a match between the observed and modelled data.

3.1.2 The Geoffrey E. Havers (GEH) statistic was used to compare the observed with modelled flows. The GEH statistic is used to remove the bias that exists when comparing flows of different magnitudes using percentages and is calculated as follows:

$$GEH = \sqrt{\frac{(M-C)^2}{(M+C)/2}}$$

Where:
M is the modelled flow; and
C is the observed flow

3.1.3 In accordance with Transport Appraisal Guidance (TAG) Unit M3.1 Table 2 and Transport for London (TfL) MAP guidance, the following criteria has been chosen for the flow calibration in the Base VISSIM models:

- GEH value less than 5; and,
- with the overall GEH for individual turning flow achieve a minimum of 5 or less for at least 85% of measurements.

3.1.4 The flow calibration results are displayed in Table 3.1, Table 3.2 and Table 3.3 below:

Table 3.1 – Flow Calibration AM Peak

Node Name	From	To	Observed Flows	Modelled Flows	Absolute Difference	Relative Difference	GEH	Accept
Dorking Way/A4	Dorking Way NB	Bath Rd WB	113	111	-2	-2%	0.2	Accept
	From Pincents LT	Bath Rd EB	180	175	-5	-3%	0.4	Accept
	Bath Rd EB RT	Docking Way SB	29	27	-2	-7%	0.4	Accept
	Bath Road EB	Bath road EB	903	882	-21	-2%	0.7	Accept
	Bath Road EB LT	Pincents Lane RA NB	414	409	-5	-1%	0.2	Accept
	Bath Road WB RT	Pincents Lane RA NB	248	254	6	2%	0.4	Accept
	Bath Road WB	Bath Rd WB	1407	1403	-4	0%	0.1	Accept
	Bath Road WB	Docking Way SB	3	2	-1	-33%	0.6	Accept
	From Pincents SB	Bath Rd WB	305	294	-11	-4%	0.6	Accept
	From Pincents SB	Docking Way SB	6	6	0	0%	0.0	Accept
	Total		**3608**	**3563**	**-45**	**-1%**	**0.8**	**Accept**
Sainsburys/ McDonalds Roadabout	Sainsburys SWB	McDonalds	2	12	10	500%	3.8	Accept
	Sainsburys SWB	From Pincents SB	278	280	2	1%	0.1	Accept
	Sainsburys SWB	Pincents Ln WB	13	4	-9	-69%	3.1	Accept
	Pincents Ln EB	McDonalds	9	4	-5	-56%	2.0	Accept

	Pincents Ln EB	Sainsburys NEB	5	0	-5	-100%	3.2	Accept
	Pincents Ln EB	From Pincents SB	51	26	-25	-49%	4.0	Accept
	Petrol Station	From Pincents SB	157	156	-1	-1%	0.1	Accept
	Pincents Ln RA NB	McDonalds	174	177	3	2%	0.2	Accept
	Pincents Ln RA NB	Sainsburys NEB	269	271	2	1%	0.1	Accept
	Pincents Ln RA NB	Pincents Ln WB	214	210	-4	-2%	0.3	Accept
	Total		**1172**	**1140**	**-32**	**-3%**	**0.9**	**Accept**
Hoadway/ Waterside Roundabout	Bath RD WB	Hoad way NB	224	220	-4	-2%	0.3	Accept
	Bath RD WB	Bath Rd WB	1492	1489	-3	0%	0.1	Accept
	Bath RD EB	Bath RD EB	1107	1119	12	1%	0.4	Accept
	Bath RD EB	Hoad way NB	4	4	0	0%	0.0	Accept
	Bath RD EB	Waterside Drive SB	52	55	3	6%	0.4	Accept
	Hoad Way SB	Bath Rd EB	244	225	-19	-8%	1.2	Accept
	Hoad Way SB	Waterside Drive SB	5	0	-5	-100%	3.2	Accept
	Hoad Way SB	Bath Rd WB	20	41	21	105%	3.8	Accept
	Bath Rd WB RT	Waterside Drive SB	319	319	0	0%	0.0	Accept
	Waterside Drive NB	Bath Rd EB	.	122	0	0%	0.0	Accept
	Waterside Drive NB	Hoad way NB	4	4	0	0%	0.0	Accept
	Waterside Drive NB	Bath Rd WB	3	3	0	0%	0.0	Accept
	Waterside Drive NB RT	Bath Rd EB	122	122	0	0%	0.0	Accept
	Total		**3596**	**3723**	**127**	**4%**	**2.1**	**Accept**
M4/ Bath Road	M4 Slip N	Bath Rd EB	344	338	-6	-2%	0.3	Accept
	M4 Slip N	M4 Slip S	1	0	-1	-100%	1.4	Accept
	M4 Slip N	M4 Slip N	6	0	-6	-100%	3.5	Accept
	M4 Slip N	Bath Rd WB	266	276	10	4%	0.6	Accept
	Bath Rd EB	Bath Rd EB	528	512	-16	-3%	0.7	Accept
	Bath Rd EB	M4 Slip S	800	810	10	1%	0.4	Accept
	Bath Rd EB	M4 Slip N	127	132	5	4%	0.4	Accept
	M4 Slip S	Bath RD EB	474	467	-7	-1%	0.3	Accept
	M4 Slip S	M4 Slip S	9	0	-9	-100%	4.2	Accept
	M4 Slip S	Bath Rd WB	913	912	-1	0%	0.0	Accept
	M4 Slip S	M4 Slip N	0	0	0	0%	0.0	Accept
	Bath RD WB	M4 Slip S	730	713	-17	-2%	0.6	Accept
	Bath RD WB	M4 Slip N	239	237	-2	-1%	0.1	Accept
	Bath RD WB	Bath Rd EB	0	3	3	0%	2.4	Accept
	Bath RD WB	Bath Rd WB	861	844	-17	-2%	0.6	Accept
	Total		**5298**	**5244**	**-54**	**-1%**	**0.7**	**Accept**
Royal Avenue/ Charrington Road Roundabout	Bath Rd EB	Bath Rd EB	954	934	-20	-2%	0.7	Accept
	Bath Rd EB	Charrington RD SB	40	49	9	23%	1.3	Accept
	Bath Rd EB	Royal Evenue NB	65	73	8	12%	1.0	Accept

	Bath Rd WB	Bath Rd WB	1442	1463	21	1%	0.6	Accept
	Bath Rd WB	Charrington RD SB	6	4	-2	-33%	0.9	Accept
	Bath Rd WB	Royal Evenue NB	10	0	-10	-100%	4.5	Accept
	Charrington Rd NB	Bath Rd WB	110	108	-2	-2%	0.2	Accept
	Charrington Rd NB	Bath Rd EB	29	27	-2	-7%	0.4	Accept
	Charrington Rd NB	Royal Evenue NB	11	20	9	82%	2.3	Accept
	Royal Avenue SB	Bath Rd WB	82	93	11	13%	1.2	Accept
	Royal Avenue SB	Bath Rd EB	24	21	-3	-13%	0.6	Accept
	Royal Avenue SB	Charrington RD SB	7	0	-7	-100%	3.7	Accept
	Total		**2780**	**2792**	**12**	**0%**	**0.2**	**Accept**
Old Bath Road/ Charrington	Bath Rd EB	Charrington Rd SB	5	4	-1	-20%	0.5	Accept
	Bath Rd EB	Bath Rd EB	497	490	-7	-1%	0.3	Accept
	Bath Rd EB	Old Bath Rd NB	498	483	-15	-3%	0.7	Accept
	Bath Rd WB	Bath Rd WB	718	712	-6	-1%	0.2	Accept
	Bath Rd WB	Old Bath Rd NB	129	134	5	4%	0.4	Accept
	Bath Rd WB	Charrington RD SB	32	32	0	0%	0.0	Accept
	Charrington Rd NB	Bath Rd WB	22	21	-1	-5%	0.2	Accept
	Charrington Rd NB	Bath Rd EB	60	60	0	0%	0.0	Accept
	Charrington Rd NB	Old Bath Rd NB	82	83	1	1%	0.1	Accept
	Old Bath Rd SB	Bath Rd WB	737	737	0	0%	0.0	Accept
	Old Bath Rd SB	Bath Rd EB	52	54	2	4%	0.3	Accept
	Old Bath Rd SB	Charrington RD SB	17	17	0	0%	0.0	Accept
	Total		**2849**	**2827**	**-22**	**-1%**	**0.4**	**Accept**
Dunelm Car Park/Multi-story Car Park	Pincents Lane WB	Dunelm Car Park	1	0	-1	-100%	1.4	Accept
	Pincents Lane WB	Pincents Lane WB	65	50	-15	-23%	2.0	Accept
	Pincents Lane WB	Ikea Access Car Park	20	19	-1	-5%	0.2	Accept
	Dunelm Car Park	Pincents Lane WB	0	0	0	0%	0.0	Accept
	Dunelm Car Park	Ikea Access Car Park	0	0	0	0%	0.0	Accept
	Dunelm Car Park	Pincents Lane EB	2	0	-2	-100%	2.0	Accept
	Pincents Lane EB	Ikea Access Car Park	0	0	0	0%	0.0	Accept
	Pincents Lane EB	Pincents Lane EB	37	14	-23	-62%	4.6	Accept
	Pincents Lane EB	Dunelm Car Park	0	0	0	0%	0.0	Accept
	Ikea Access Car Park	Pincents Lane EB	2	0	-2	-100%	2.0	Accept
	Ikea Access Car Park	Dunelm Car Park	0	0	0	0%	0.0	Accept
	Ikea Access Car Park	Pincents Lane WB	0	0	0	0%	0.0	Accept
	Total		**127**	**83**	**-44**	**-35%**	**4.3**	**Accept**
Ikea/Multi-story Car Park	Pincents Lane NB	Bus Station	2	6	4	200%	2.0	Accept
	Pincents Lane NB	Pincents Lane NB	46	43	-3	-7%	0.4	Accept
	Pincents Lane NB	Ikea Car Park	1	0	-1	-100%	1.4	Accept

	Bus Station	Pincents Lane NB	0	6	6	0%	3.5	Accept
	Bus Station	Pincents Lane SB	1	6	5	500%	2.7	Accept
	Pincents Lane SB	Pincents Lane SB	10	8	-2	-20%	0.7	Accept
	Ikea Car Park	Pincents Lane SB	1	0	-1	-100%	1.4	Accept
	Total		**61**	**69**	**8**	**13%**	**1.0**	**Accept**
							Overall with GEH of 5 or less	**100%**

Table 3.2 – Flow Calibration PM Peak

Node Name	From	To	Observed Flows	Modelled Flows	Absolute Difference	Relative Difference	GEH	Accept
Dorking Way/A4	Dorking Way NB	Bath Rd WB	32	32	0	0%	0.0	Accept
	From Pincents LT	Bath Rd EB	479	466	-13	-3%	0.6	Accept
	Bath Rd EB RT	Docking Way SB	55	55	0	0%	0.0	Accept
	Bath Road EB	Bath road EB	1212	1224	12	1%	0.3	Accept
	Bath Road EB LT	Pincents Lane RA NB	600	580	-20	-3%	0.8	Accept
	Bath Road WB RT	Pincents Lane RA NB	364	362	-2	-1%	0.1	Accept
	Bath Road WB	Bath Rd WB	1018	1024	6	1%	0.2	Accept
	Bath Road WB	Docking Way SB	4	4	0	0%	0.0	Accept
	From Pincents SB	Bath Rd WB	625	615	-10	-2%	0.4	Accept
	From Pincents SB	Docking Way SB	24	23	-1	-4%	0.2	Accept
	Total		**4413**	**4385**	**-28**	**-1%**	**0.4**	**Accept**
Sainsburys/ McDonalds Roadabout	Sainsburys SWB	McDonalds	1	15	14	1400%	4.9	Accept
	Sainsburys SWB	From Pincents SB	586	590	4	1%	0.2	Accept
	Sainsburys SWB	Pincents Ln WB	19	2	-17	-89%	5.2	Reject
	Pincents Ln EB	McDonalds	32	26	-6	-19%	1.1	Accept
	Pincents Ln EB	Sainsburys NEB	45	21	-24	-53%	4.2	Accept
	Pincents Ln EB	From Pincents SB	317	323	6	2%	0.3	Accept
	Petrol Station	From Pincents SB	221	181	-40	-18%	2.8	Accept
	Pincents Ln RA NB	McDonalds	314	289	-25	-8%	1.4	Accept
	Pincents Ln RA NB	Sainsburys NEB	409	434	25	6%	1.2	Accept
	Pincents Ln RA NB	Pincents Ln WB	237	214	-23	-10%	1.5	Accept
	Total		**2181**	**2095**	**-86**	**-4%**	**1.9**	**Accept**
Hoadway/ Waterside Roundabout	Bath RD WB	Hoad way NB	203	203	0	0%	0.0	Accept
	Bath RD WB	Bath Rd WB	1267	1272	5	0%	0.1	Accept
	Bath RD EB	Bath RD EB	1098	1101	3	0%	0.1	Accept
	Bath RD EB	Hoad way NB	11	11	0	0%	0.0	Accept
	Bath RD EB	Waterside Drive SB	14	15	1	7%	0.3	Accept
	Hoad Way SB	Bath Rd EB	233	231	-2	-1%	0.1	Accept
	Hoad Way SB	Waterside Drive SB	2	0	-2	-100%	2.0	Accept
	Hoad Way SB	Bath Rd WB	6	12	6	100%	2.0	Accept
	Bath Rd WB RT	Waterside Drive SB	108	110	2	2%	0.2	Accept

	Waterside Drive NB	Bath Rd EB	392	391	-1	0%	0.1	Accept
	Waterside Drive NB	Hoad way NB	6	10	4	67%	1.4	Accept
	Waterside Drive NB	Bath Rd WB	23	23	0	0%	0.0	Accept
	Waterside Drive NB RT	Bath Rd EB	392	391	-1	0%	0.1	Accept
	Total		**3755**	**3770**	**15**	**0%**	**0.2**	**Accept**
M4/ Bath Road	M4 Slip N	Bath Rd EB	338	331	-7	-2%	0.4	Accept
	M4 Slip N	M4 Slip S	0	0	0	0%	0.0	Accept
	M4 Slip N	M4 Slip N	1	0	-1	-100%	1.4	Accept
	M4 Slip N	Bath Rd WB	93	96	3	3%	0.3	Accept
	Bath Rd EB	Bath Rd EB	784	762	-22	-3%	0.8	Accept
	Bath Rd EB	M4 Slip S	790	799	9	1%	0.3	Accept
	Bath Rd EB	M4 Slip N	151	155	4	3%	0.3	Accept
	M4 Slip S	Bath RD EB	745	747	2	0%	0.1	Accept
	M4 Slip S	M4 Slip S	5	0	-5	-100%	3.2	Accept
	M4 Slip S	Bath Rd WB	782	802	20	3%	0.7	Accept
	M4 Slip S	M4 Slip N	22	0	-22	-100%	6.6	Reject
	Bath RD WB	M4 Slip S	623	622	-1	0%	0.0	Accept
	Bath RD WB	M4 Slip N	239	358	119	50%	6.9	Reject
	Bath RD WB	Bath Rd EB	0	6	6	0%	3.5	Accept
	Bath RD WB	Bath Rd WB	713	689	-24	-3%	0.9	Accept
	Total		**5286**	**5367**	**81**	**2%**	**1.1**	**Accept**
Royal Avenue/ Charrington Road Roundabout	Bath Rd EB	Bath Rd EB	1412	1423	11	1%	0.3	Accept
	Bath Rd EB	Charrington RD SB	140	149	9	6%	0.7	Accept
	Bath Rd EB	Royal Evenue NB	109	120	11	10%	1.0	Accept
	Bath Rd WB	Bath Rd WB	1221	1249	28	2%	0.8	Accept
	Bath Rd WB	Charrington RD SB	35	31	-4	-11%	0.7	Accept
	Bath Rd WB	Royal Evenue NB	4	0	-4	-100%	2.8	Accept
	Charrington Rd NB	Bath Rd WB	87	74	-13	-15%	1.4	Accept
	Charrington Rd NB	Bath Rd EB	15	12	-3	-20%	0.8	Accept
	Charrington Rd NB	Royal Evenue NB	25	24	-1	-4%	0.2	Accept
	Royal Avenue SB	Bath Rd WB	50	61	11	22%	1.5	Accept
	Royal Avenue SB	Bath Rd EB	26	21	-5	-19%	1.0	Accept
	Royal Avenue SB	Charrington RD SB	5	0	-5	-100%	3.2	Accept
	Total		**3129**	**3164**	**35**	**1%**	**0.6**	**Accept**
Old Bath Road/ Charrington	Bath Rd EB	Charrington Rd SB	6	6	0	0%	0.0	Accept
	Bath Rd EB	Bath Rd EB	641	636	-5	-1%	0.2	Accept
	Bath Rd EB	Old Bath Rd NB	814	807	-7	-1%	0.2	Accept
	Bath Rd WB	Bath Rd WB	658	655	-3	0%	0.1	Accept
	Bath Rd WB	Old Bath Rd NB	101	106	5	5%	0.5	Accept
	Bath Rd WB	Charrington RD SB	51	52	1	2%	0.1	Accept
	Charrington Rd NB	Bath Rd WB	6	5	-1	-17%	0.4	Accept
	Charrington Rd NB	Bath Rd EB	63	64	1	2%	0.1	Accept

	Charrington Rd NB	Old Bath Rd NB	55	55	0	0%	0.0	Accept
	Old Bath Rd SB	Bath Rd WB	620	613	-7	-1%	0.3	Accept
	Old Bath Rd SB	Bath Rd EB	67	69	2	3%	0.2	Accept
	Old Bath Rd SB	Charrington RD SB	52	51	-1	-2%	0.1	Accept
	Total		**3134**	**3119**	**-15**	**0%**	**0.3**	**Accept**
Dunelm Car Park/Multi-story Car Park	Pincents Lane WB	Dunelm Car Park	38	38	0	0%	0.0	Accept
	Pincents Lane WB	Pincents Lane WB	50	38	-12	-24%	1.8	Accept
	Pincents Lane WB	Ikea Access Car Park	138	129	-9	-7%	0.8	Accept
	Dunelm Car Park	Pincents Lane WB	3	0	-3	-100%	2.4	Accept
	Dunelm Car Park	Ikea Access Car Park	8	9	1	13%	0.3	Accept
	Dunelm Car Park	Pincents Lane EB	33	35	2	6%	0.3	Accept
	Pincents Lane EB	Ikea Access Car Park	1	0	-1	-100%	1.4	Accept
	Pincents Lane EB	Pincents Lane EB	155	145	-10	-6%	0.8	Accept
	Pincents Lane EB	Dunelm Car Park	4	2	-2	-50%	1.2	Accept
	Ikea Access Car Park	Pincents Lane EB	108	106	-2	-2%	0.2	Accept
	Ikea Access Car Park	Dunelm Car Park	8	2	-6	-75%	2.7	Accept
	Ikea Access Car Park	Pincents Lane WB	0	7	7	0%	3.7	Accept
	Total		**546**	**511**	**-35**	**-6%**	**1.5**	**Accept**
Ikea/Multi-story Car Park	Pincents Lane NB	Bus Station	3	8	5	167%	2.1	Accept
	Pincents Lane NB	Pincents Lane NB	19	18	-1	-5%	0.2	Accept
	Pincents Lane NB	Ikea Car Park	16	19	3	19%	0.7	Accept
	Bus Station	Pincents Lane NB	0	7	7	0%	3.7	Accept
	Bus Station	Pincents Lane SB	2	14	12	600%	4.2	Accept
	Pincents Lane SB	Pincents Lane SB	69	67	-2	-3%	0.2	Accept
	Ikea Car Park	Pincents Lane SB	64	65	1	2%	0.1	Accept
	Total		**173**	**198**	**25**	**14%**	**1.8**	**Accept**
							Overall with GEH of 5 or less	**97%**

Table 3.3 – Flow Calibration Saturday Peak

Node Name	From	To	Observed Flows	Modelled Flows	Absolute Difference	Relative Difference	GEH	Accept
Dorking Way/A4	Dorking Way NB	Bath Rd WB	55	55	0	0%	0.0	Accept
	From Pincents LT	Bath Rd EB	501	487	-14	-3%	0.6	Accept
	Bath Rd EB RT	Docking Way SB	22	23	1	5%	0.2	Accept
	Bath Road EB	Bath road EB	983	968	-15	-2%	0.5	Accept
	Bath Road EB LT	Pincents Lane RA NB	841	852	11	1%	0.4	Accept
	Bath Road WB RT	Pincents Lane RA NB	500	498	-2	0%	0.1	Accept

	Bath Road WB	Bath Rd WB	1051	1029	-22	-2%	0.7	Accept
	Bath Road WB	Docking Way SB	11	10	-1	-9%	0.3	Accept
	From Pincents SB	Bath Rd WB	701	701	0	0%	0.0	Accept
	From Pincents SB	Docking Way SB	14	13	-1	-7%	0.3	Accept
	Total		**4679**	**4636**	**-43**	**-1%**	**0.6**	**Accept**
Sainsburys/ McDonalds Roadabout	Sainsburys SWB	McDonalds	21	24	22	1100%	0.6	Accept
	Sainsburys SWB	From Pincents SB	642	647	5	1%	0.2	Accept
	Sainsburys SWB	Pincents Ln WB	2	1	-20	-95%	0.8	Accept
	Pincents Ln EB	McDonalds	66	65	-1	-2%	0.1	Accept
	Pincents Ln EB	Sainsburys NEB	63	42	-21	-33%	2.9	Accept
	Pincents Ln EB	From Pincents SB	342	341	-1	0%	0.1	Accept
	Petrol Station	From Pincents SB	223	201	-22	-10%	1.5	Accept
	Pincents Ln RA NB	McDonalds	306	327	21	7%	1.2	Accept
	Pincents Ln RA NB	Sainsburys NEB	466	486	20	4%	0.9	Accept
	Pincents Ln RA NB	Pincents Ln WB	560	532	-28	-5%	1.2	Accept
	Total		**2691**	**2666**	**-25**	**-1%**	**0.5**	**Accept**
Hoadway/ Waterside Roundabout	Bath RD WB	Hoad way NB	156	151	-5	-3%	0.4	Accept
	Bath RD WB	Bath Rd WB	1184	1182	-2	0%	0.1	Accept
	Bath RD EB	Bath RD EB	1154	1170	16	1%	0.5	Accept
	Bath RD EB	Hoad way NB	6	6	0	0%	0.0	Accept
	Bath RD EB	Waterside Drive SB	14	14	0	0%	0.0	Accept
	Hoad Way SB	Bath Rd EB	197	195	-2	-1%	0.1	Accept
	Hoad Way SB	Waterside Drive SB	3	1	-2	-67%	1.4	Accept
	Hoad Way SB	Bath Rd WB	17	22	5	29%	1.1	Accept
	Bath Rd WB RT	Waterside Drive SB	56	55	-1	-2%	0.1	Accept
	Waterside Drive NB	Bath Rd EB	121	122	1	1%	0.1	Accept
	Waterside Drive NB	Hoad way NB	4	4	0	0%	0.0	Accept
	Waterside Drive NB	Bath Rd WB	6	6	0	0%	0.0	Accept
	Waterside Drive NB RT	Bath Rd EB	121	122	1	1%	0.1	Accept
	Total		**3039**	**3050**	**11**	**0%**	**0.2**	**Accept**
M4/Bath Road	M4 Slip N	Bath Rd EB	381	386	5	1%	0.3	Accept
	M4 Slip N	M4 Slip S	6	0	-6	-100%	3.5	Accept
	M4 Slip N	M4 Slip N	4	0	-4	-100%	2.8	Accept
	M4 Slip N	Bath Rd WB	91	94	3	3%	0.3	Accept
	Bath Rd EB	Bath Rd EB	656	638	-18	-3%	0.7	Accept
	Bath Rd EB	M4 Slip S	746	749	3	0%	0.1	Accept
	Bath Rd EB	M4 Slip N	77	80	3	4%	0.3	Accept
	M4 Slip S	Bath RD EB	809	816	7	1%	0.2	Accept
	M4 Slip S	M4 Slip S	5	0	-5	-100%	3.2	Accept
	M4 Slip S	Bath Rd WB	681	691	10	1%	0.4	Accept
	M4 Slip S	M4 Slip N	0	0	0	0%	0.0	Accept
	Bath RD WB	M4 Slip S	854	836	-18	-2%	0.6	Accept

	Bath RD WB	M4 Slip N	324	321	-3	-1%	0.2	Accept
	Bath RD WB	Bath Rd EB	0	11	11	0%	4.7	Accept
	Bath RD WB	Bath Rd WB	629	606	-23	-4%	0.9	Accept
	Total		**5263**	**5228**	**-35**	**-1%**	**0.5**	**Accept**
Royal Avenue/ Charrington Road Roundabout	Bath Rd EB	Bath Rd EB	1299	1295	-4	0%	0.1	Accept
	Bath Rd EB	Charrington RD SB	84	101	17	20%	1.8	Accept
	Bath Rd EB	Royal Evenue NB	55	63	8	15%	1.0	Accept
	Bath Rd WB	Bath Rd WB	1341	1350	9	1%	0.2	Accept
	Bath Rd WB	Charrington RD SB	27	21	-6	-22%	1.2	Accept
	Bath Rd WB	Royal Evenue NB	20	0	-20	-100%	6.3	Reject
	Charrington Rd NB	Bath Rd WB	120	110	-10	-8%	0.9	Accept
	Charrington Rd NB	Bath Rd EB	34	33	-1	-3%	0.2	Accept
	Charrington Rd NB	Royal Evenue NB	1	19	18	1800%	5.7	Reject
	Royal Avenue SB	Bath Rd WB	55	72	17	31%	2.1	Accept
	Royal Avenue SB	Bath Rd EB	27	20	-7	-26%	1.4	Accept
	Royal Avenue SB	Charrington RD SB	9	0	-9	-100%	4.2	Accept
	Total		**3072**	**3084**	**12**	**0%**	**0.2**	**Accept**
Old Bath Road/ Charrington	Bath Rd EB	Charrington Rd SB	16	14	-2	-13%	0.5	Accept
	Bath Rd EB	Bath Rd EB	679	672	-7	-1%	0.3	Accept
	Bath Rd EB	Old Bath Rd NB	663	657	-6	-1%	0.2	Accept
	Bath Rd WB	Bath Rd WB	695	705	10	1%	0.4	Accept
	Bath Rd WB	Old Bath Rd NB	102	105	3	3%	0.3	Accept
	Bath Rd WB	Charrington RD SB	55	55	0	0%	0.0	Accept
	Charrington Rd NB	Bath Rd WB	20	19	-1	-5%	0.2	Accept
	Charrington Rd NB	Bath Rd EB	61	62	1	2%	0.1	Accept
	Charrington Rd NB	Old Bath Rd NB	82	83	1	1%	0.1	Accept
	Old Bath Rd SB	Bath Rd WB	643	649	6	1%	0.2	Accept
	Old Bath Rd SB	Bath Rd EB	83	85	2	2%	0.2	Accept
	Old Bath Rd SB	Charrington RD SB	42	42	0	0%	0.0	Accept
	Total		**3141**	**3148**	**7**	**0%**	**0.1**	**Accept**
Dunelm Car Park/Multi-story Car Park	Pincents Lane WB	Dunelm Car Park	101	103	2	2%	0.2	Accept
	Pincents Lane WB	Pincents Lane WB	67	40	-27	-40%	3.7	Accept
	Pincents Lane WB	Ikea Access Car Park	408	389	-19	-5%	1.0	Accept
	Dunelm Car Park	Pincents Lane WB	2	0	-2	-100%	2.0	Accept
	Dunelm Car Park	Ikea Access Car Park	17	17	0	0%	0.0	Accept
	Dunelm Car Park	Pincents Lane EB	89	91	2	2%	0.2	Accept
	Pincents Lane EB	Ikea Access Car Park	0	0	0	0%	0.0	Accept
	Pincents Lane EB	Pincents Lane EB	85	88	3	4%	0.3	Accept
	Pincents Lane EB	Dunelm Car Park	5	4	-1	-20%	0.5	Accept
	Ikea Access Car Park	Pincents Lane EB	279	259	-20	-7%	1.2	Accept

	Ikea Access Car Park	Dunelm Car Park	27	26	-1	-4%	0.2	Accept
	Ikea Access Car Park	Pincents Lane WB	0	23	23	0%	6.8	Reject
	Total		**1080**	**1040**	**-40**	**-4%**	**1.2**	**Accept**
Ikea/Multi-story Car Park	Pincents Lane NB	Bus Station	1	7	6	600%	3.0	Accept
	Pincents Lane NB	Pincents Lane NB	22	19	-3	-14%	0.7	Accept
	Pincents Lane NB	Ikea Car Park	32	37	5	16%	0.9	Accept
	Bus Station	Pincents Lane NB	0	7	7	0%	3.7	Accept
	Bus Station	Pincents Lane SB	1	14	13	1300%	4.7	Accept
	Pincents Lane SB	Pincents Lane SB	22	23	1	5%	0.2	Accept
	Ikea Car Park	Pincents Lane SB	55	56	1	2%	0.1	Accept
	Total		**133**	**163**	**30**	**23%**	**2.5**	**Accept**
							Overall with GEH of 5 or less	**97%**

3.1.5 Three tables above show that flows are very well calibrated in accordance with the criteria set out in paragraph 3.1.3 for the 2023 Base VISSIM models for all peak hours. The AM Base model achieves 100% of the turns with a GEH value of less than 5, the PM and Saturday Base model both show 97%.

Validation

3.1.6 Journey time (JT) for both cars and buses has been used to validate the 2023 Base VISSIM models (AM, PM & Sat). As discussed in 2.2 Traffic Surveys, journey time was collected from four routes for cars and two routes for buses. The routes are shown in Figure 2.4, Figure 2.5 and Figure 2.6.

3.1.7 Table 3 in the DfT's TAG Unit M3.1 sets out the JT validation criterion and guideline

- Modelled times along routes should be within 15% of surveyed times; and,
- More than 85% of the routes should meet the validation criteria.

3.1.8 The results for journey time validation for cars are described in the tables below:

Table 3.4 – Journey Time Validation for Cars AM Peak

JT Section	Observed time (s)	Modelled time (s)	Difference (s)	Difference (%)
Yellow Route 1	27.8	30.2	2.4	8.7%
Purple Route 2	45.3	48.6	3.3	7.3%
Red Route 3	165.7	179.8	14.1	8.5%
Green Route 4	190.1	208.6	18.5	9.7%

Table 3.5 – Journey Time Validation for Cars PM Peak

JT Section	Observed time (s)	Modelled time (s)	Difference (s)	Difference (%)
Yellow Route 1	35.0	30.9	-4.2	-11.9%
Purple Route 2	55.7	57.8	2.2	3.9%
Red Route 3	168.7	168.2	-0.5	-0.3%
Green Route 4	209.5	199.3	-10.2	-4.9%

Table 3.6 – Journey Time Validation for Cars Saturday Peak

JT Section	Observed time (s)	Modelled time (s)	Difference (s)	Difference (%)
Yellow Route 1	28.0	30.6	2.6	9.4%
Purple Route 2	70.7	63.6	-7.0	-9.9%
Red Route 3	172.0	168.4	-3.6	-2.1%
Green Route 4	217.5	197.3	-20.2	-9.3%

3.1.9 Tables 3.4-3.6 above demonstrate that modelled journey time on the four routes are validated against the observed with relative difference is all within the +/-15% for the AM, PM and Saturday peaks.

3.1.10 The following tables show the journey time validation results for buses:

Table 3.7 – Journey Time Validation for Buses AM Peak

Bus Route	Observed time (s)	Modelled time (s)	Difference (s)	Difference (%)
15 Skyblue WB	203	231	28	13.8%
15 Skyblue EB	223	190	-33	-14.9%
1 Jetblack WB	169	189	20	12.1%
1 Jetblack EB	168	164	-4	-2.5%

Table 3.8 – Journey Time Validation for Buses PM Peak

Bus Route	Observed time (s)	Modelled time (s)	Difference (s)	Difference (%)
15 Skyblue WB	194	219	25	12.6%
15 Skyblue EB	247	228	-19	-7.8%
1 Jetblack WB	218	200	-18	-8.3%
1 Jetblack EB	186	200	14	7.4%

Table 3.9 – Journey Time Validation for Buses Saturday Peak

Bus Route	Observed time (s)	Modelled time (s)	Difference (s)	Difference (%)
15 Skyblue WB	322	317	-5	-1.7%
15 Skyblue EB	260	265	5	1.8%
1 Jetblack WB	183	208	25	13.6%
1 Jetblack EB	192	201	9	4.6%

3.1.11 Tables 3.7-3.9 show that journey time for buses is well validated with all the relative difference within +/-15% for all three peak times.

3.1.12 In addition to the journey time validation, the surveyed pedestrian call rate (i.e. demand dependence) has also used to validate the Base VISSIM models. The validation results are listed in the tables below.

Table 3.10 - Demand Dependence Validation for Two Pedestrian Crossings

Site No.	Peak Time	Observed Rate	Modelled Rate	Difference (%)
Site 1	AM	8	8	0%
	PM	4	4	0%
	Saturday	6	6	0%
Site 2	AM	17	16	-6%
	PM	8	8	0%
	Saturday	14	13	-7%

3.1.13 TfL's Model Auditing Process (MAP) V4.0 Engineer Guide for Design sets out the criteria for demand dependence validation. It needs to show a frequency of at least 90% of that observed on-street.

3.1.14 shows that demand dependence at the two signalised pedestrian crossings is well validated against the observed call rate for all three peak hours at both crossings.

Queue Length

3.1.15 Given that measuring queue length on site is subjective and note consistent to the measurements extracted from a VISSIM model, a direct comparison of queue lengths is not recommended in TfL's MAP V4.0 and in DMRB. However, surveyed queue lengths have been used as a reference to ensure queues observed at locations on site appear are broadly comparable to those in the model.

Level of Service (LOS)

3.1.16 The level of service for each major junction within the network has been extracted from the Base VISSIM models for each scenario. The results are displayed below in Figures 3.1-3.3

3.1.17 A LOS of A to C suggests that the junction operates within the capacity (under 85% capacity), a LOS of D suggests that the junction operates approaching it's capacity (85%). A LOS of E suggests that the junction operates at capacity, and a LOS of F suggests that the junction operates over capacity.

3.1.18 The overall junction LOS results suggest that all junctions within the network operate within capacity.

Figure 3.1 - Overall Junction LOS Results AM Peak

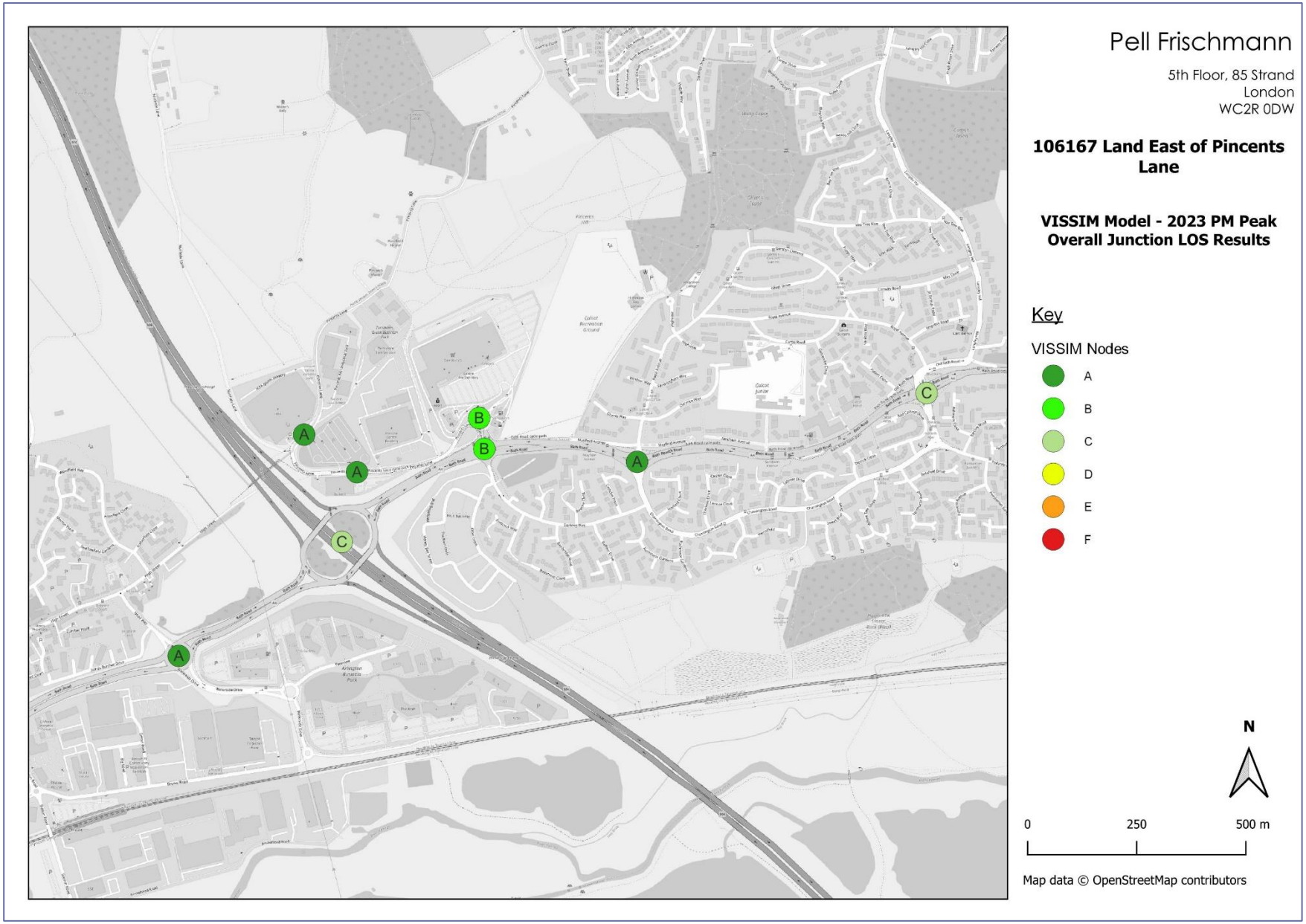


Figure 3.2 - Overall Junction LOS Results PM Peak

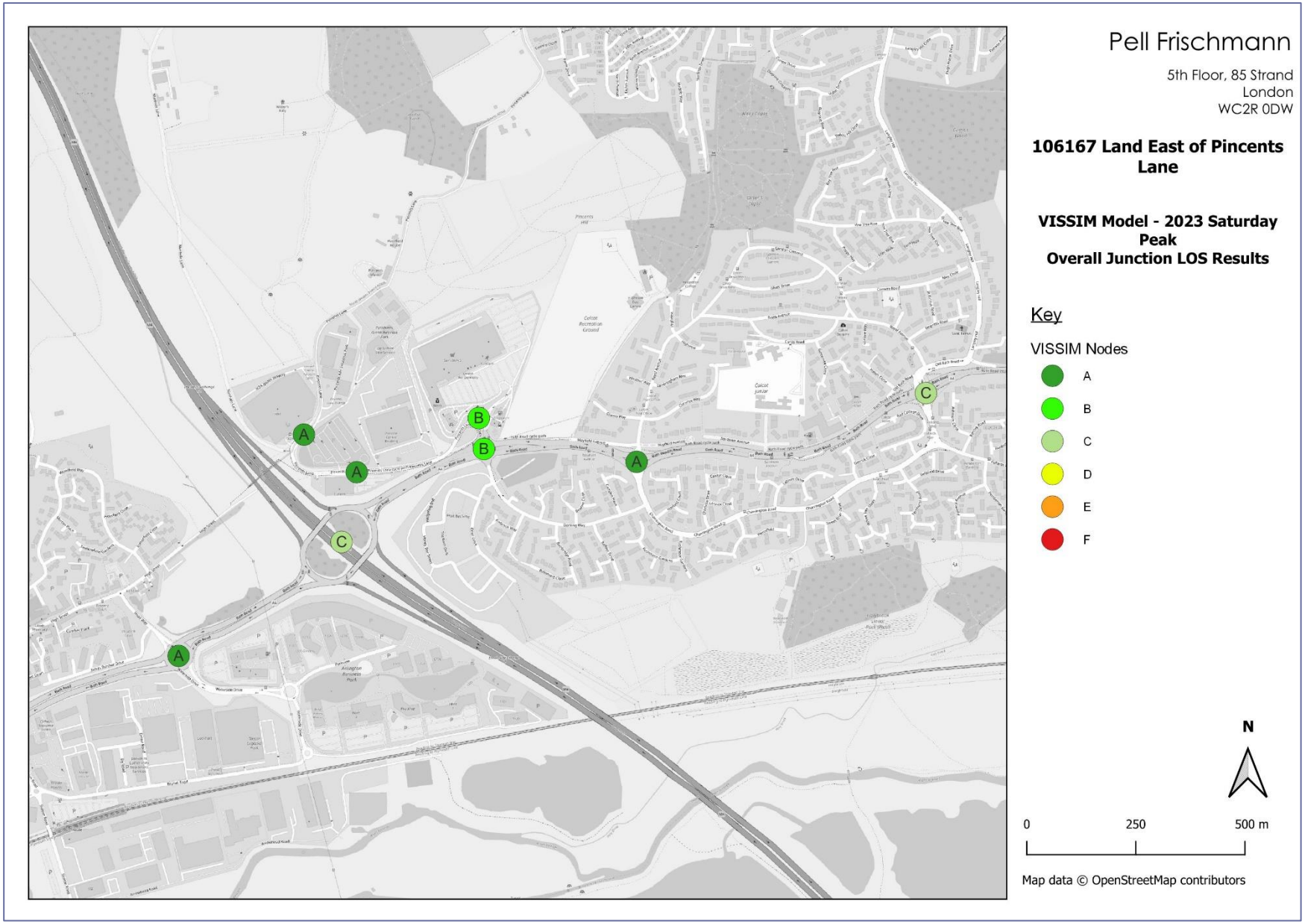


Figure 3.3 - Overall Junction LOS Results Saturday Peak

4 Conclusions

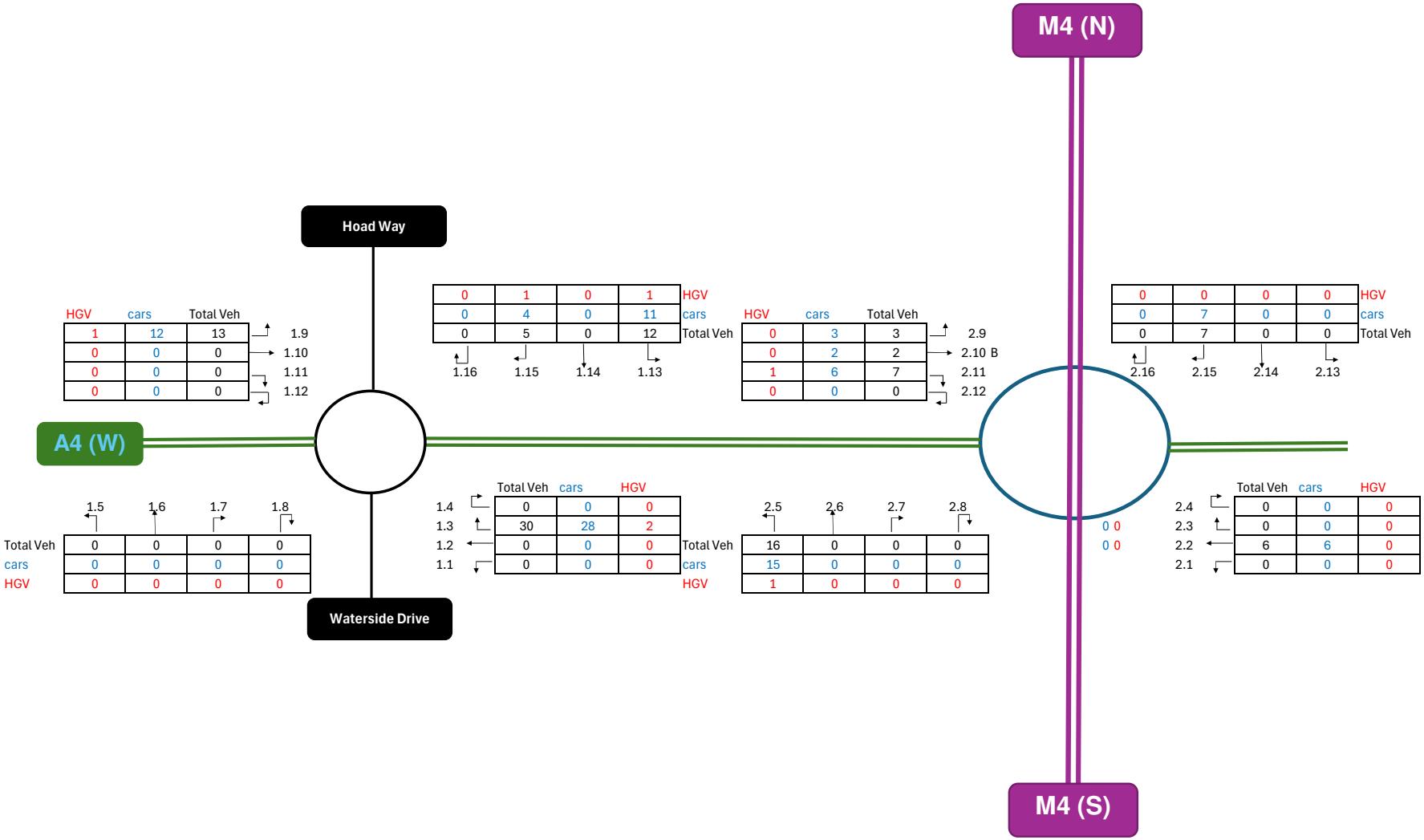
4.1.1 It is concluded that the 2023 Base VISSIM models are well calibrated and validated in accordance with TAG and TfL's guidelines on the basis of the following for all three peak times.

- Traffic flows are well calibrated;
- Journey time for cars and buses are well validated; and,
- Demand dependence for the two signalised pedestrian crossings is well validated.

4.1.2 Therefore, the 2023 Base VISSIM models are considered suitable for the purpose of testing future developments and network changes.

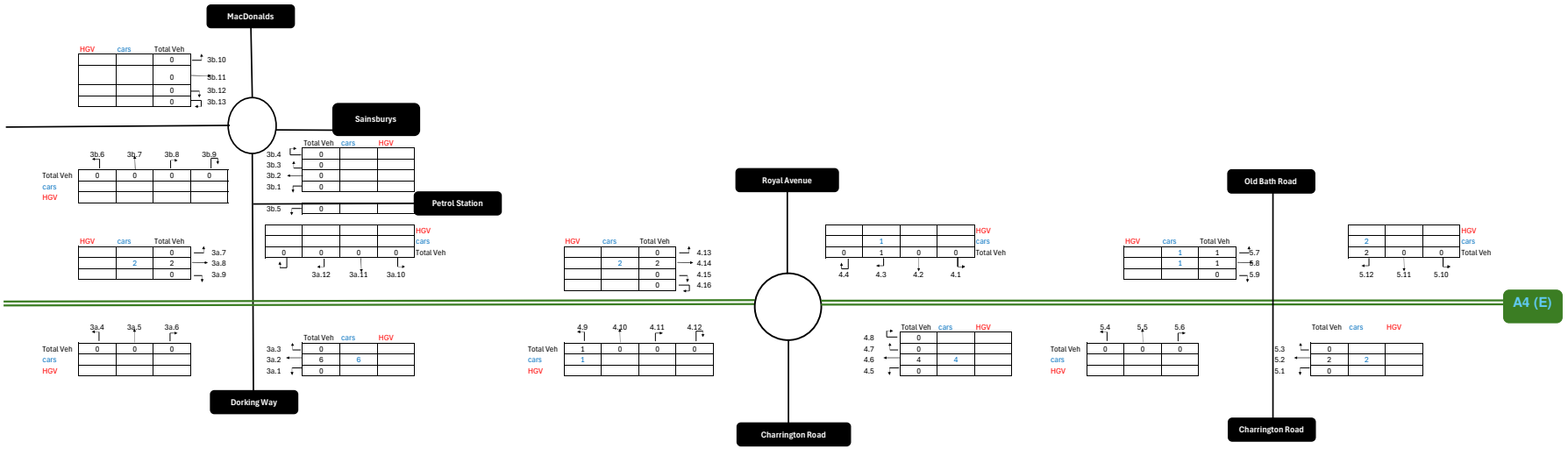
4.1.3 The level of service analysis indicates that all major junctions within the network operate within capacity.

Appendix B – Land North of A4 Bath Road, Proposed Development Trip Distribution

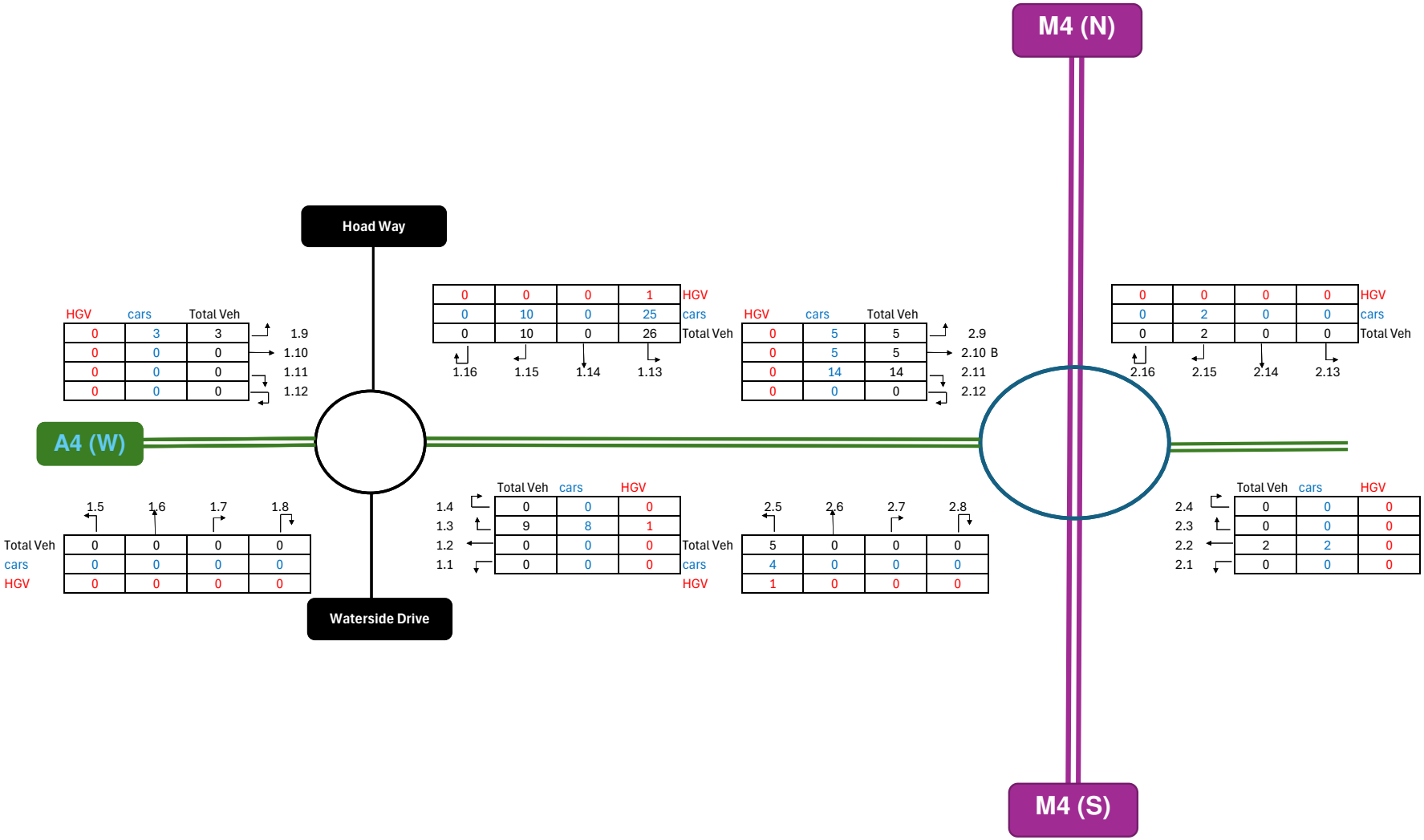


Proposed AM Traffic Flows

Sheet 1 of 2

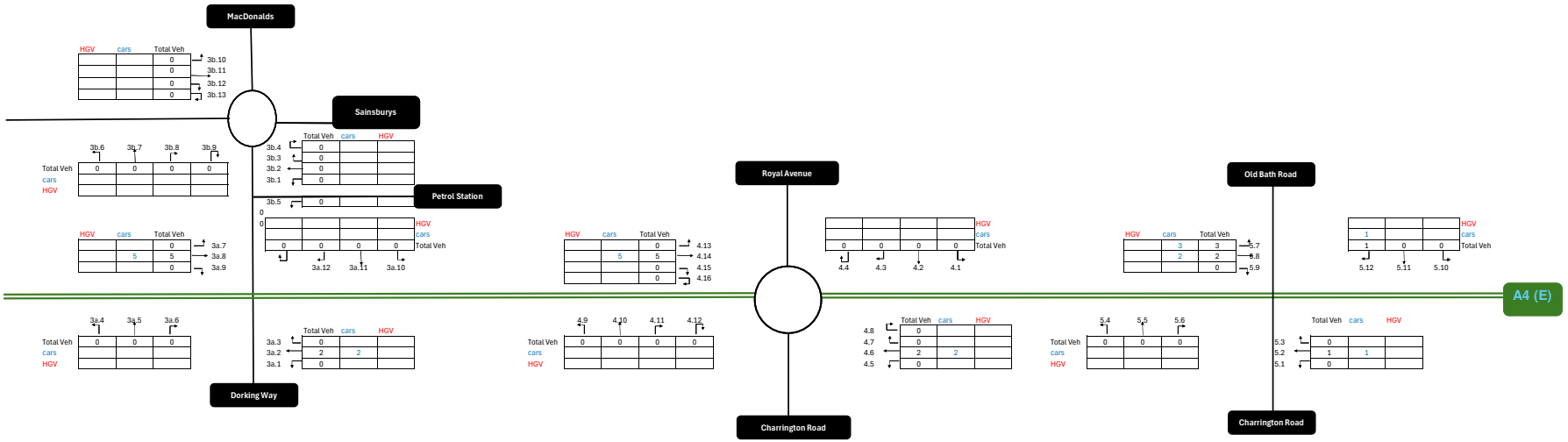


Proposed AM Traffic Flows
Sheet 2 of 2



Proposed PM Traffic Flows

Sheet 1 of 2



Proposed PM Traffic Flows
Sheet 2 of 2

Appendix C – Details of Junctions Performance for All Modelled Scenarios

Detail of Junctions Performance for All Modelled Scenarios

AM	Traffic Flow (vehicles)				Average Queue Length (meters)			Maximum Queue Length (meters)			Delay (seconds)			LOS			LOS_Val		
Junctions	Observed	Base 2023	DN 2033	DS 2033	Base 2023	DN 2033	DS 2033	Base 2023	DN 2033	DS 2033	Base 2023	DN 2033	DS 2033	Base 2023	DN 2033	DS 2033	Base 2023	DN 2033	DS 2033
Dorking Way/A4	3608	3563	3830	3834	10.4	12.0	12.2	147.6	163.0	172.2	20.9	21.8	21.9	C	C	C	3	3	3
Sainsburys/ McDonalds Roadabout	1172	1140	1229	1226	0.3	0.4	0.4	39.0	42.9	42.3	2.8	3.2	3.2	A	A	A	1	1	1
Hoadway/ Waterside Roundabout	3596	3723	4072	4116	1.8	16.4	22.5	94.6	299.4	353.7	5.3	18.0	19.1	A	C	C	1	3	3
M4/ Bath Road	5298	5244	5609	5643	12.2	27.6	28.0	142.7	435.7	420.9	35.7	48.7	49.0	D	D	D	4	4	4
Royal Avenue/ Charrington Road Roundabout	2780	2792	3009	3019	0.9	1.5	1.5	72.1	80.7	78.9	4.0	4.6	4.8	A	A	A	1	1	1
Old Bath Road/ Charrington	2849	2827	3027	3021	17.3	19.2	19.2	107.9	118.4	120.5	29.0	29.9	30.1	C	C	C	3	3	3
Dunelm Car Park/Multi-story Car Park	127	83	168	167	0.0	0.0	0.0	0.0	2.5	6.5	0.8	0.4	0.4	A	A	A	1	1	1
Ikea/Multi-story Car Park	61	69	154	155	0.1	0.1	0.1	27.3	25.9	26.0	4.0	3.5	3.6	A	A	A	1	1	1

PM	Traffic Flow (vehicles)				Average Queue Length (meters)			Maximum Queue Length (meters)			Delay (seconds)			LOS			LOS_Val		
Junctions	Observed	Base 2023	DN 2033	DS 2033	Base 2023	DN 2033	DS 2033	Base 2023	DN 2033	DS 2033	Base 2023	DN 2033	DS 2033	Base 2023	DN 2033	DS 2033	Base 2023	DN 2033	DS 2033
Dorking Way/A4	4413	4385	4687	4701	11.6	13.5	13.5	134.5	149.8	145.0	19.9	20.5	20.2	B	C	C	2	3	3
Sainsburys/ McDonalds Roadabout	2181	2095	2211	2205	4.2	5.6	6.0	104.1	102.6	123.3	10.4	12.4	13.0	B	B	B	2	2	2
Hoadway/ Waterside Roundabout	3755	3770	4151	4192	2.7	6.7	7.2	107.0	181.1	187.4	6.5	11.3	11.5	A	B	B	1	2	2
M4/ Bath Road	5286	5367	5806	5838	8.1	10.9	10.5	117.1	156.2	143.6	28.9	31.6	31.2	C	C	C	3	3	3
Royal Avenue/ Charrington Road Roundabout	3129	3164	3396	3400	1.0	1.5	1.5	74.4	83.1	73.7	3.5	4.3	4.3	A	A	A	1	1	1
Old Bath Road/ Charrington	3134	3119	3342	3340	17.6	19.6	19.5	144.9	164.9	175.8	25.8	26.8	26.7	C	C	C	3	3	3
Dunelm Car Park/Multi-story Car Park	546	511	597	598	0.0	0.0	0.0	16.3	17.9	18.8	1.6	1.6	1.6	A	A	A	1	1	1
Ikea/Multi-story Car Park	173	198	285	285	0.3	0.4	0.4	35.8	39.0	36.8	6.4	7.8	7.8	A	A	A	1	1	1