AtkinsRéalis

# Transport Modelling Report

South Oxfordshire District Council, Vale of White Horse District Council, and Oxfordshire County Council

25 September 2024

7.0

# SOUTH AND VALE JOINT LOCAL PLAN 2041

# Notice

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## Client signoff

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# 1. Introduction

## 1.1 Study Objectives

In early 2024, AtkinsRéalis was commissioned by Oxfordshire County Council (OCC) to further develop and use the Oxfordshire Strategic Model (OSM) to help assess the impacts of the Emerging South Oxfordshire and Vale of the White Horse Districts' ("South and Vale") Joint Local Plan 2041.

To deliver this analysis, it was first necessary to ensure that the 2018 base year within OSM was suitably replicating observed base year traffic flows within the area of focus (as is shown in Figure 1-1). The scope of work therefore included the local re-calibration of the highway model for most of the network in South and Vale districts to 2018 conditions.

The OSM was then run to build two 2041 future year scenarios: firstly, the forecast scenario without the emerging plan (to assess the adopted Vale of White Horse Local Plan 2031 Parts 1 & 2 and South Oxfordshire Local Plan 2035) and, secondly, to assess the Emerging South and Vale Joint Local Plan 2041. These capture the impact of planned and proposed future growth within the area of focus taking account of the latest land use assumptions including various transport infrastructure schemes, housing and employment developments, for both development scenarios.

## 1.2 Scope of Report

The structure of this Modelling Report is as follows:

- Chapter two provides an overview of the modelling methodology;
- Chapter three presents the local calibration work leading to an updated 2018 Base Year model;
- Chapter four presents the future year model forecasting assumptions used in the Adopted Local Plans and Emerging Joint Local Plan 2041 scenarios;
- Chapter five presents the results of the 2041 Adopted Local Plans scenario;
- Chapter six presents the results of the 2041 Emerging Joint Local Plan scenario; and
- Chapter seven provides a summary of the report and key findings.

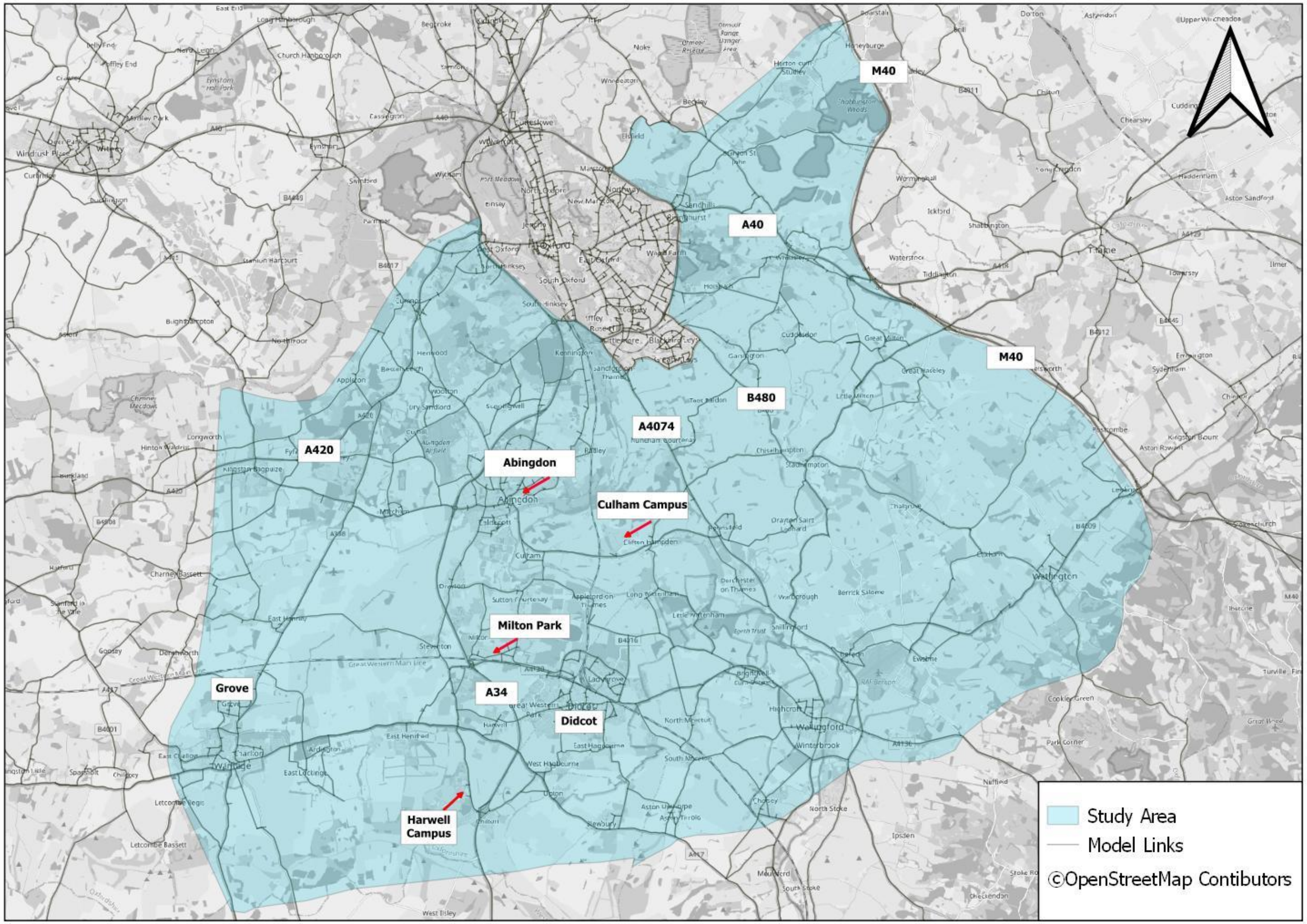


**Figure 1-1 - The area of focus for the study**

# 2. Modelling Methodology

## 2.1 Background to the Oxfordshire Strategic Model

In 2013, OCC commissioned Atkins (now named AtkinsRéalis) to develop a suite of multi-modal strategic models to provide evidence to support robust future assessments for funding bids and scheme prioritisation, particularly regarding transport scheme assessments that meet the Department for Transport (DfT) Transport Appraisal Guidance (TAG). The resulting Oxfordshire Strategic Model (OSM) was a new, strategic transport model that has been developed specifically to support business cases, local plans and other use cases.

In the summer of 2020, the model was further updated following comments from DfT on another Oxfordshire County Council project using OSM. When built, OSM had a 2013 base year and was fully compliant with the TAG requirements. Both the Public Transport Model and the Highway Model passed the appropriate calibration/validation criteria. The model has been used for a range of other projects including previous Local Plans, thus demonstrating suitability of its use to inform the transport evidence base for this use case.

In February 2021, AtkinsRéalis undertook the local re-calibration of the highway model for Oxford City, thus creating, for the first time, a 2018 Base Year for the Variable Demand Model (VDM). Due to lack of additional information at the time, National Trip End Model (NTEM) growth was applied to all districts between 2013 and 2018, except Oxford City (where available local data showed no increase between 2013 and 2018). The same approach was used to update the public transport demand, which is also necessary to run the VDM.

In late 2021, AtkinsRéalis was commissioned by OCC to further develop and use OSM to help assess the impacts of a number of potential improvements along the A4074 corridor between Oxford City and Berinsfield, including the provision of Park and Ride (P&R) sites (sometimes referred to as mobility hubs) at several potential locations in South Oxfordshire.

To deliver the A4074 corridor analysis, it was first necessary to ensure that the 2018 base year within the OSM model was suitably replicating observed base year traffic flows within the area of interest. The scope of work therefore included the local re-calibration of the highway model for most of the network in South Oxfordshire to 2018 conditions. To ensure consistency with other streams of work, a harmonization of the 2018 base years for Oxford City and South Oxfordshire was undertaken, and a common base year model was built for the wider region. The value of time, vehicle operating costs and other parameters of the VDM were updated to comply with the latest version of the TAG Databook available at the time (v1.17, released in November 2021).

This version of the model was the starting point for this study.

## 2.2 Description of the model

The OSM modelling suite consists of three key elements:

- a Highway Assignment Model (HAM) in SATURN representing vehicle-based movements within and across the Oxfordshire County for weekday morning peak hour (08:00 – 09:00), an average inter-peak hour (10:00 – 16:00) and an evening peak hour (17:00 – 18:00);
- a Public Transport Assignment Model (PTAM) in EMME representing bus and rail-based movements across the same area and for the same time periods, month and year; and
- a multi-modal pivot incremental Variable Demand Model (VDM), coded in EMME, that estimates frequency choice, main mode choice, time period choice, destination choice, and sub-mode choice in response to changes in generalised costs of travel across a 24-hour period (07:00 – 07:00).

The OSM covers the whole of Great Britain with different degrees of detail. The OSM covers the strategic links in Oxfordshire and has a detailed modelled area and a fully modelled area as shown in Figure 2-1. The level of detail varies as follows:

- **Fully Modelled Area:** the area over which proposed interventions have influence, and in which junctions are in SATURN simulation, is further subdivided as:
  - **Area of Detailed Modelling** – the area over which significant impacts of interventions are certain and the modelling detail in this area would be characterised by: representation of all trip movements; small zones; very detailed networks; and junction modelling (including flow metering and blocking back).
  - **Rest of the Fully Modelled Area** – the area over which the impacts of interventions are considered to be quite likely but relatively weak in magnitude and would be characterised by: representation of all trip movements; somewhat larger zones and less network detail than for the Area of Detailed Modelling; and speed/flow modelling (primarily link-based but possibly also including a representation of strategically important junctions).
- **External Area:** the area where impacts of interventions would be so small as to be reasonably assumed to be negligible and would be characterised by: a SATURN buffer network representing a large proportion of the rest of Great Britain; a partial representation of demand (trips to, from and across the Fully Modelled Area); large zones; skeletal networks and simple speed/flow relationships or fixed speed modelling.

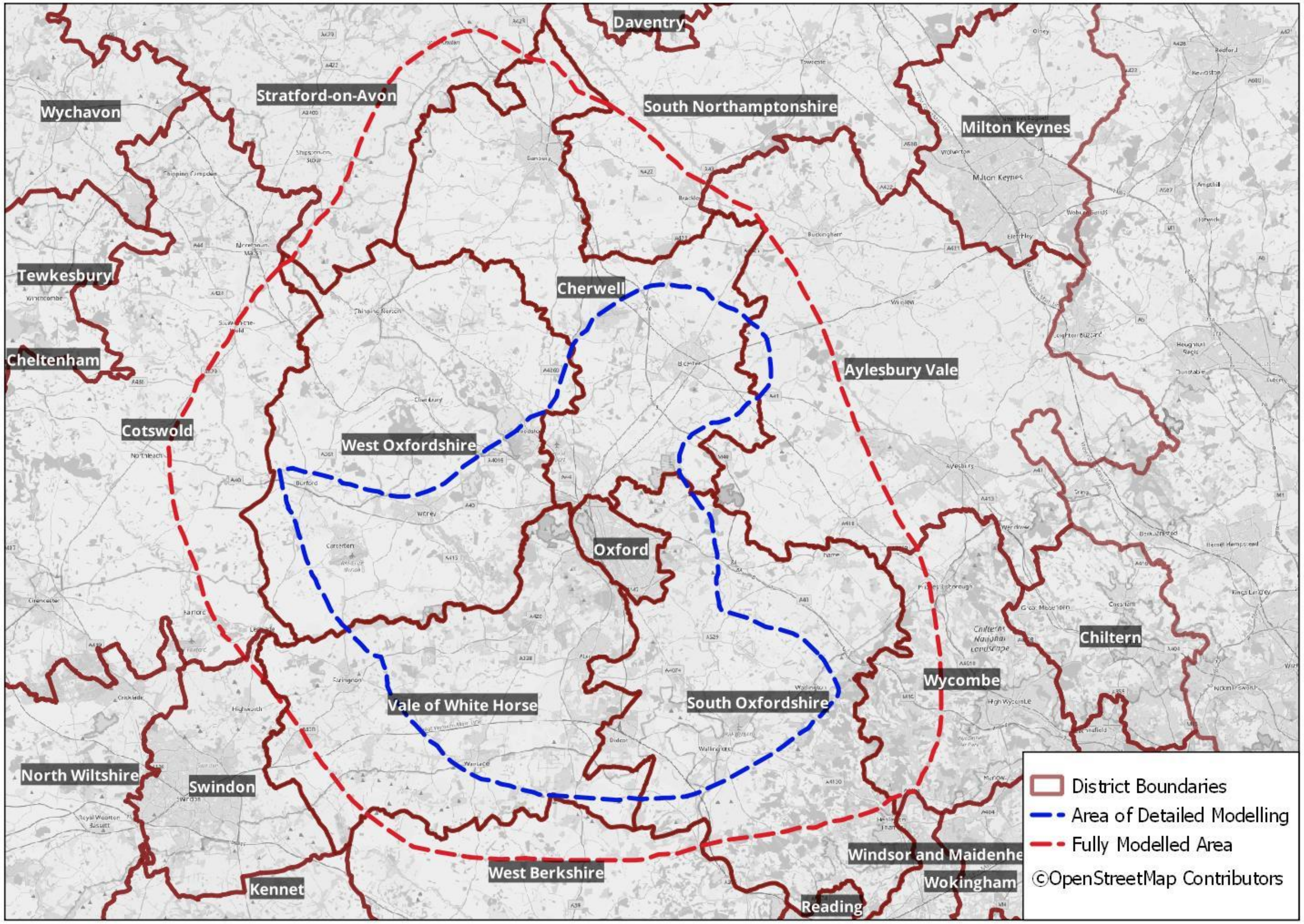


**Figure 2-1 - Detailed Modelled Area**

## 2.3 Overview of the OSM Modelling Approach

The OSM methodology closely follows TAG, in particular:

- TAG Unit M1.1 – Principles of Modelling and Forecasting;
- TAG Unit A1.1 – Cost-benefit analysis;
- TAG Unit A1.3 – User and provider impacts;
- TAG Unit M2 – Variable Demand Modelling; and
- TAG Unit M4 – Forecasting and Uncertainty.

The general approach is summarised in Figure 2-2 whereby:

- The forecasting process commences with the development of the reference case by updating the demand for the forecast year being appraised.
- The future year demand is uplifted by adding the land use assumptions to the base year demand and/or by factoring the base year demand using growth factors supplied by DfT, as appropriate.
- The variable demand model is run for producing a forecast based on unchanged costs from base year, i.e. no transport schemes are added.
- The supply-side factors are then updated (i.e. network changes and different cost assumptions) and the reference case forecast is modified iteratively through the VDM until demand and cost are consistent. Once achieved, there is a sound basis for the 'Without-Intervention' (or 'Do Minimum') scenarios to be tested.
- A similar process is undertaken to produce the 'With intervention' (or 'Do Something') forecast by using the network interventions defined for the 'Do Something'.

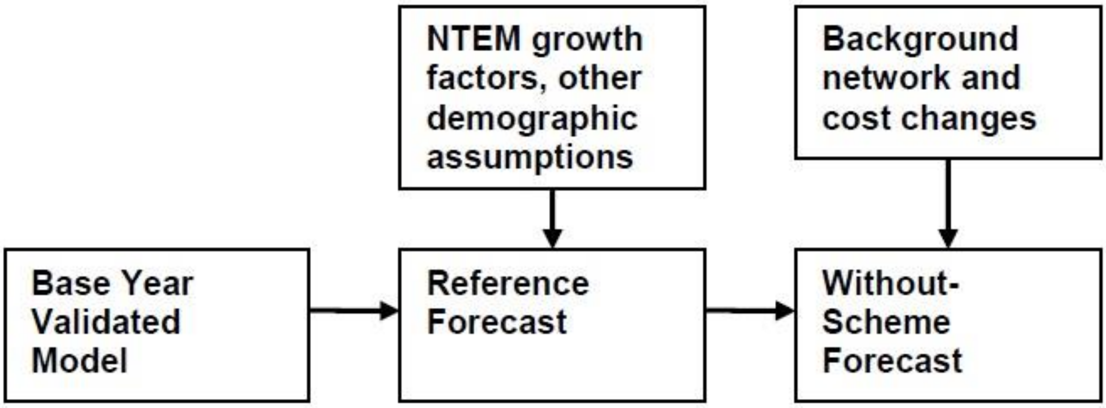


**Figure 2-2 - Without Scheme Forecasting Methodology[1]**

The VDM structure, built in line with TAG, is shown in Figure 2-3.

[1] Source: TAG Unit M4 Figure 1

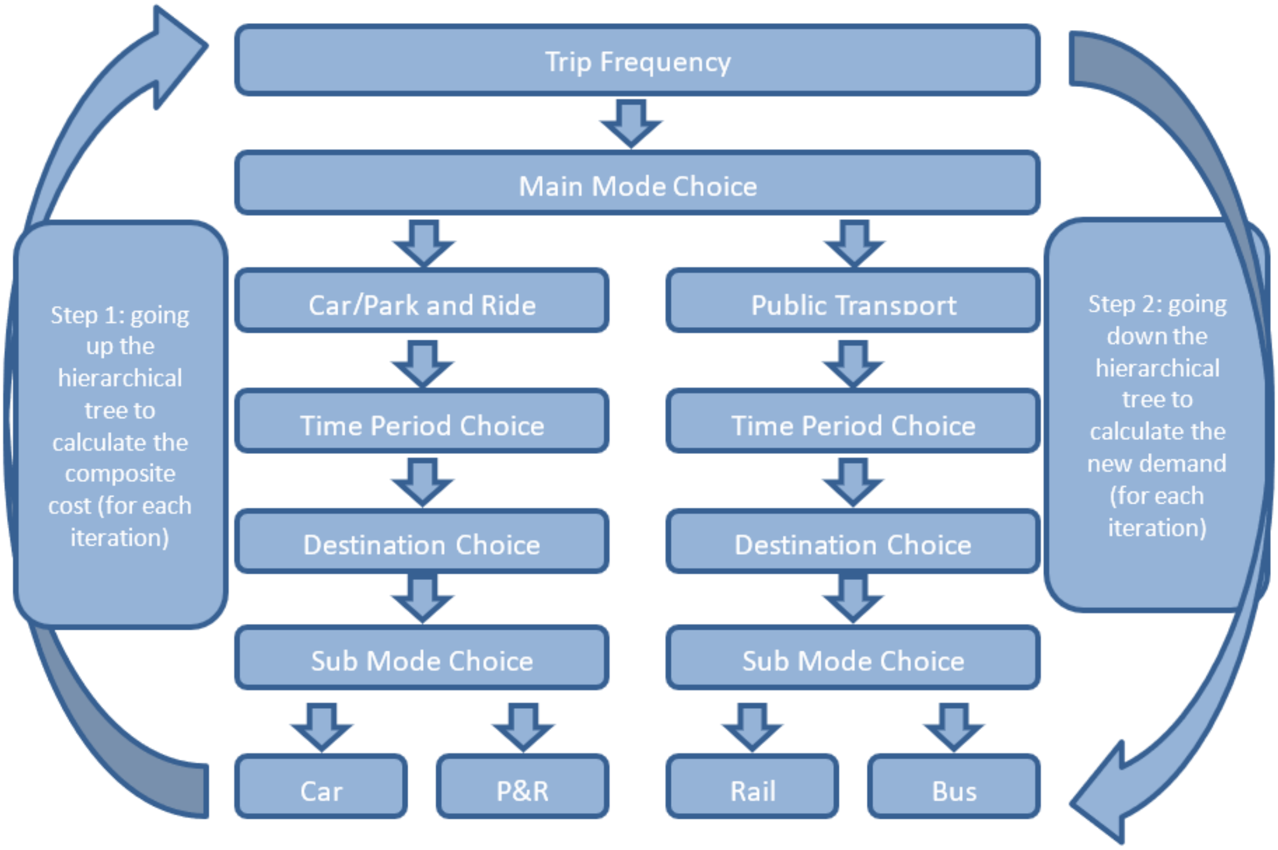


**Figure 2-3 - Variable Demand Model Hierarchy**[2]

## 2.4 Model Calibration

OSM is a large, county-wide strategic multi-mode model, and it is best practice to undertake localised calibration prior to testing in the model. Previous work has included updating Oxford City and the area along the A4074 corridor between Oxford City and Berinsfield. This work enabled improvements to calibration of the highway model in the South Oxfordshire and Vale of White Horse districts to be made prior to testing the Emerging South and Vale Joint Local Plan 2041.

As part of the A4074 Corridor study, the P&R demand was also calibrated to 2018 level, using observed counts provided by OCC.

The public transport demand for 2018 was obtained by applying TEMPRO growth factors between 2013 and 2018. Calibration was not undertaken given that there was no observed data readily available.

Within this commission, the scope of work included a local calibration of the 2018 Base Year highway assignment model across the South Oxfordshire and Vale of White Horse districts. The extent of the calibration was focused on Vale of White Horse (that had previously not been enhanced) and South Oxfordshire districts, as shown in Figure 1-1.

[2] Based on TAG Unit M2.1, Appendix C.

## 2.5 Demand Segmentation

Demand segments or user classes are used to describe the differing characteristics of vehicle users within the highway assignment model. It is important that appropriate demand segmentation is applied to the assignment because the vehicle operating cost and value of time vary for different user classes. A total of seven user classes have been used to represent different trip purposes in the model as shown below in Table 2-1.

**Table 2-1 - User Class Definition (Journey Purpose Segmentation)**

| User Class | Vehicle Type | Trip Purpose |
|---|---|---|
| 1 | Car | Home Based Employer Business (HBEB) |
| 2 | Car | Home Based Other (HBO) |
| 3 | Car | Home Based Commute (HBW) |
| 4 | Car | Non-Home Based Employer Business (NHBEB) |
| 5 | Car | Non-Home Based Other (NHBO) |
| 6 | Light Goods Vehicles (LGV) | |
| 7 | Heavy Goods Vehicles (HGV) | |

## 2.6 Time Periods

The OSM highway assignment model includes three time periods as shown below in Table 2-2. They represent the AM and PM peak hours, plus a period representing an average Inter-peak hour. The modelled time periods and peak-to-period factors were unchanged from the original version of OSM. The model represents an average weekday in March 2018 covering a typical working day (Monday, Tuesday, Wednesday and Thursday).

**Table 2-2 - Model Time Periods**

| Model Time Period | Temporal Coverage |
|---|---|
| AM Peak Hour | 08:00 – 09:00 |
| Inter-Peak hour | 10:00 – 16:00 (average) |
| PM Peak Hour | 17:00 – 18:00 |

The model assumes that the peak hour-to-period factors will change between 2018 Base Year and 2041 Future Year, due to flexible working hours turning the morning and evening into flatter peaks, as accepted by DfT in other work using OSM. These factors are listed in Table 2-3.

**Table 2-3 - Peak Hour to Peak Period Factors for car**

| Time period | 2018 AM | 2018 IP | 2018 PM | 2041 AM | 2041 IP | 2041 PM |
|---|---|---|---|---|---|---|
| Commuting (HBW) | 2.20 | 6.00 | 2.41 | 3.00 | 6.00 | 3.00 |
| Other (HBO+NHBO) | 2.80 | 6.00 | 3.29 | 3.00 | 6.00 | 3.00 |
| Employer business (HBEB+NHBEB) | 2.64 | 6.00 | 2.74 | 3.00 | 6.00 | 3.00 |

## 2.7 PCU Factors

Passenger Cars Units (PCUs) are used as the standard unit in SATURN for demand and capacities. This allows the effect of longer/slower vehicles that occupy more road space and take longer time to clear junctions to be represented within the model. The vehicle to PCU conversion factors used for the various user classes are summarised in Table 2-4. They are based on guidance provided in TAG unit M3.1, Section D.

**Table 2-4 - PCU Conversion Factors**

| Vehicle Type | Description | PCU Factor |
|---|---|---|
| Car | Private Car | 1.00 |
| Bus | All Bus Types | 2.50 |
| LGV | Goods vehicle using car-based chassis | 1.00 |
| HGV[3] | OGV1 and OGV2 (Rigid and Articulated) | 2.30 |

## 2.8 Highway Assignment Methodology

The assignment of trips to the highway network was undertaken using a standard 'Wardrop Equilibrium' approach, which seeks to minimise travel costs (travel time and vehicle operating costs) for all vehicles in the network. The Wardrop Equilibrium is based on the following proposition: "Traffic arranges itself on networks such that the cost of travel on all routes used between each O-D pair is equal to the minimum cost of travel and all unused routes have equal or greater cost".

The Wardrop Equilibrium as implemented in SATURN is based on the 'Frank-Wolfe Algorithm', which employs an iterative process. This process is based on successive 'All or Nothing' assignments, where an optimal proportion of flows from successive assignments are combined to minimise an 'Objective Function'. The travel costs are recalculated on each iteration, and then compared to the previous iteration. The process is terminated once costs from successive iteration have not changed significantly. This process results in possible multi-routing between any origin-destination pair.

The assignment is based on minimum generalised cost routes where the generalised cost is defined as a linear combination of time and distance as given below.

$$C = PPM * T + PPK * D + M$$

Where: C is the cost in units of pence,
T is time in units of minutes,
D is distance in kilometres,
M is monetary change in pence,
PPM specifies "Pence Per Minute"
PPK specifies "Pence Per Kilometre"

The disutility of travel is expressed in terms of generalised cost, which can be related back to time and money in accordance with the TAG Unit M2.1. The coefficients for the individual components of the generalised cost were calculated using TAG Databook 1.20.2, released in January 2023.

[3] TAG unit M3.1; Section D.7.2 provides two values for HGV's: either 2.5 for HGVs on motorways and all-purpose dual carriageways or 2.0 for all the other road types.

The values of Pence Per Minute (PPM) and Pence Per Kilometre (PPK) are shown in Table 2-5, for each user class, both for 2018 base year and 2041 future year.

**Table 2-5 - PPM and PPK Values by User Class and Time Period (2010 prices)**

| Year | Parameter | AM PPM | AM PPK | Inter peak PPM | Inter peak PPK | PM PPM | PM PPK |
|---|---|---|---|---|---|---|---|
| 2018 | Car – Home based Employer Business | 30.65 | 12.73 | 31.40 | 12.73 | 31.09 | 12.73 |
| 2018 | Car – Home based Other | 14.18 | 6.35 | 15.10 | 6.35 | 14.85 | 6.35 |
| 2018 | Car – Home based Commute | 20.55 | 6.35 | 20.89 | 6.35 | 20.62 | 6.35 |
| 2018 | Car – Non-Home based Employer Business | 30.65 | 12.73 | 31.40 | 12.73 | 31.09 | 12.73 |
| 2018 | Car – Non-Home based Other | 14.18 | 6.35 | 15.10 | 6.35 | 14.85 | 6.35 |
| 2018 | LGV | 22.21 | 13.98 | 22.21 | 13.98 | 22.21 | 13.98 |
| 2018 | HGV | 22.12 | 37.97 | 22.12 | 37.97 | 22.12 | 37.97 |
| 2041 | Car – Home based Employer Business | 41.60 | 9.10 | 42.63 | 9.10 | 42.20 | 9.10 |
| 2041 | Car – Home based Other | 19.25 | 4.58 | 20.50 | 4.58 | 20.16 | 4.58 |
| 2041 | Car – Home based Commute | 27.90 | 4.58 | 28.35 | 4.58 | 28.00 | 4.58 |
| 2041 | Car – Non-Home based Employer Business | 41.60 | 9.10 | 42.63 | 9.10 | 42.20 | 9.10 |
| 2041 | Car – Non-Home based Other | 19.25 | 4.58 | 20.50 | 4.58 | 20.16 | 4.58 |
| 2041 | LGV | 30.15 | 11.30 | 30.15 | 11.30 | 30.15 | 11.30 |
| 2041 | HGV | 30.03 | 35.36 | 30.03 | 35.36 | 30.03 | 35.36 |

## 2.9 Public Transport Assignment Methodology

The Public Transport Assignment Model uses the standard transit assignment implemented in EMME, i.e. a multipath assignment, based on the computation of optimal strategies. Further details of the assignment methodology may be found in the EMME reference manual.

The generalised cost function used for the public transport assignment routing (generalised travel time), measured in units of time (minutes), is given by:

$$GTT = V_{wk}*A + V_{wt}*W + T + B$$

Where: GTT is the Generalised Travel Time
Vwk is the weight applied to time spent walking (walk time weight);
A is the total walking time to and from the services and during an interchange;
Vwt is the weight applied to time spent waiting (wait time weight);
W is the total waiting time for all services used on the journey;
T is the total in-vehicle time; and
B is the total boarding penalty applied for each service boarded on the journey.

The public transport assignment model uses parameters based on those provided in TAG Unit M3-2, which in turn are derived from work undertaken by the Institute of Highways and Transportation to establish guidelines for urban transport strategies and further work commissioned by the DfT on the value of travel time savings. Further details, including the various references, can be found in the TAG Unit M3-2.

In the OSM demand model framework, the standard transit assignment in EMME (module 5.11 and 5.31) is used for both rail and bus assignment. Typically, the cost inputs for deriving attractive lines in the PT assignments include effective headway and boarding time penalties, as well as the factors and weights in association with each cost element. In the OSM, for the actual line headway for PT assignment a global waiting time factor of 0.5 is assumed (half of the effective headways). This is probably not a major issue for PT assignment if the waiting time for every PT service is treated in the same way. However, with a weight of 2.5[4] against in-vehicle ride time, the waiting time saving from an improved PT service such as increased frequency will be significantly over-estimated.

In view of this, a new approach was implemented based on the PDFH5 Section B Table B4.8, which shows the average service interval penalties by rail service coverage for a headway from 5 minutes to 180 minutes, as extracted below (see Table 2-7). Assuming there is no boarding penalty applied, it can be reasonably assumed that the penalty is equivalent to passenger's average waiting time[6], combined with the cases when passengers arrive at a stop randomly or pre-planned against timetables.

The parameter values for assignment are set out in Table 2-6 below. These parameters were determined during the calibration/validation of the original base year model (2013).

**Table 2-6 - Assignment Parameters**

| Parameter | Value |
|---|---|
| Wait time factor | PDFH curve |
| Wait time weight | 2.5 |
| Walk time weight | 2.0 |
| Boarding penalty (Adjusted as part of the calibration process) | 0 to 25 |

**Table 2-7 - PDFH waiting time**

**Table B4.8 Average Service Interval Penalties (in minutes) for Different Flow Types**

| | Equivalent Time Penalty | | | | |
|---|---|---|---|---|---|
| Service Interval | London InterCity | Non-London inter-urban | London SE area | Non-London SE area | Non-London urban |
| 5 | 5 | 5 | 5 | 5 | 5 |
| 10 | 10 | 10 | 10 | 10 | 10 |
| 15 | 14 | 14 | 14 | 14 | 14 |
| 20 | 18 | 18 | 19 | 18 | 18 |
| 30 | 24 | 23 | 25 | 24 | 24 |
| 40 | 27 | 26 | 29 | 27 | 28 |
| 60 | 33 | 31 | 36 | 33 | 35 |
| 90 | 43 | 39 | 46 | 43 | 45 |
| 120 | 52 | 47 | 57 | 52 | 55 |
| 180 | 70 | 63 | 78 | 70 | 74 |

Source: Passenger Demand Forecasting Handbook

[4] As suggested in TAG M3.2 Para. 3.1.5, the waiting time weight is 1.5-2.5 times in-vehicle time.
[5] Passenger Demand Forecasting Handbook
[6] Note that this is the waiting time in terms of in-vehicle ride time equivalence, i.e. after applying the waiting time to in-vehicle time weight, which is 2.5 assumed in the OSM demand model.

# 3. 2018 Local Model Calibration

Model Calibration refers to the process of refining and confirming the values of model parameters and improving origin-destination movements in the demand matrices to improve the overall model performance by benchmarking against the observed data collated from various sources and discussed in section 3.1 below.

This document presents a summary of the specific calibration work done for this commission in the area of focus in South Oxfordshire and Vale of White Horse districts.

## 3.1 Data Used

To help inform an understanding of traffic levels in the area of focus, a range of data was collated and used. This data was used during model calibration and it is summarised in this chapter. The data sources presented include:

- Traffic Counts from years 2017 and 2018:
  - Automatic Traffic Counts (ATC) – datasets were available for one-week, two-week or one-year periods, depending on the source;
  - Manual Classified Counts (MCC) - single day datasets;
- Traffic counts for 3 major employment sites - single day datasets.

Traffic count data was used to identify observed traffic flows on key links and junctions in the area of focus for use in the base model calibration process. Observed traffic count data was collated from ATC, MCC, and data provided from employment sites in the study area. A summary of the traffic data used is presented in Table 3-1. Further details about this data, such as site location, and direction is shown in Appendix A. The geographical location of the traffic count data types is presented in Figure 3-1.

**Table 3-1 - Traffic Counts used for South and Vale Model Update**

| Count Type | Number of Counts |
|---|---|
| ATC | 31 |
| MCC | 2 |
| Employment sites | 3 |

The count data sets represent a broad coverage of the road network in the South Oxfordshire and Vale of White Horse districts (as shown in Figure 3-1). Existing data from 2017 and 2018 was utilised. As the base year is 2018, using data from 2024 would not be appropriate due to the six years elapsed in between. All the traffic count sites showing flows for 2017 have been adjusted to a common base year of 2018, based on the adjustment factors already used in OSM for the A4074 Corridor study, which used count sites with data both for 2017 and 2018 to calculate the adjustment factors between the two available years. These factors were applied to the count data that was only available for 2017 to bring them to the level of the base year of 2018. The count sites comprising the newly collated data did not form uninterrupted cordons or screenlines, but instead were considered as ad-hoc sites in the calibration, which meant all the readily available data could be fully utilised. These sites are spread across the area of focus and reflect the distribution of growth across this area. Oxford City was re-calibrated in a similar way in February 2021. For other areas in the model, such as Cherwell and West Oxfordshire districts, growth from the fully calibrated and validated model for 2013 was uplifted using TEMPro factors. This approach is considered proportionate given the data available and acceptable for use in determining area-wide local plan impacts.

In addition to traffic flow data on roads across the network, count data for three large employment sites (Culham Campus, Harwell Campus and Milton Park) was obtained from surveys used in planning applications.

The survey data was combined if undertaken for multiple accesses, and analysed by vehicle type (car, LGV, HGV).

Culham Campus data was collected in 2017, for Harwell Campus data was from 2018 and for Milton Park data was from March 2020 prior to lockdown. No adjustment factors have been applied to account for the varying years due to not having information available that is specific to the employment sites, see section 3.4.2 for further information.

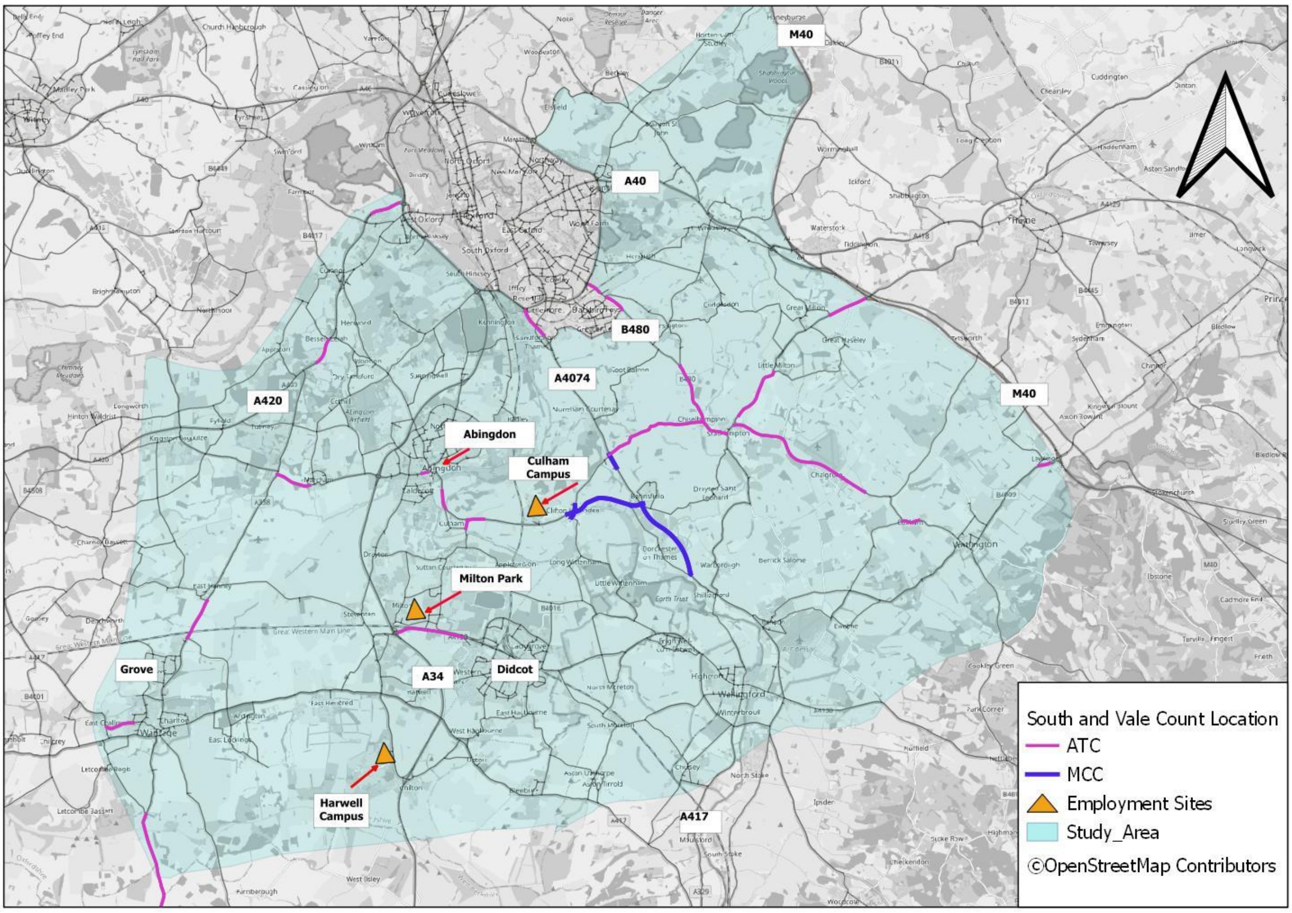


**Figure 3-1 - Traffic Link Counts Locations**

# 3.2 Matrix calibration

## 3.2.1 Matrix Building Methodology

The 2018 calibrated matrices built for the A4074 study were used as the starting point for developing the South and Vale model matrices. For the purpose of modelling at the Joint Local Plan 2041 scale, the matrices were not representing the right level of demand, particularly towards the north of Vale district (Frilford) and towards west of South district (around Culham and Clifton Hampden). The matrices were inconsistent with some of the observed counts across the two districts and therefore it was prudent to undertake a selective matrix adjustment (through the use of select link analysis). A new full matrix estimation was not performed as the existing matrix had already been subjected to matrix estimation, as per the TAG Unit M3.1, para 8.3.5.

### 3.2.2 Select Link Factoring

In areas where the model did not meet required levels of calibration an independent link was selected to adjust the demand using SLA (select link analysis). A factor was applied to the select link matrix on this link in order to match the observed count, and the difference between the pre- and post-factored select link matrix was then included in the main matrix, this was done at an all-vehicle level (total of cars, LGVs and HGVs).

### 3.2.3 Results

Adjustments for the select link factoring at locations across the area of focus result in changes to the matrix. This new matrix was compared to the original to understand the changes at a global level. The comparison is shown in Table 3-2 below. Total car matrix changes are less the 1% in any time period, LGV matrices see the greatest alterations with reductions of between 4% and 7% whilst HGVs see a negligible change in the PM and around a 4% reduction in both the AM and Inter-Peak. The LGV and HGV changes are brought about by the link factoring process since the counts showed modelled LGV and HGV flows were greater than observed. The resultant matrix changes by less than 2% in any time period. There is no guidance regarding the degree of change that is considered acceptable, but the changes identified are considered insignificant across the whole model.

**Table 3-2 - 2018 A4074 Study Model Matrix Comparison**

| User Class | A4074 Study Calibrated Matrix Total (PCUs) | | | South and Vale Calibrated Matrix Total (PCUs) | | |
|---|---|---|---|---|---|---|
| | AM Peak | Inter-Peak | PM Peak | AM Peak | Inter-Peak | PM Peak |
| Car – HBEB | 7,664 | 3,584 | 9,137 | 7,551 | 3,517 | 9,078 |
| Car – HBO | 22,419 | 27,465 | 27,976 | 22,094 | 27,388 | 28,224 |
| Car – HBW | 46,162 | 9,988 | 54,942 | 46,072 | 9,995 | 55,060 |
| Car – NHBEB | 8,331 | 13,476 | 6,783 | 8,169 | 13,220 | 6,686 |
| Car – NHBO | 11,694 | 15,484 | 14,688 | 11,664 | 15,327 | 14,683 |
| LGV | 13,311 | 10,305 | 10,202 | 12,442 | 9,834 | 9,496 |
| HGV | 7,230 | 6,904 | 3,171 | 6,880 | 6,622 | 3,158 |
| Total | 116,811 | 87,206 | 126,900 | 114,870 | 85,904 | 126,384 |
| Difference (totals) | | | | -1.7% | -1.5% | -0.4% |

## 3.3 Network Calibration

The calibration procedure involves a series of steps designed to improve the performance of the model and ensure it simulates observed 2018 traffic flows. Calibration procedures included the following steps:

- Updating the base model to ensure all schemes built between 2013 and 2018 were included
- Ensuring network characteristics, such as free-flow speeds represent observed conditions;
- Ensuring capacity controls such as speed-flow curves, saturation flows and turn capacities were appropriate to simulate observed conditions;
- Checking the routing of vehicles in the model by verifying routes from the highway model against internet-based route planners.

### 3.3.1 2013 to 2018 scheme inclusion

The uncertainty log for the previous version of the model (base year 2013) was reviewed to identify any highway schemes which would have been built between 2013 and 2018 (current base model). The schemes to be included in the new base model were checked against drawings and internet-based mapping to ensure that the coding best reflects the ground conditions. The schemes added to the 2013 base model are summarised in Table 3-3.

**Table 3-3 - Schemes within the 2018 base model**

| Ref | District | Schemes |
|---|---|---|
| 1 | Vale/South | Harwell Link Road Section 1 (B4493 to A417) New single lane road between B4493 and A417 |
| 2 | Vale/South | A34 Milton Interchange Hamburger. Signalised hamburger implemented. |
| 3 | Vale/South | A34 Chilton Northern Slip Roads. Inclusion of slips to the north of the junction. |
| 4 | Vale/South | Foxhall Bridge Widening Widened to allow 2 full lanes across the rail bridge |
| 5 | Vale/South | Access to Harwell Section 2 (Hagbourne Hill) Capacity improvements and new roundabout for access from A34 |
| 6 | Vale/South | Great Western Park access |
| 7 | Vale/South | A420-Highworth Road, Shrivenham Priority junction converted to roundabout |
| 8 | Cherwell | A41 / Neunkirchen Way roundabout (Rodney House) Signalisation and capacity improvements of roundabout |
| 9 | Cherwell | A41 Oxford Road / Boundary Way roundabout improvement scheme |
| 10 | Cherwell | Bicester Town Centre changes |
| 11 | Cherwell | M40 J10 Improvements Roundabout converted to signalised roundabout |
| 12 | Cherwell | M40 J9 Phase 2 Signalisation of rest of junction |
| 13 | Cherwell | Oxford Road / Pingle Drive junction Conversion of roundabout to signalised junction |
| 14 | Cherwell | Bucknell Road/A4095 Howes Lane new priority junction |
| 15 | Cherwell | Pioneer Roundabout Signalised hamburger implemented |
| 16 | Cherwell | A44 Corridor Improvements - Kidlington Roundabout (P1B), Peartree Loop Farm (P1D) and A44 up to and including junction with Cassington Road (P1A) |
| 17 | Oxford | Becket Street extension and new junction with Oxpens Road – New site access and link road through Oxpens site |
| 18 | Oxford | Botley interchange – Capacity improvements on circulatory and approaches |
| 19 | Oxford | Cutteslowe and Wolvercote Roundabouts |
| 20 | Oxford | Frideswide Square improvements: Station access converted from signalised junction to a roundabout. Park End Street / Hythe Bridge Street and Park End Street/Hollybush Row signals converted to roundabouts. Bus link from Hollybush Row to Park End Street/Becket Street junction closed completely |
| 21 | Oxford | Hinksey Hill – A423 to A34 southbound: Upgrade to the westbound approach from the A423. |
| 22 | Oxford | Kennington Roundabout improvements: Signalised Hamburger implemented. |
| 23 | Oxford | The Plain and Longwall Street junction – Signal retiming at Longwall Street and cycle improvements |
| 24 | Oxford | West Way/ Botley Road junction improvements: Junction upgrades on West Way and North Hinksey Road. West Way/A420, West Way/North Hinksey Road and the junction to the south |
| 25 | Oxford | Worcester Street/George Street junction Opening of junction to allow movements |
| 26 | Oxford | Updated Barton site access and bus link |

| Ref | District | Schemes |
|---|---|---|
| 27 | Oxford | Headington roundabout - phase 1 (completed) |
| 28 | Oxford | Includes Access to Headington package. |
| 29 | Oxford | Botley Rd Bus Lane Phase 1 |
| 30 | Oxford | Elsfield Road, Old Marston |
| 31 | Oxford | Closure of Union Street |
| 32 | Oxford | Fern Hill Road (Eastern Bypass) |
| 33 | West | A4095/B4022 Staple Hall - Two mini-roundabouts connected by a short connecting link (2014 situation) |
| 34 | West | A415 Ducklington Lane/Station Lane junction improvement – Capacity increase on the Station Lane approach. |
| 35 | West | Down's Road/A40 new junction - At grade roundabout access for Downs Road connecting onto the A40. |
| 36 | West | Shilton Link Road from B4020 to Elmhusrt Way |

### 3.3.2 Network improvements

In addition to the inclusion of the schemes between 2013 and 2018, the network was refined in other areas. This included:

- Incorporating the improvements to the highway network around Watlington that had been enhanced as part of other studies (to maintain consistency across the models);
- Milton Interchange lane allocations were compared to observed markings and the signals optimised to improve the operation of the junction;
- Speed correction on A415 Abingdon Road;
- The zone connectors were amended for Milton Park – the zone loads on at Brook Drive as a better central loading (rather than Bradstock Way);
- The development zone for Land adjacent to Culham Campus was updated.

## 3.4 Flow Calibration Results

### 3.4.1 Validation Criteria and Acceptability Guidelines

The two measures which are used for the individual link validation are flow and GEH. The flow measure is based on the relative flow difference between modelled flows and observed counts, with three different criteria set depending on the observed flows. The GEH measure uses the statistic as defined below:

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

Where: GEH is the Geoffrey E. Havers statistic;
M is the modelled flow; and
C is the observed flow.

TAG Unit M3.1 Table 2 describes the Link Flow and Turning Movements Validation Criteria and Acceptability Guidelines as shown in Table 3-4. The guidance requires that the flow criteria or GEH should be achieved not both, and flows that meet either criterion should be regarded as satisfactory.

**Table 3-4 - Link Flow and Turning Movements Validation Criteria and Acceptability Guidelines**

| Criteria and Measures | Acceptability Guideline |
|---|---|
| Individual flows within 15% for flows from 700 to 2,700 veh/h | > 85% of cases |
| Individual flows within 100 veh/h for flows less than 700 veh/h | > 85% of cases |
| Individual flows within 400 veh/h for flows more than 2,700 veh/h | > 85% of cases |
| GEH <5 for individual flows | > 85% of cases |

Consistent with a strategic model, no turning movements were collected for the highway assignment model.

### 3.4.2 Main Employment Sites

The uncertainty log review for the forecasting setup noted that some large employment sites were partially built in 2018 and therefore there are trips to/from these locations (modelled zones) which would not have been present in the initial model development in 2013. These include three large employment sites of Culham Campus, Harwell Campus and Milton Park. Count data for these 3 sites records the number of trips to/from these locations. The count data was compared to modelled trips to/from these zones and factored where necessary to be representative of the observed flow, link flow criteria was used to determine how the model compared to the observed data. Table 3-5 below shows how the model reflects observed flows for these locations following the development area factoring.

**Table 3-5 - Development Calibration (flow in PCUs)**

| Location | Direction | AM | | | IP | | | PM | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Count | Model | Pass | Count | Model | Pass | Count | Model | Pass |
| Culham Campus | Inbound | 516 | 492 | Yes | 96 | 95 | Yes | 88 | 105 | Yes |
| | Outbound | 67 | 68 | Yes | 137 | 136 | Yes | 426 | 393 | Yes |
| Harwell Campus | Inbound | 1,672 | 1,655 | Yes | 200 | 197 | Yes | 108 | 113 | Yes |
| | Outbound | 118 | 114 | Yes | 253 | 248 | Yes | 1,405 | 1,399 | Yes |
| Milton Park | Inbound | 2,281 | 2,368 | Yes | 373 | 383 | Yes | 387 | 489 | Yes |
| | Outbound | 328 | 372 | Yes | 460 | 459 | Yes | 1,638 | 1,645 | Yes |

### 3.4.3 Total network in South and Vale

Table 3-6 shows the flow calibration results of individual links that have count data (as detailed in section 3.1.1) and were used in the calibration process, in terms of the proportion which meet TAG criteria for each time period (as summarised in Table 3-4).

**Table 3-6 - Link Calibration Summary**

| Time Period | % Ad hoc Links passing TAG Criteria | TAG Criteria Percentage (%) |
|---|---|---|
| AM Peak | 92% | >85% |
| Inter-Peak | 95% | >85% |
| PM Peak | 90% | >85% |

For individual link counts, all the three peaks exceed TAG flow criteria of 85%, either in terms of flows or GEH. Links in the AM peak achieved 92%, Inter-Peak reached 95% and PM peak achieved 90%. Appendix A presents a summary of the results of all individual links used in calibration. Figure 3-2, Figure 3-3 and Figure 3-4 presents the calibration links and shows whether they are passing or failing the TAG criteria in the respective time period.

Figure 3-2 shows the link calibration for the AM peak. It is noted that:

- The B480 west of Stadhampton link fails in both directions with model flow being greater than the observed count. In the eastbound direction the modelled flow is 155 vehicles higher than the observed flow of 250 vehicles, in the westbound direction the modelled flow is 350 vehicles higher than the observed flow of 413 vehicles. Investigations into improving this link found that decreasing the flow significantly impacted surrounding count calibrations, suggesting that there is variation due to counts being collected on different dates.
- The B480 north of Chiselhampton link fails in the northbound direction with model flow being greater than the observed count, to a similar extent as the B480 west of Stadhampton link in the westbound direction.
- A4130 eastern arm (between Milton Interchange and Mendip Heights roundabout) has a lower modelled flow than observed. The modelled flow is 305 vehicles lowed than the observed count of 840 vehicles. The difference is driven by large levels of delay at the A4130 signals with Sir Frank Williams Avenue causing queuing on the link and vehicles to seek alternate routes, such as Milton Road.
- A415 South of Abingdon has a higher modelled flow than observed with a GEH of 7.6. However, there are surrounding counts that meet calibration and therefore improving this link impacts those around it, suggesting that there is variation due to counts being collected on different dates.

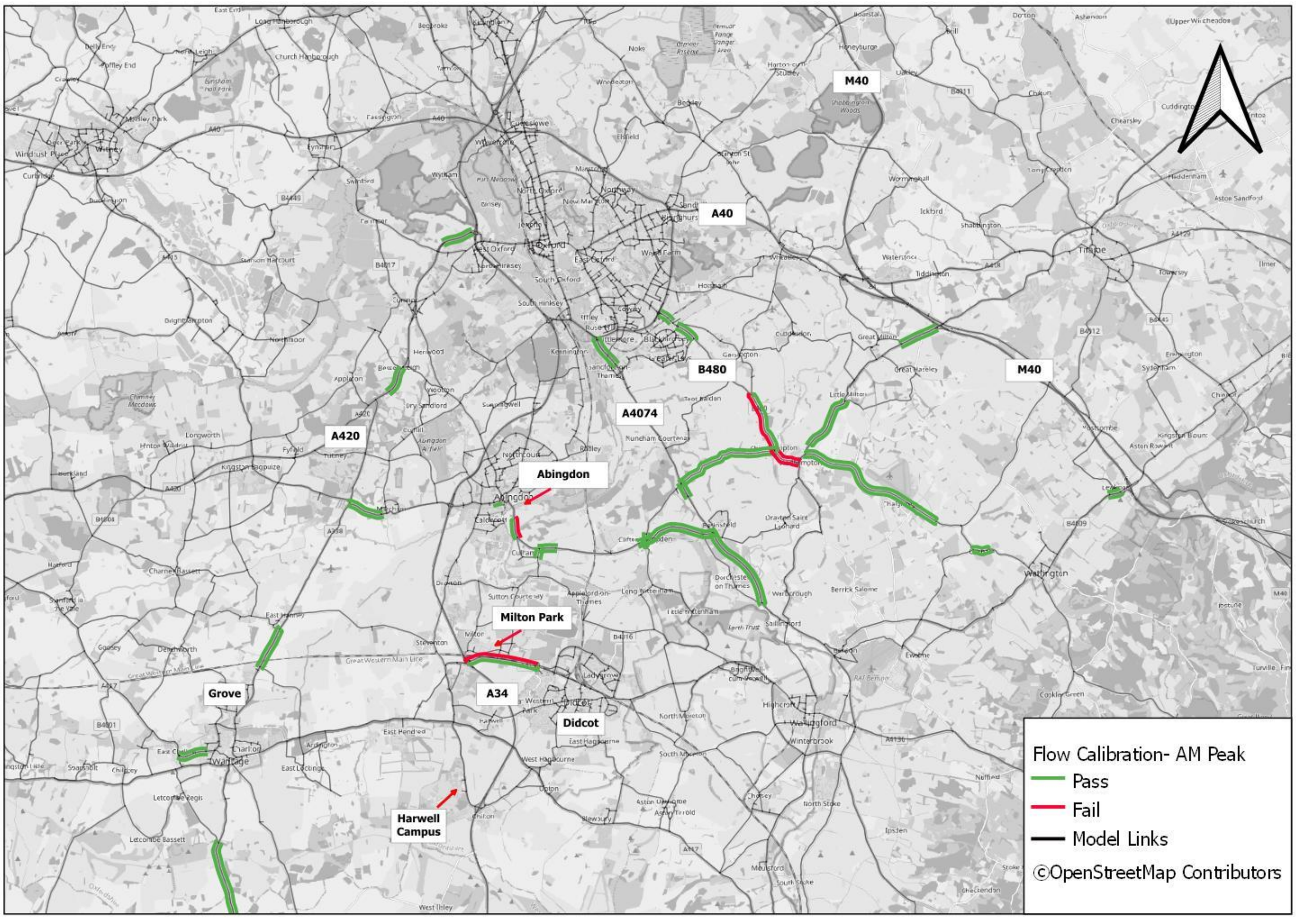


**Figure 3-2 - Link Flow Calibration - AM Peak**

Figure 3-3 shows the link calibration for the inter-peak. It is noted that:

- The B480 west of Stadhampton link fails in the northbound direction with model flow being greater than the observed count. The model flow is 109 vehicles greater than the observed of 300 vehicles, with a GEH of 5.8, so only just falls outside of criteria. Given that the other counts surrounding it are well calibrated no further investigation was taken.
- B480 Watlington Road fails in the northbound direction with the model flow being lower than observed. There is a count to the south which validates well so there could be inconsistencies with the counts due to collection at different dates. The wider area model calibrates well against the counts, so this is considered acceptable.
- A4130 eastern arm (between Mendip Heights roundabout and Milton Interchange) has a slightly lower modelled flow compared to observed. The model flow is 146 vehicles lower than the observed of 747 vehicles, with a GEH of 5.6, so only just falls outside of criteria. Didcot Power Station itself is represented by two zones, which is proportionate for a strategic model, and it is likely that the counts are capturing vehicles which would stay on the A4130 for longer whilst the model has trips using Milton Road and Park Drive to access Milton Interchange. The impact of this on the overall generalised cost is likely to be minimal and therefore should not impact the overall model.

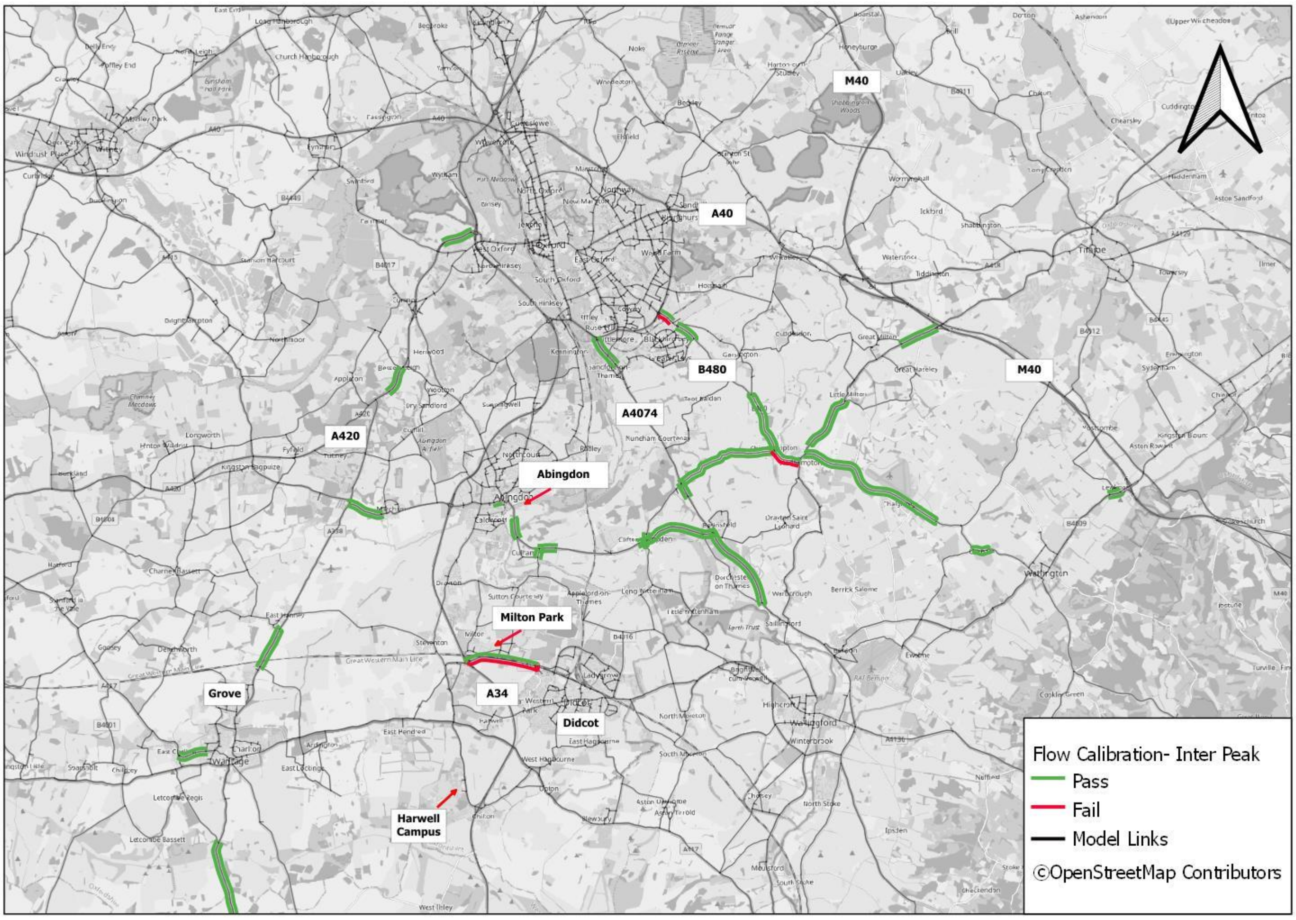


**Figure 3-3 - Link Flow Calibration – Inter-Peak**

Figure 3-4 shows the link calibration for the PM peak. It is noted that:

- The B480 Watlington Road fails in both directions with model flow being greater than the observed count in the eastbound direction (the modelled flow is 226 vehicles higher than the observed count of 805 vehicles) and lower in the westbound direction (the modelled flow is 174 vehicles lower than the observed count of 612 vehicles). The count further south on the B480 validates so there could be inconsistencies with the counts due to collection at different dates.
- The B4015 between the junctions with the B480 and A4074 fails in the eastbound direction. The modelled flow is 128 vehicles lower than observed of 335 vehicles. Given that the other counts surrounding it are well calibrated no further investigation was taken.
- A338 north of Grove fails in the southbound direction with a greater model flow than observed. The vehicles using this link also pass through other sites which validate suggesting a potential inconsistency between count data sets.
- Frilford Road is lower than observed in the westbound direction, with a modelled flow 212 vehicles lower than the observed flow of 739 vehicles. There is a competing route along Faringdon Road which traffic re-routes to as soon as there is any level of congestion at the Frilford signals.

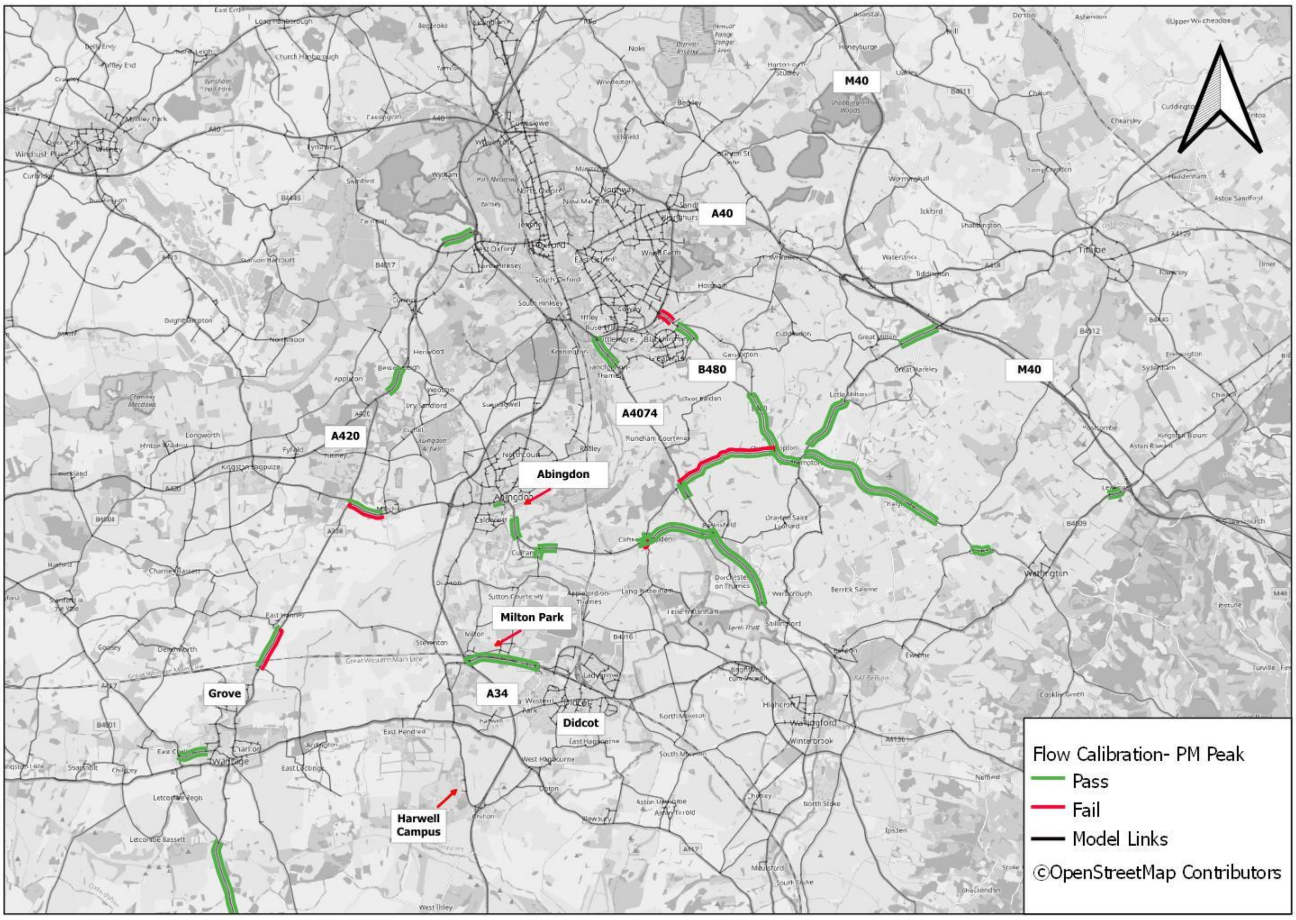


**Figure 3-4 - Link Flow Calibration - PM Peak**

Overall, the calibration results are acceptable with a pass rate of over 85% in all time periods.

## 3.5 Assignment Convergence

The convergence statistics of the highway assignment for each modelled time period are summarised below in Table 3-8. Acceptable convergence criteria statistics as per set out in TAG Unit M3.1 (Table 4) are reproduced below in Table 3-7.

**Table 3-7 - Summary of Convergence Measures and Base Model Acceptable Values**

| Measure of Convergence | Base Model Acceptable Values |
|---|---|
| Delta and % GAP | Less than 0.1% or at least stable with convergence fully documented and all other criteria met |
| Percentage of links with flow change (P)<1% | Four consecutive iterations greater than 98% |
| Percentage of links with cost change (P2)<1% | Four consecutive iterations greater than 98% |
| Percentage cost in total user cost | Four consecutive iterations less than 0.1% (SUE only) |

It can be observed that all the three peak models are converging to the required TAG criteria shown above, with convergence being reached in 25 iteration loops in AM peak, 18 in PM peak and 18 in Inter-Peak.

**Table 3-8 - Model Convergence Summary**

| Time Period | Iteration | Flow Change (%) | Delay Change (%) | % Gap | Assignment Convergence | Simulation Convergence | VI (%) |
|---|---|---|---|---|---|---|---|
| AM | 22 | 99.1 | 99.6 | 0.0061 | 0.0065/10 | 0.036/ 7 | 0.00041 |
| | 23 | 99.0 | 99.6 | 0.0066 | 0.0071/10 | 0.035/ 7 | 0.00003 |
| | 24 | 98.9 | 99.6 | 0.0045 | 0.0057/10 | 0.031/ 3 | 0.00031 |
| | 25 | 99.2 | 99.6 | 0.0087 | 0.0035/10 | 0.034/ 7 | 0.00024 |
| IP | 15 | 98.5 | 99.8 | 0.0057 | 0.0032/10 | 0.014/ 7 | 0.00020 |
| | 16 | 99.1 | 99.8 | 0.0035 | 0.0031/10 | 0.012/ 7 | 0.00018 |
| | 17 | 98.9 | 99.9 | 0.0043 | 0.0024/10 | 0.011/ 7 | 0.00014 |
| | 18 | 99.3 | 99.9 | 0.0025 | 0.0025/10 | 0.010/ 7 | 0.00016 |
| PM | 15 | 98.6 | 99.5 | 0.0074 | 0.0110/10 | 0.043/ 7 | 0.00058 |
| | 16 | 98.8 | 99.5 | 0.0092 | 0.0065/10 | 0.038/ 7 | 0.00030 |
| | 17 | 99.0 | 99.6 | 0.012 | 0.0043/10 | 0.040/ 7 | 0.00006 |
| | 18 | 98.8 | 99.5 | 0.0070 | 0.0043/10 | 0.041/ 7 | 0.00016 |

## 3.6 Summary

The South and Vale highway assignment model has been tested against the criteria stipulated in TAG Unit M3.1 for:

- Link flows calibration across individual links; and
- Assignment convergence.

The base assignment models have been shown to be suitable for the three modelled time periods and meet the convergence criteria. In terms of individual flow accuracy, the model performs strongly across all time periods.

The majority of the individual links used for calibration passed the TAG criteria of 85% (TAG Unit M3.1 Table 2), with 92% of the links in AM peak; 95% in Inter-Peak; and 90% in PM peak passing. Further investigation highlighted that several of those links that fail the criteria are only slightly outside of criteria and with surrounding links that pass calibration. This demonstrates that the model achieves a good level of fit against observed flows across the area of focus.

In conclusion, the updated 2018 South and Vale base year highway model performs well against all the relevant TAG criteria, and it is suitable to form the basis for development of forecast models testing the local plans.

# 4. Forecast Modelling Assumptions

Forecast models are built to test the future impact of the local plans. In order to develop the forecast model, housing and employment assumptions are reviewed along with transport infrastructure schemes. This chapter summarises the forecast model inputs.

## 4.1 Assumptions Log

The list of land use assumptions and highway and public transport schemes considered in the model was discussed with Oxfordshire County Council, as highway authority, and Vale of White Horse and South Oxfordshire District Councils, as local planning authorities.

The housing and employment developments and transport schemes to be included in the modelled scenarios have been allocated to one of four categories (see detailed definitions in Table A2, p.48, TAG Unit M4 Forecasting and Uncertainty, Department for Transport, November 2023), as appropriate:

- Near certain: Housing, employment or transport schemes that will happen or there is a high probability that they will happen;
- More than likely: The outcome is likely to happen but there is some uncertainty;
- Reasonably foreseeable: The outcome may happen but there is significant uncertainty; and
- Hypothetical: There is considerable uncertainty whether the outcome will ever happen.

## 4.2 Forecast year modelled scenarios

The modelled area has evolved since it was previously modelled as part of Evaluation of Transport Impact study (ETI Stage 3) - Scenario 5c (dated July 2020) for the adopted South Oxfordshire Local Plan for planned growth to 2035.

The forecast scenarios for allocated development tested as part of this study are:

- 2041 Do Minimum - the adopted “Vale of White Horse Local Plan 2031 Parts 1 & 2” combined with “South Oxfordshire Local Plan 2035” (equivalent of 5c plus Vale Local Plan Part 2), with appropriate changes to the network to reflect the latest information on scheme development, and
- 2041 Do Something - the South and Vale Emerging Joint Local Plan with a plan end year of 2041.

The land use assumptions for South Oxfordshire and Vale of White Horse districts have been fully reviewed as part of this study.

All of the future year scenario tests were not constrained to NTEM growth, and as such provide higher growth than TEMPRO which constrains aggregate growth across all regions to be consistent with national forecasts. Use of the unconstrained option provides a higher growth scenario in terms of traffic growth, which would be expected to occur should all development be delivered. This provides a worst-case scenario and ensures the results of the model runs are robust.

## 4.3 Land use assumptions

This section summarises the land use assumptions used for each of the forecast scenarios. The allocations of the local plans for South and Vale are detailed in the first section and the additional land use assumptions for the rest of Oxford are in the subsequent section.

### 4.3.1 Allocations

The Local Plan allocations included within both scenarios defined in section 4.2 are summarised in Table 4-1. The main changes in land use assumptions between the two scenarios occur at Chalgrove Airfield, Dalton Barracks, Didcot Gateway, Didcot Orchard Centre Phase 2 (renamed Rich's Sidings and Broadway), North West Grove, and Crowmarsh Gifford.

In the Emerging Joint Local Plan 2041, Crowmarsh Gifford has a proposed use that had not been determined at the time of undertaking this exercise. This has been modelled for employment, as this is deemed to be the worst case in terms of impact on the network.

Since the model run the proposed allocation at Crowmarsh Gifford has been withdrawn. As such, a greater travel demand will be shown for journeys to / from Crowmarsh Gifford, particularly during the peak hours (owing to the employment use assumed) than is actually now proposed in the plan.

Figure 4-1 and Figure 4-2 show the location and the quantum of the development sites described in Table 4-1, separated between use type.

**Table 4-1 - Allocations**

| | Do Minimum | | Do Something | |
|---|---|---|---|---|
| | **Housing (dwellings)** | **Employment (ha)** | **Housing (dwellings)** | **Employment (ha)** |
| **South Oxfordshire** | | | | |
| Land adjacent to Culham Campus | 3,500 | 2.3 | 3,500 | 2.3 |
| Land at Berinsfield Garden Village | 1,700 | 5 | 1,700 | 5 |
| Land South of Grenoble Road | 3,000 | 10 | 3,000 | 10 |
| Didcot - Southmead Industrial Estate | - | 2.7 | - | 2.7 |
| Crowmarsh Gifford | - | - | - | 0.28 |
| Land at Chalgrove Airfield | 3,000 | 5 | - | - |
| Chalgrove - Monument Business Park | - | 2.25 | - | 2.25 |
| Land at Northfield | 1,800 | | 1,800 | |
| Land at Wheatley Campus | 500 | | 500 | |
| Joyce Grove Nettlebed | 15 | | - | |
| Priests Close, Nettlebed | 11 | | - | |
| Land at Bayswater Brook | 1,100 | | 1,100 | |
| Didcot North East | 934 | | 934 | |
| Land at Didcot Gateway | 300 | | 200 | |
| Ladygrove East | 750 | | 750 | |
| Rich's Sidings and Broadway | 300 | | 100 | |
| Vauxhall Barracks, Didcot | 300 | | 300 | |
| **Total for South Oxfordshire** | **17,210** | **27.25** | **13,884** | **22.53** |
| **Vale of White Horse** | | | | |
| Milton Park | - | 14 | - | 14 |
| Grove Technology Park | - | 5.4 | - | 5.4 |
| Harwell Campus | - | 93 | - | 93 |
| Didcot A | - | 29 | - | 29 |
| Monks Farm | 434 | 6 | 434 | 6 |
| Abingdon Science Park at Barton Lane | - | 0.7 | - | 0.7 |
| Land at Dalton Barracks Garden Village | 1,200 | - | 2,750 | - |
| North West of Valley Park | 800 | - | 800 | - |
| East of Kingston Bagpuize | 600 | - | 600 | - |
| North-east of East Hanney | 80 | - | 80 | - |
| North West of Grove | 400 | - | 600 | - |
| **Total for Vale of White Horse** | **3,514** | **148.10** | **5,269** | **148.10** |

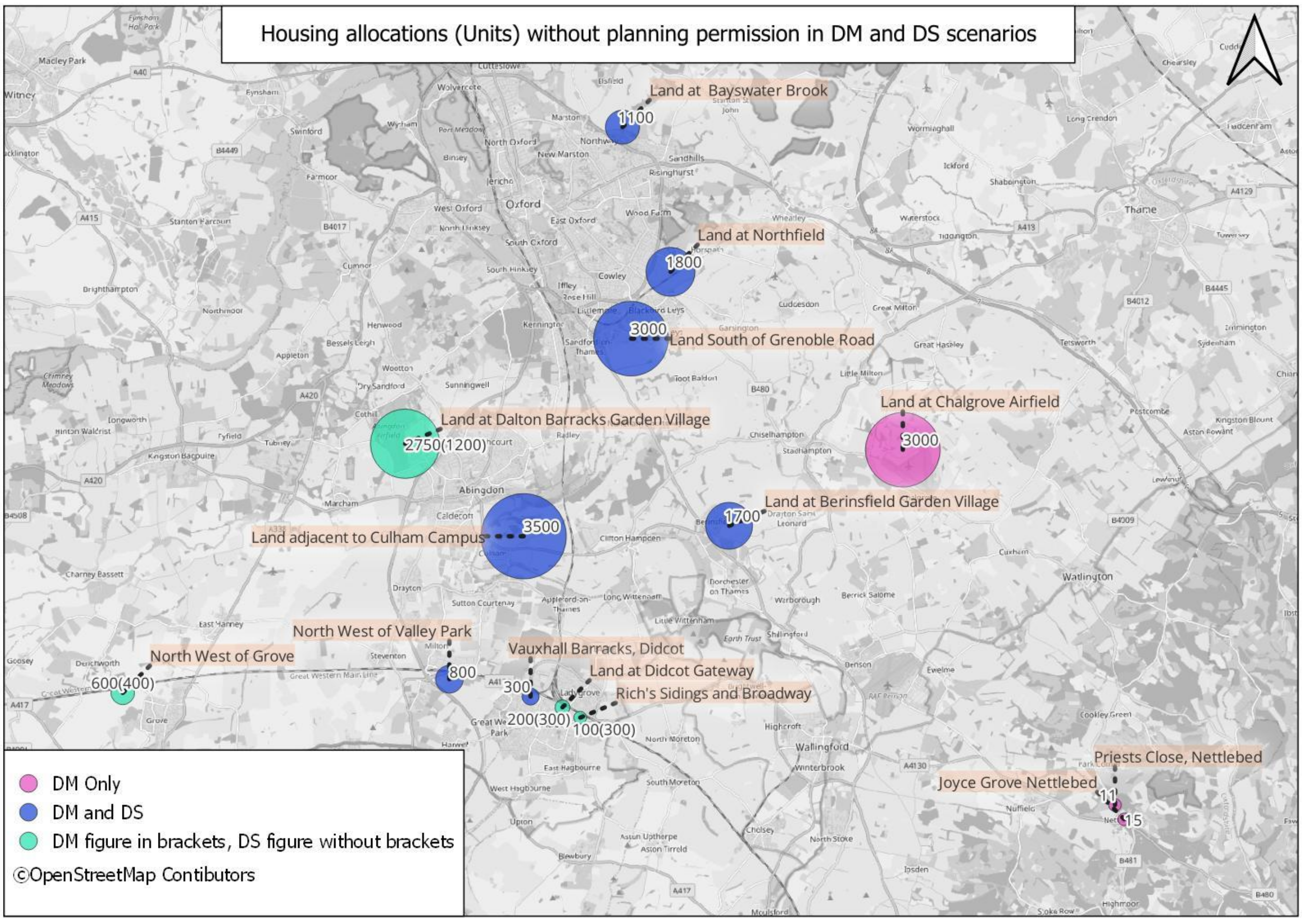


**Figure 4-1 - Housing allocations in the DM and DS scenarios**

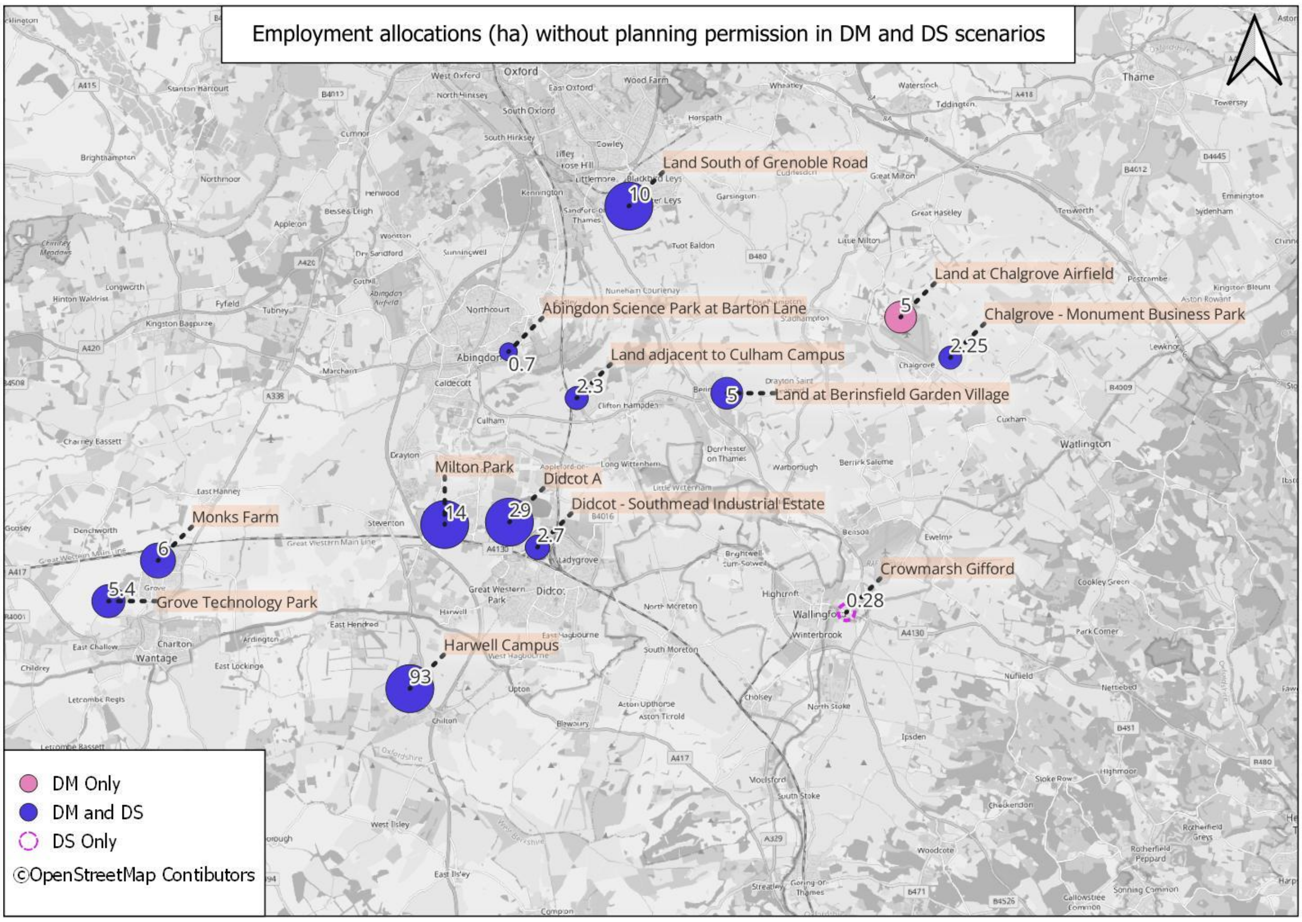


**Figure 4-2 - Employment allocations in the DM and DS scenarios**

Note that where a housing allocation changes between scenarios its DS quantum is shown first, with the DM quantum shown in brackets.

Where allocations are saved in the emerging Joint Local Plan but homes and or employment has planning permission and thus are included in the completions and permissions list, these are removed from the allocations list for both scenarios to prevent double counting.

## 4.3.2 General Land Use Assumptions

The land use assumptions, which come from planning applications, and are not part of the allocations mentioned previously are the same between the two scenarios. Table 4-2 and Table 4-3 summarises the number of dwellings assumed for each district in Oxfordshire in 2041 for the Adopted Local Plans (i.e. Do Minimum) and Emerging Joint Local Plan (i.e. Do Something) respectively. General land use assumptions in neighbouring districts are based on Local Plans that were adopted at the time of this study.

Table 4-4 and Table 4-5 summarise the number of jobs assumed for each district.

Note: allocations listed as item 3 in these tables are those discussed in the previous section.

**Table 4-2 - Housing assumptions for 2041 DM relative to 2018 base year (dwellings)**

| ID | No of dwellings | Cherwell | City | South | Vale | West | Total |
|---|---|---|---|---|---|---|---|
| 1 | Near certain | 12,779 | 2,294 | 15,043 | 14,445 | 4,152 | 48,713 |
| 2 | More than likely | 11,300 | 1,698 | - | 58 | 2,181 | 15,237 |
| 3 | Allocations | - | - | 17,210 | 3,514 | - | 20,724 |
| 4 | Allocations NDP | - | - | 979 | - | - | 979 |
| 5 | Reasonably foreseeable | - | 6,110 | - | - | 2,160 | 8,270 |
| 6 | Hypothetical | - | - | - | - | 5,073 | 5,073 |
| **TOTAL** | | **24,079** | **10,102** | **33,232** | **18,017** | **13,566** | **98,996** |

**Table 4-3 - Housing assumptions for 2041 DS relative to 2018 base year (dwellings)**

| ID | No of dwellings | Cherwell | City | South | Vale | West | Total |
|---|---|---|---|---|---|---|---|
| 1 | Near certain | 12,779 | 2,294 | 15,043 | 14,445 | 4,152 | 48,713 |
| 2 | More than likely | 11,300 | 1,698 | - | 53 | 2,181 | 15,232 |
| 3 | Allocations | - | - | 13,884 | 5,269 | - | 19,153 |
| 4 | Allocations NDP | - | - | 783 | - | - | 783 |
| 5 | Reasonably foreseeable | - | 6,110 | - | - | 2,160 | 8,270 |
| 6 | Hypothetical | - | - | - | - | 5,073 | 5,073 |
| **TOTAL** | | **24,079** | **10,102** | **29,710** | **19,767** | **13,566** | **97,224** |

**Table 4-4 - Employment assumptions for 2041 DM relative to 2018 base year (jobs)**

| ID | No of jobs | Cherwell | City | South | Vale | West | Total |
|---|---|---|---|---|---|---|---|
| 1 | Near certain | 18,752 | 1,227 | 2,005 | 6,813 | 7,567 | 36,363 |
| 2 | More than likely | 20,000 | 14,333 | - | - | 3,143 | 37,476 |
| 3 | Allocations | - | - | 7,818 | 15,815 | - | 23,633 |
| 4 | Allocations NDP | - | - | 116 | - | - | 116 |
| 5 | Outline | - | - | - | 1,845 | - | 1,845 |
| 6 | Reasonably foreseeable | 2,683 | 11,415 | - | - | - | 14,098 |
| 7 | Hypothetical | - | - | - | - | 4,556 | 4,556 |
| **TOTAL** | | **41,434** | **26,975** | **9,939** | **24,474** | **15,266** | **118,088** |

**Table 4-5 - Employment assumptions for 2041 DS relative to 2018 base year (jobs)**

| ID | No of jobs | Cherwell | City | South | Vale | West | Total |
|---|---|---|---|---|---|---|---|
| 1 | Near certain | 18,752 | 1,227 | 2,005 | 6,813 | 7,567 | 36,363 |
| 2 | More than likely | 20,000 | 14,333 | - | - | 3,143 | 37,476 |
| 3 | Allocations | - | - | 6,847 | 15,815 | - | 22,662 |
| 4 | Allocations NDP | - | - | 116 | - | - | 116 |
| 5 | Outline | - | - | - | 1,845 | - | 1,845 |
| 6 | Reasonably foreseeable | 2,683 | 11,415 | - | - | - | 14,098 |
| 7 | Hypothetical | - | - | - | - | 4,556 | 4,556 |
| **TOTAL** | | **41,434** | **26,975** | **8,968** | **24,474** | **15,266** | **117,117** |

# 4.4 NTEM

Strategic level transport modelling typically forecasts growth using NTEM data to account for background growth that falls outside of the plan area. The comparison between the assumptions in the Local Plans and the NTEM are presented in Table 4-6 and Table 4-7. The NTEM planning data was extracted from the TEMPro version 8.0 dataset for future forecast year 2041.

**Table 4-6 - Summary of the number of dwellings by district**

| District | Cherwell | Oxford | South Oxfordshire | Vale of White Horse | West Oxfordshire | Total |
|---|---|---|---|---|---|---|
| Modelled DM | 24,079 | 10,102 | 33,232 | 16,817 | 13,566 | 97,796 |
| Modelled DS | 24,079 | 10,102 | 29,710 | 18,367 | 13,566 | 95,824 |
| TEMPro80Core | 10,275 | 769 | 6,140 | 13,363 | 5,974 | 36,522 |

**Table 4-7 - Summary of the number of jobs by district**

| District | Cherwell | Oxford | South Oxfordshire | Vale of White Horse | West Oxfordshire | Total |
|---|---|---|---|---|---|---|
| Modelled DM | 41,434 | 26,975 | 9,939 | 24,474 | 15,266 | 118,088 |
| Modelled DS | 41,434 | 26,975 | 8,968 | 24,474 | 15,266 | 117,117 |
| TEMPro80Core | 6,943 | 9,975 | 5,833 | 5,506 | 4,412 | 32,667 |

As demonstrated the number of dwellings included in the forecast scenarios is significantly higher than the NTEM outputs. On a previous occasion, it was agreed with DfT that no additional growth will need to be assumed in the model for locations within Oxfordshire. Consequently, NTEM growth factors were only used for zones in the model located outside the county.

# 4.5 Network Assumptions

## 4.5.1 Highway network assumptions

The network for the DM scenario includes the following modifications from the 2018 base year (although this is not a complete list):

- Updating speeds on road sections where 20mph zones have been implemented.
- Updating of HIF1 funded scheme designs (A4130 Widening, Didcot Science Bridge, Didcot to Culham River Crossing and Clifton Hampden Bypass).
- Updated design of Benson and Watlington relief roads.
- Two new P&R sites are included in the model, one in Eynsham and another in Begbroke.
- Inclusion of completed schemes at Harwell Link Road, A34 Milton Interchange Hamburger, A34 Chilton Northern Slip Roads, Foxhall Bridge Widening, Hagbourne Hill improvements, Great Western Park Access, and A420 roundabout near Shrivenham.
- Inclusion of ‘more than likely’ schemes at Lodge Hill Interchange, Valley Park accesses to A4130, Valley Park Spine Road, improvements to Frilford Junction, Improvements to Featherbed/Steventon Lights junction, Rowstock Roundabout improvements, Grove Northern Link Road, Wantage Eastern Link Road, Didcot Northern Perimeter Road Phase Three, Thomson Avenue and Fermi Avenue junction improvements, A420 / Coxwell Road signalisation, A415 to A420 link road, Harwell village traffic

management measures, Access to Harwell Section 2 (Hagbourne Hill), Chilton Road closure, Stadhampton bypass, Chiselhampton bypass, Golden Balls grade separation, and Headington roundabout grade separation.

A plot of the schemes that are coded in the study area is presented in Figure 4-3 below. Additional transport schemes are included in other districts in Oxfordshire. All these network assumptions obtained prior agreement from OCC and the district authorities.

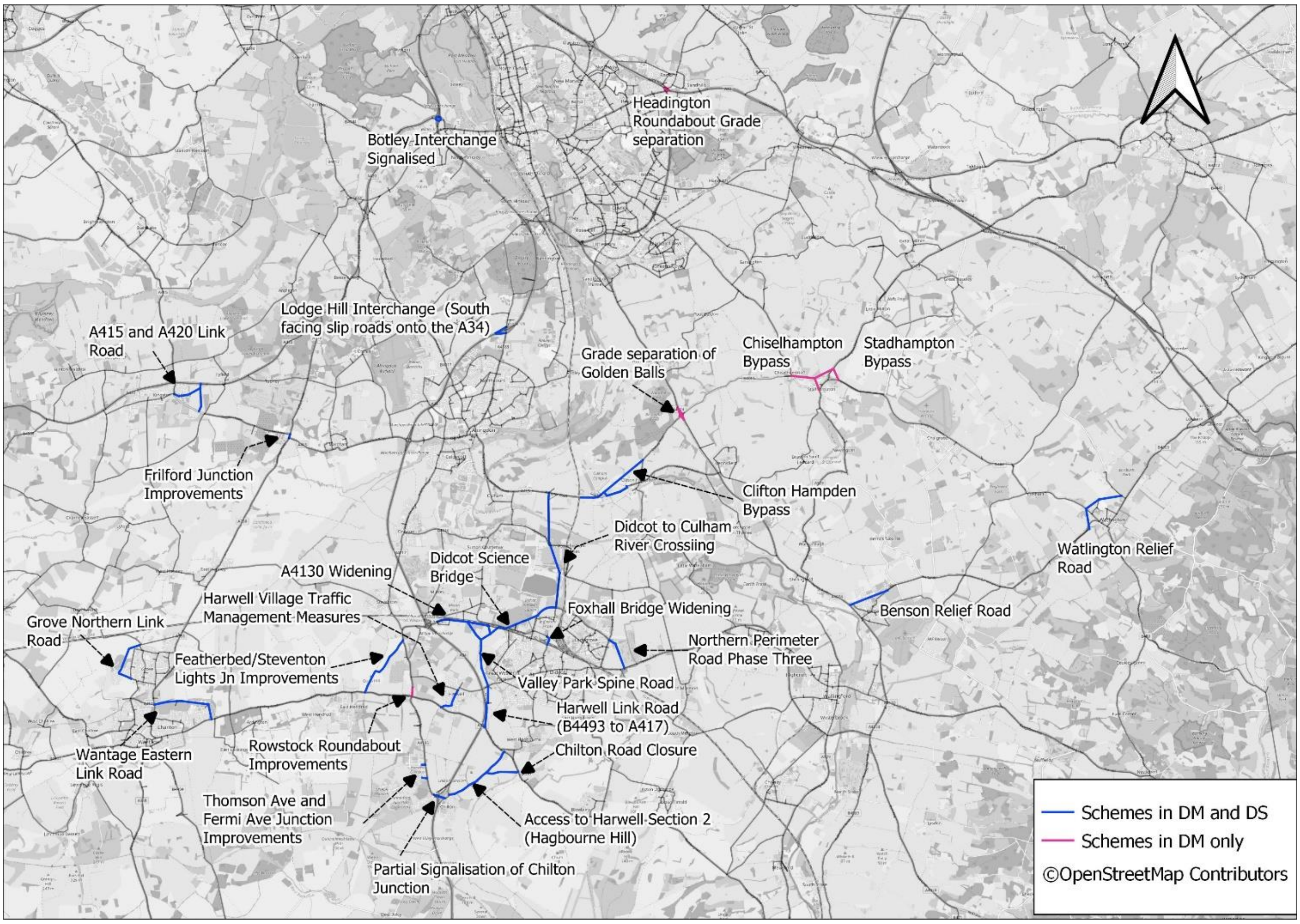


**Figure 4-3 - Future Year Schemes in / near the South and Vale districts**

The differences between the DM and DS scenarios consist of the removal of 5 highway schemes and one bus route and addition of a new highway scheme. These differences are presented in Table 4-8.

Future scenarios will assume that the existing five P&R sites remain open with current charging tariffs. The 2041 Future Year also included the Eynsham and Begbroke P&R sites.

**Table 4-8 - List of Forecast Year scheme differences**

| Scheme | DM | DS |
|---|---|---|
| Golden Balls Grade Separation | Yes | No |
| Chiselhampton Bypass | Yes | No |
| Stadhampton Bypass | Yes | No |
| Headington Grade Separation | Yes | No |
| Rowstock roundabout capacity Improvements* | Yes | No |
| Fermi Avenue and Thomson Avenue signalisation | No | Yes |
| Bus service between Didcot and Chalgrove | Yes | No |

*Improvements considered a capacity increase (flare length) on Reading Road arm so that all 4 arms of the roundabout had the same capacity at stopline.

## 4.5.2 20mph zones

All the new and approved 20mph areas within the model area were included in both forecast scenarios. Where the entire link is required to be adjusted to 20mph this was reduced. Where the 20mph section did not extend for the entire length of the link, then the speed on the link was calculated as the sum of the proportion of link at each speed.

The links at 20mph were derived from drawings/plans provided by district and county officers. These are shown in Figure 4-4. The links where the 20mph section is not for the entire link are shown in a different colour.

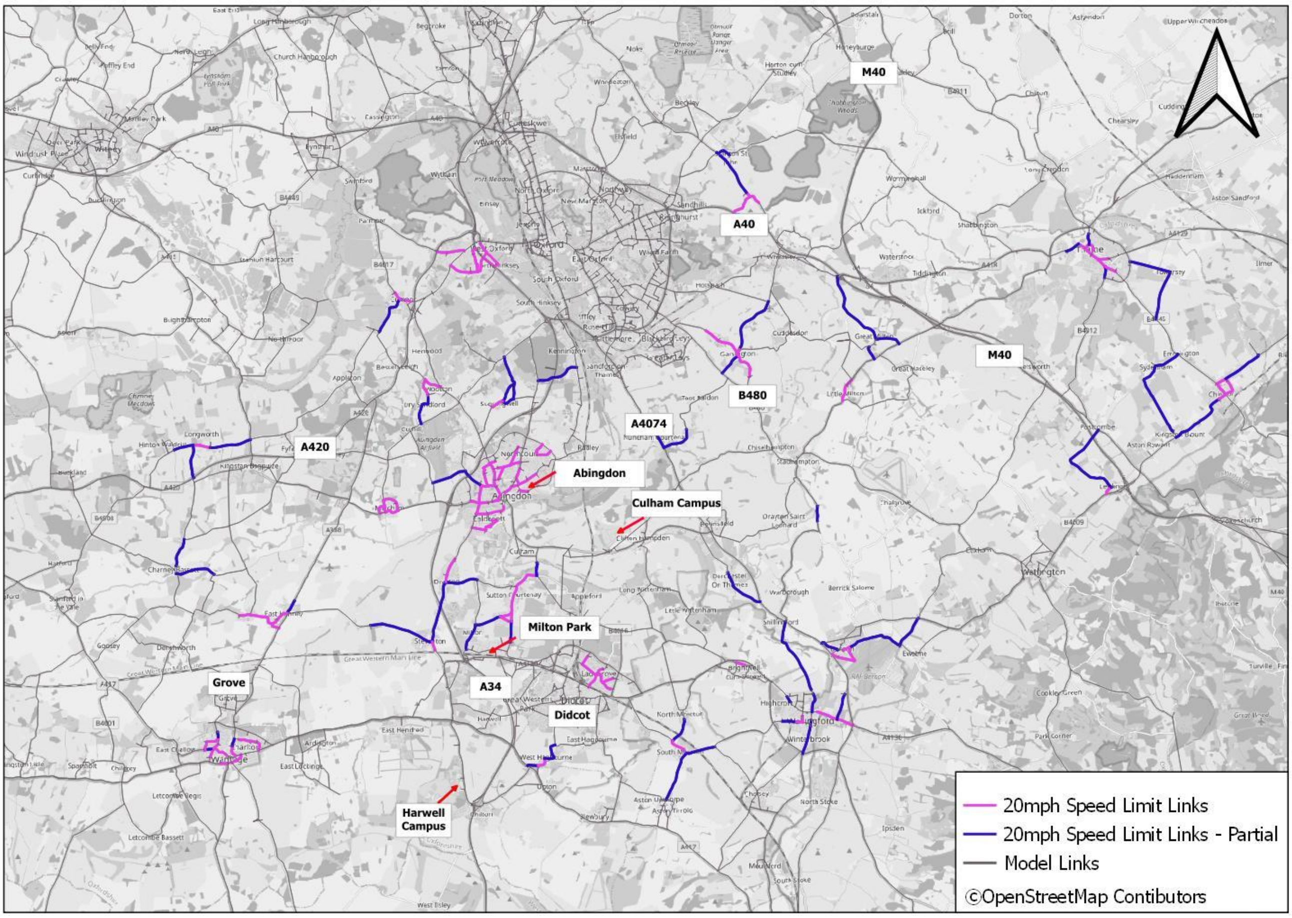


**Figure 4-4 - 20mph zones**

## 4.5.3 Traffic signal optimisation and weight limits

Traffic signal optimisation to improve the operation of junctions was undertaken at 8 locations, as illustrated in Figure 4-5. This method is frequently used in modelling and is performed to reduce large delays at these junctions in relation to the change in traffic flows between base year and the forecast year so as not to artificially introduce delays which may not be present. Without this technique, if the delays remained then traffic could be unnecessarily supressed to other modes and time periods to avoid the delay.

The existing weight limit on the B4015 Oxford Road that travels north/south through Clifton Hampden village remained unchanged but in the DS scenario with HIF1 in place HGVs can use the B4015 north of the village to enable access to HIF1 from Golden Balls.


**Figure 4-5 - Signal Optimised Junctions in Forecast year (2041)**

## 4.5.4 Bus assumptions

Figure 4-6 shows the bus routes altered as part of the Adopted Local Plans and Emerging Joint Local Plan 2041. The Didcot - Chalgrove service does not exist in the Emerging Joint Local Plan 2041. However, it should be noted that:

- The frequency of the bus service passing near Dalton Barracks has not been changed between DM and DS (modelled at 1 bus per hour in both scenarios)
- When Land at Chalgrove Airfield is removed from DS scenario, the bus service between Chalgrove and Didcot has also been removed, but the frequency of the existing bus service T1 has not been decreased

▪ The Wheatley to Thornhill bus service exists in both scenario (but it is no longer expected to be implemented).

**Table 4-9 - Additional bus services**

| Route ID | Route Name | Frequency (buses per hour) | DM | DS |
|---|---|---|---|---|
| 1 (Green) | Didcot Parkway to Northern Gateway | 4 | Yes | Yes |
| 2 (Purple) | Abingdon to Cowley Centre | 2 | Yes | Yes |
| 3 (Blue) | Chalgrove to Didcot | 2 | Yes | No |
| 4 (Red) | Grenoble Road to Oxford City Centre | 6 | Yes | Yes |
| 5 (Orange) | Bayswater to Oxford City Centre | 3 | Yes | Yes |
| 6 (Pink) | Wheatley to Thornhill | 2 | Yes | Yes |

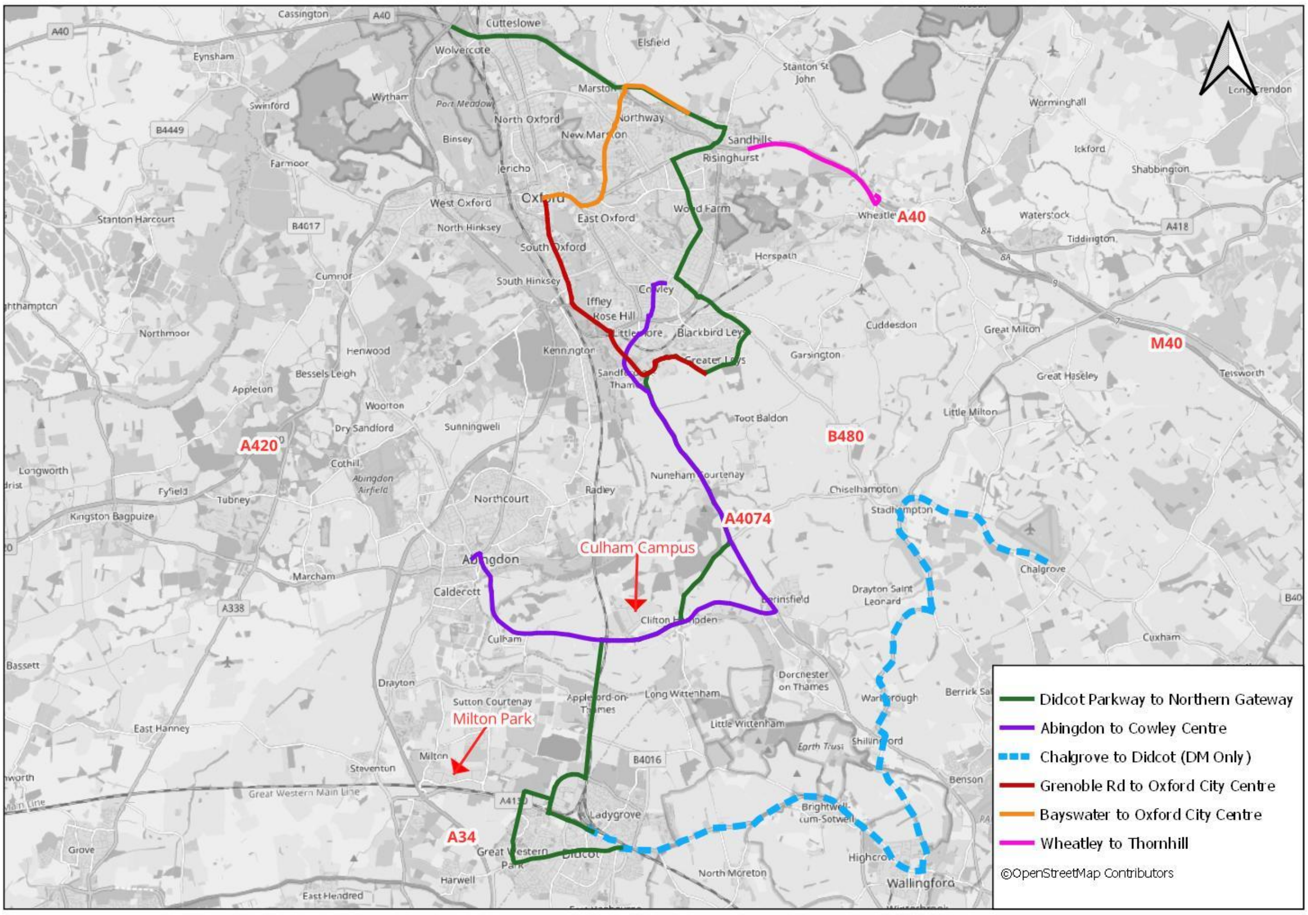


**Figure 4-6 - Bus Route Changes**

## 4.5.5 Park and Ride assumptions

The P&R assumptions are applied equally to the adopted LPs (DM) and emerging JLP (DS) scenarios.

there are two new P&R sites included in the DM and DS models: Eynsham and Begbroke in comparison with the base year 2018.

Based on experience from previous streams of work, it was decided to assume the following in terms of charges:

- The five P&R sites in the Base Year (2018) would continue to have a charge for parking. The P&R sites that are included in the future year only (Eynsham, Begbroke), would not have a charge for parking.
- For all sites, the bus fares will be in line with the fares of the regular bus services in the respective areas.

### 4.5.6 Rail assumptions

The forecast year changes to the Rail assumptions in the modelled scenarios are generally of marginal relevance to the area of interest for this study. The rail network assumptions are applied equally to the DM and DS scenarios.

# 5. 2041 Adopted Local Plans (DM) Scenario results

## 5.1 Introduction

The Adopted Local Plans (Do Minimum) scenario includes the specific land use and transport elements that are assumed as part of the adopted “Vale of White Horse Local Plan 2031 Parts 1 & 2” and “South Oxfordshire Local Plan 2035”, for 2041, as detailed in Chapter 4.

The standard set of model outputs was produced to assess the impact of the growth in the demand for travel between 2018 Base Year (BY) and 2041 Do Minimum (DM) scenario. The outputs from the VDM are summarised in the remainder of this chapter and the change in network performance over time is given for the following performance measures:

- The forecast change in travel demand and mode shares in the Variable Demand Model (VDM)
- The resulting changes in the overall performance of the highway and public transport network.

## 5.2 Change in Aggregated Travel Demand

### 5.2.1 Aggregated Demand for the Entire Model

Table 5-1 summarises the growth in travel demand for the entire model by mode from the 2018 BY to the 2041 DM for each time period (AM Peak, Inter-Peak, PM Peak) in OSM. The growth is mainly determined by the assumed land use (98,996 additional jobs and 118,088 additional jobs), and the respective trip rates, as well as NTEM growth for locations outside of the county.

Overall travel demand is forecast to grow by 42%, 55% and 37% in the AM, Inter-Peak and PM peak periods respectively, with an average of 46% over 12 hours. This suggests that network congestion during the AM and PM peaks is causing traffic to shift to the less congested Inter-Peak period i.e. replicating a choice for people to travel outside of peak times. The table does not include LGV and HGV demand which is not subject to VDM.

The analysis of the percentage growth should only be done for each mode individually, to understand how much it increased compared with itself. Comparison of the percentages between modes is not recommended, as each mode uses denominators with very different sizes, such as, a 10% growth in bus patronage is significantly fewer journeys than 10% growth in car journeys.

Regular car[7] demand is increasing significantly in all time periods due to the trips generated by the additional housing and employment sites, and it is expected to have a material impact on the travel conditions (journey times, delays, etc.).

The P&R demand shows a very large increase percentage-wise. However, in absolute terms, it is the mode with the fewest trips. The growth is driven by higher difficulty in accessing Oxford City by car and by a real term increase[8] in fares of only 1% per annum beyond 2020. Additionally, there are two additional sites (Eynsham and Begbroke) and the parking at these two sites is free of charge.

[7] Car for the full trip as opposed to P&R which uses cars for part of the trip

[8] Which excludes the impact of inflation.

The bus demand shows a significant increase of 49%, 53% and 45% in the AM, Inter-Peak and PM peak periods respectively, with an average of 50% over 12 hours. The increase in demand is due to the overall growth in the number of dwellings and jobs between the two scenarios and also due to an increase in supply, i.e. increased frequencies, new services, etc. Based on the assumptions in the modelled scenarios, there is an increase in the number of buses per hour on every corridor modelled. However, it should be noted that bus demand is negatively influenced by the increased highway congestion. This results in higher travel times for bus which makes it relatively less attractive, especially if competing rail services are available.

The rail demand also shows a very large increase percentage-wise. However, in absolute terms it has fewer trips than bus. The growth is driven by the implementation of new rail services, which results in increased frequencies on all corridors within Oxfordshire.

It should be noted that an issue with the rail services was observed in the Base Year. After the future year scenarios were built, it was found that the existing rail services between Didcot, Oxford and Banbury (running as a shuttle service) were not included in base year, but they were included in the future year. As a result, the VDM perceives an improvement in rail services when, in reality, there is none. This mainly affects the comparison of the future year scenarios with the base year. Based on investigations done for other studies in Oxfordshire undertaken in parallel, this would account for up to 10% of the increase. As both future year scenarios (DM and DS) have the same rail assumptions, the conclusions of the comparison between the two are not materially influenced. Further to this, some additional rail services associated with the East West Rail proposals are included in the assumptions for both the DM and DS scenarios, which will also be a contributory factor in the increase in rail demand shown.

**Table 5-1 - Change in Travel by Mode and Time period for the entire model (2018 BY to 2041 DM)**

| Time period / Mode | 2018 BY | 2041 DM | Change between 2041 DM and 2018 BY |
|---|---|---|---|
| **AM Peak period (07:00 – 10:00)** | | | |
| Reg car[9] (veh.) | 234,612 | 329,105 | 94,493 (40%) |
| P&R (veh.) | 2,946 | 7,131 | 4,185 (142%) |
| Bus only (pass.) | 25,057 | 37,419 | 12,363 (49%) |
| Rail (pass.) | 9,866 | 20,461 | 10,595 (107%) |
| TOTAL (persons) | 348,263 | 494,836 | 146,573 (42%) |
| **IP period (10:00 – 16:00)** | | | |
| Reg car (veh.) | 413,926 | 632,706 | 218,780 (53%) |
| P&R (veh.) | 2,761 | 4,962 | 2,202 (80%) |
| Bus only (pass.) | 42,314 | 64,874 | 22,560 (53%) |
| Rail (pass.) | 11,481 | 25,437 | 13,956 (122%) |
| TOTAL (persons) | 610,872 | 945,285 | 334,413 (55%) |
| **PM peak period (16:00-19:00)** | | | |
| Reg car (veh.) | 314,172 | 429,134 | 114,962 (37%) |
| P&R (veh.) | 2,551 | 5,347 | 2,796 (110%) |
| Bus only (pass.) | 24,966 | 36,238 | 11,272 (45%) |
| Rail (pass.) | 12,300 | 22,157 | 9,857 (80%) |
| TOTAL (persons) | 452,248 | 617,416 | 165,168 (37%) |
| **12 hours (07:00 – 19:00)** | | | |
| Reg car (veh.) | 962,710 | 1,390,945 | 428,236 (44%) |
| P&R (veh.) | 8,258 | 17,440 | 9,182 (111%) |
| Bus only (pass.) | 92,337 | 138,531 | 46,194 (50%) |
| Rail (pass.) | 33,648 | 68,055 | 34,408 (102%) |
| TOTAL (persons) | 1,411,383 | 2,057,537 | 646,154 (46%) |

### 5.2.2 Overall Mode Share for the Entire model

Table 5-2 summarises the changes in overall mode share by time period. Over a 12-hour period, there is a mode shift of 1.4% from car to various public transport sub modes. As the AM and PM peak has more congestion, it can be observed that the mode shift is greater in the AM and PM peak periods than the Inter-Peak.

There is an increase in P&R due to the addition of P&R sites, which is greatest in the AM peak with 0.7% and PM with 0.3%. Generally, the arrivals at the P&R sites are much more concentrated in the AM peak period, while the returns are spread over inter-peak, PM peak and off-peak. The P&R mode share does not change

[9] This refers to the car demand, excluding the car leg of the P&R trips.

materially during the Inter-Peak. The mode share by bus and rail shows an increase due to the availability of services (although the rail mode partially increases due to the issue with the rail services in Base Year mentioned in section 5.2.1).

**Table 5-2 - Change in Mode Share by Time period (2018 BY to 2041 DM)**

| Time period / Mode | 2018 BY | 2041 DM | Relative change between 2041 DM and 2018 BY |
|---|---|---|---|
| **AM Peak period (07:00 – 10:00)** | | | |
| Reg car | 89.1% | 86.9% | -2.2% |
| P&R | 0.9% | 1.6% | 0.7% |
| Bus only | 7.2% | 7.6% | 0.4% |
| Rail | 2.8% | 4.1% | 1.3% |
| **IP period (10:00 – 16:00)** | | | |
| Reg car | 90.7% | 89.9% | -0.8% |
| P&R | 0.5% | 0.6% | 0.1% |
| Bus only | 6.9% | 6.9% | -0.1% |
| Rail | 1.9% | 2.7% | 0.8% |
| **PM peak period (16:00-19:00)** | | | |
| Reg car | 90.9% | 89.4% | -1.6% |
| P&R | 0.6% | 1.0% | 0.3% |
| Bus only | 5.5% | 5.9% | 0.3% |
| Rail | 2.7% | 3.6% | 0.9% |
| **12 hours (07:00 – 19:00)** | | | |
| Reg car | 90.4% | 89.0% | -1.4% |
| P&R | 0.6% | 0.9% | 0.3% |
| Bus only | 6.5% | 6.7% | 0.2% |
| Rail | 2.4% | 3.3% | 0.9% |

### 5.2.3 Aggregated Demand for each district

Table 5-3 summarises the growth in travel demand in South Oxfordshire district by time period and mode from the 2018 Base year to the 2041 DM scenario. Between 2018 BY and the 2041 DM scenario, the overall increase in the AM peak period at origin level is 56% while at destination level it is 44%. This is because there is higher growth in trips from dwellings (origins in the AM) than trips to jobs (destinations in the AM) in the district. In the inter-peak period the growth in travel demand is balanced with 61% for origins and destinations. The PM peak period has broadly the reverse pattern to the AM and the 12 hours demand is balanced between origins and destinations, as expected.

**Table 5-3 - Change in Travel by Mode and Time period for South Oxfordshire District (2018 BY to 2041 DM)**

| Time period / Mode | 2018 BY | | 2041 DM | | Relative change between 2041 DM and 2018 BY | |
|---|---|---|---|---|---|---|
| | Origin | Destination | Origin | Destination | Origin | Destination |
| **AM Peak period (07:00 – 10:00)** | | | | | | |
| Reg car (veh.) | 38,847 | 30,617 | 58,904 | 43,241 | 52% | 41% |
| P&R (veh.) | 286 | 35 | 786 | 54 | 175% | 56% |
| Bus only (pass.) | 1,302 | 933 | 3,216 | 1,630 | 147% | 75% |
| Rail (pass.) | 1,453 | 700 | 4,277 | 2,606 | 194% | 272% |
| TOTAL (persons) | 54,691 | 42,151 | 85,373 | 60,895 | 56% | 44% |
| **IP period (10:00 – 16:00)** | | | | | | |
| Reg car (veh.) | 60,990 | 62,024 | 96,928 | 97,582 | 59% | 57% |
| P&R (veh.) | 144 | 155 | 247 | 360 | 72% | 133% |
| Bus only (pass.) | 1,734 | 1,339 | 3,000 | 2,865 | 73% | 114% |
| Rail (pass.) | 1,067 | 926 | 2,836 | 2,982 | 166% | 222% |
| TOTAL (persons) | 84,698 | 85,450 | 136,380 | 137,572 | 61% | 61% |
| **PM peak period (16:00-19:00)** | | | | | | |
| Reg car (veh.) | 54,477 | 59,993 | 71,695 | 84,141 | 32% | 40% |
| P&R (veh.) | 31 | 163 | 36 | 493 | 18% | 203% |
| Bus only (pass.) | 787 | 959 | 1,291 | 2,631 | 64% | 174% |
| Rail (pass.) | 986 | 1,785 | 2,858 | 5,066 | 190% | 184% |
| TOTAL (persons) | 73,071 | 81,786 | 96,351 | 117,050 | 32% | 43% |
| **12 hours (07:00 – 19:00)** | | | | | | |
| Reg car (veh.) | 154,314 | 152,635 | 227,527 | 224,964 | 47% | 47% |
| P&R (veh.) | 460 | 352 | 1,069 | 907 | 132% | 158% |
| Bus only (pass.) | 3,822 | 3,231 | 7,507 | 7,126 | 96% | 121% |
| Rail (pass.) | 3,506 | 3,411 | 9,971 | 10,654 | 184% | 212% |
| TOTAL (persons) | 212,460 | 209,386 | 318,105 | 315,516 | 50% | 51% |

When comparing these results at the daily level to what was given for the whole model area in Table 5-1, it can be observed that the growth in total trips is greater in South Oxfordshire (around 50%) compared to the overall model area (at 46%), showing that the level of housing and employment growth in South Oxfordshire district is higher than the average in Oxfordshire County. South is the district with the highest growth in number of dwellings (approx. a third of the total number of dwellings in Oxfordshire County).

Table 5-4 summarises the growth in travel demand in the Vale of White Horse district by time period and mode from the 2018 Base year to the 2041 DM scenario. Between 2018 BY and the 2041 DM, the overall increase in the AM peak period at origin level is 44% while at destination level it is 35%. This is because there is higher growth in trips from dwellings (origins in the AM) than trips to jobs (destinations in the AM) in the district. In the inter-peak period the growth in travel demand is more balanced with 62% for origins and 60% for destinations. The PM peak period has broadly the reverse pattern to the AM and the 12 hours demand is, balanced between origins and destinations, as expected.

**Table 5-4 - Change in Travel by Mode and Time period for Vale of White Horse District (2018 BY to 2041 DM**

| Time period / Mode | 2018 BY | | 2041 DM | | Relative change between 2041 DM and 2018 BY | |
|---|---|---|---|---|---|---|
| | **Origin** | **Destination** | **Origin** | **Destination** | **Origin** | **Destination** |
| **AM Peak period (07:00 – 10:00)** | | | | | | |
| Reg car (veh.) | 41,849 | 45,874 | 59,476 | 61,389 | 42% | 34% |
| P&R (veh.) | 733 | 34 | 1,484 | 130 | 102% | 287% |
| Bus only (pass.) | 2,844 | 1,958 | 4,413 | 3,346 | 55% | 71% |
| Rail (pass.) | 607 | 654 | 2,411 | 2,167 | 297% | 232% |
| TOTAL (persons) | 60,417 | 63,833 | 86,797 | 86,105 | 44% | 35% |
| **IP period (10:00 – 16:00)** | | | | | | |
| Reg car (veh.) | 66,722 | 66,455 | 107,164 | 105,242 | 61% | 58% |
| P&R (veh.) | 243 | 336 | 456 | 608 | 88% | 81% |
| Bus only (pass.) | 3,282 | 3,364 | 5,171 | 5,230 | 58% | 55% |
| Rail (pass.) | 530 | 299 | 2,101 | 1,979 | 297% | 561% |
| TOTAL (persons) | 93,836 | 93,395 | 152,078 | 149,814 | 62% | 60% |
| **PM peak period (16:00-19:00)** | | | | | | |
| Reg car (veh.) | 51,978 | 50,046 | 74,334 | 72,342 | 43% | 45% |
| P&R (veh.) | 67 | 734 | 84 | 1,447 | 24% | 97% |
| Bus only (pass.) | 1,628 | 2,224 | 2,898 | 3,596 | 78% | 62% |
| Rail (pass.) | 812 | 692 | 2,293 | 2,390 | 182% | 245% |
| TOTAL (persons) | 71,281 | 70,106 | 101,620 | 101,606 | 43% | 45% |
| **12 hours (07:00 – 19:00)** | | | | | | |
| Reg car (veh.) | 160,549 | 162,376 | 240,973 | 238,972 | 50% | 47% |
| P&R (veh.) | 1,043 | 1,104 | 2,023 | 2,185 | 94% | 98% |
| Bus only (pass.) | 7,755 | 7,547 | 12,483 | 12,172 | 61% | 61% |
| Rail (pass.) | 1,949 | 1,645 | 6,805 | 6,536 | 249% | 297% |
| TOTAL (persons) | 225,533 | 227,335 | 340,495 | 337,526 | 51% | 48% |

When comparing these results at the daily level to what was given for the whole model area in Table 5-1, it can be observed that the growth in total trips is greater in Vale of White Horse District (around 50%) compared to the overall model area (at 46%). Vale is the district with the third highest growth in number of dwellings and the second with the second highest growth in number of jobs in Oxfordshire County. Vale of White Horse has lower percentage increases for bus and rail than South given that more housing and employment growth is located in South Oxfordshire and that most of the bus service improvements are also primarily in South.

## 5.2.4 Overall Changes to the Highway network

Travel demand on the highway network is forecast to increase between the 2018 BY and 2041 DM due to the increase in houses and jobs in the model. The performance of the highway network over time (for the whole model area) is summarised by reporting the overall network performance in terms of the total number of trips, travel distance, travel time, delay, and speed. Table 5-5 summarises the changes in peak hour travel conditions for the entire highway network between the 2018 Base year and the 2041 DM. The table includes cars, buses, LGV and HGV demand.

Overall highway trip demand is forecast to increase by 41% in the AM peak hour, with an increase of 48% in the Inter-peak, and of 39% in the PM peak hour. Total travel distance increases by 35%, 43% and 33% in the AM, Inter-Peak and PM peak hour respectively. Inter-peak demand increases by the greatest proportion, as the highway network is generally under less stress in this time period and has more scope for additional trips.

Average delays increase by 150% in the AM peak, 70% in the inter-peak, and 122% in the PM peak. Increased delay per vehicle is logical given the increased number of trips and how delays tend to increase exponentially when junctions approach capacity. The delay increases are greatest in the AM peak indicating that the network is closer to capacity in some areas for this time period.

**Table 5-5 - Overall performance of the highway network (2018 BY to 2041 DM)**

| Time Period/Metric | 2018 BY | 2041 DM | Difference (2041 DM - 2018 BY) |
|---|---|---|---|
| **AM Peak hour (08:00 – 09:00)** | | | |
| Trips (PCUs) | 114,019 | 160,785 | 46,766(41%) |
| Travel Distance (PCU-kms) | 5,091,224 | 6,885,330 | 1,794,106(35%) |
| Travel Time (PCU-hrs) | 64,713 | 99,387 | 34,674(54%) |
| Delay (PCU-hrs) | 3,895 | 13,742 | 9,846(253%) |
| Average Distance (km) per PCU | 45 | 43 | -2(-4%) |
| Average Travel Time (min) per PCU | 34 | 37 | 3(9%) |
| Average Delay (sec) per PCU | 123 | 308 | 185(150%) |
| Average speed (km/h) | 79 | 69 | -9(-12%) |
| **Inter-peak hour (average)** | | | |
| Trips (PCUs) | 85,345 | 126,665 | 41,321(48%) |
| Travel Distance (PCU-kms) | 4,335,511 | 6,190,086 | 1,854,575(43%) |
| Travel Time (PCU-hrs) | 51,738 | 78,231 | 26,493(51%) |
| Delay (PCU-hrs) | 2,066 | 5,207 | 3,140(152%) |
| Average Distance (km) per PCU | 51 | 49 | -2(-4%) |
| Average Travel Time (min) per PCU | 36 | 37 | 1(2%) |
| Average Delay (sec) per PCU | 87 | 148 | 61(70%) |
| Average speed (km/h) | 84 | 79 | -5(-6%) |
| **PM Peak hour (17:00 – 18:00)** | | | |
| Trips (PCUs) | 125,247 | 174,141 | 48,894(39%) |
| Travel Distance (PCU-kms) | 5,626,236 | 7,473,607 | 1,847,372(33%) |
| Travel Time (PCU-hrs) | 70,947 | 106,343 | 35,396(50%) |
| Delay (PCU-hrs) | 4,643 | 14,306 | 9,662(208%) |
| Average Distance (km) per PCU | 45 | 43 | -2(-4%) |
| Average Travel Time (min) per PCU | 34 | 37 | 3(8%) |
| Average Delay (sec) per PCU | 133 | 296 | 162(122%) |
| Average speed (km/h) | 79 | 70 | -9(-11%) |

### 5.2.5 Overall Changes to the Public Transport network performance

Travel demand on the public transport network is forecast to increase between the 2018 BY and 2041 DM. The performance of the public transport network over time is summarised by reporting on the overall network performance in terms of the number of passengers, generalised travel time, in vehicle time, walking time and waiting time. Table 5-6 summarises the overall performance of the public transport network between the 2018 BY and the 2041 DM scenario for the entire model. It should be noted that the number of trips in this table represent the number of boardings, so it is not the same measure as the one presented in Table 5-2, which shows the number of person trips (a person trip can generate more than one boarding).

The number of boardings by bus increases on average by 56% (56,911 person trips) over a 12-hour period, with an increase of 58%, 55% and 54% for AM, Inter-peak and PM peak periods respectively. This increase is slightly higher than the 50% increase in person trips, which suggest that the new trips require interchanges between bus services or between bus and rail. It should also be noted that bus boardings include the P&R users.

Over a 12-hour period, there is an increase in average wait time for bus users, which is probably due to the increased number of interchanges. There is also an increase in the time spent onboard bus services (in-vehicle time) due to the influence of the increased highway congestion. However, there is a decrease in access/egress time (walk time), which means that bus stops/services are available at locations closer to the generation and/or attraction points. Overall, this results in a slight decrease in Generalised Travel Time, which is the measure of disutility for public transport users.

The increase in boardings for rail is consistent with the increase in the number of person trips, with an average increase of 102% (34,408 person trips) over a 12-hour period, with an increase of 116% in the AM peak period, 122% in the Inter-peak period and 87% in the PM peak period. This suggests that passengers do not require interchanges between rail services to complete their journeys.

Over a 12-hour period, there is a decrease in all the statistics for rail, except demand. The smallest decrease is in average wait time for rail users, as service frequencies increase but not significantly. There is also a decrease in the time spent onboard rail services (in-vehicle time) due to the improvement in speed on some services, for example a decrease of journey times of 3 minutes between London and Reading and 3 minutes between Reading and Oxford. However, the highest decrease is estimated for access/egress time (walk time). For rail, this means that bus services are used more in 2041 DM to access rail which results in shorter average walk time per trip.

**Table 5-6 - Overall performance of the Public Transport network (2018 to 2041 DM)**

| Time period | 2018 BY | | 2041 DM | | Percentage change between 2041 DM and 2018 BY | |
|---|---|---|---|---|---|---|
| | Rail | Bus | Rail | Bus | Rail | Bus |
| **AM Peak hour (08:00 – 09:00)** | | | | | | |
| Demand (boardings) | 4,236 | 10,910 | 9,142 | 17,215 | 116% | 58% |
| Average GTT[10] (mins.) | 254.0 | 80.3 | 168.7 | 83.6 | -34% | 4% |
| Average IVT[11] (mins.) | 45.4 | 20.8 | 31.5 | 23.9 | -31% | 15% |
| Average Walk (mins.) | 82.5 | 20.7 | 48.9 | 20.3 | -41% | -2% |
| Average Wait (mins.) | 8.2 | 4.1 | 6.9 | 4.1 | -16% | 0% |
| **IP average hour (10:00 – 16:00)** | | | | | | |
| Demand (boardings) | 1,914 | 7,551 | 4,240 | 11,722 | 122% | 55% |
| Average GTT (mins.) | 247.0 | 84.2 | 185.0 | 81.4 | -25% | -3% |
| Average IVT (mins.) | 48.6 | 20.3 | 34.4 | 24.4 | -29% | 20% |
| Average Walk (mins.) | 78.1 | 23.6 | 50.6 | 18.0 | -35% | -24% |
| Average Wait (mins.) | 8.9 | 3.9 | 10.4 | 4.7 | 17% | 21% |
| **PM peak hour (17:00-18:00)** | | | | | | |
| Demand (boardings) | 4,870 | 10,260 | 9,093 | 15,753 | 87% | 54% |
| Average GTT (mins.) | 270.2 | 83.8 | 169.0 | 82.7 | -37% | -1% |
| Average IVT (mins.) | 45.3 | 21.9 | 33.5 | 27.4 | -26% | 25% |
| Average Walk (mins.) | 90.3 | 22.5 | 48.3 | 17.4 | -46% | -23% |
| Average Wait (mins.) | 9.6 | 3.8 | 7.2 | 4.5 | -25% | 20% |
| **12-hour period (07:00 – 19:00)** | | | | | | |
| Demand (boardings) | 33,648 | 101,465 | 68,055 | 158,377 | 102% | 56% |
| Average GTT (mins.) | 256.6 | 83.1 | 177.9 | 82.2 | -31% | -1% |
| Average IVT (mins.) | 46.3 | 20.9 | 33.8 | 25.0 | -27% | 20% |
| Average Walk (mins.) | 83.5 | 22.5 | 50.2 | 18.4 | -40% | -18% |
| Average Wait (mins.) | 8.9 | 3.9 | 8.5 | 4.5 | -5% | 14% |

Notes: (i) Numbers may not sum to 100 due to rounding; (ii) Local rail services only; (iii) In Vehicle Time, walk and wait times are not weighted, whilst the Generalised Travel Time is total travel time from the assignment.

## 5.3 Convergence

The 2041 DM model run presented in this chapter did not achieve a convergence gap of under 0.2 in less than 40 iterations of the VDM, which is the normal criteria for convergence according to TAG. Given the fact that this was a model run with unconstrained demand, this was not unexpected.

[10] Generalised travel time

[11] In-vehicle time (un-weighted).

As the convergence of the 2041 DM scenario was close to convergence (0.2708) and it is assumed that the changes in traffic flow between iterations are minimal in the area of interest for this particular study (presented in Figure 1-1), we believe that the level of convergence is satisfactory.

On this basis the model is considered suitable for assessing the adopted Local Plans and Emerging Joint Local Plan 2041.

## 5.4 Highway Results

As set out in Section 4.2 and 4.3 this scenario comprises the adopted “Vale of White Horse Local Plan 2031 Parts 1 & 2” combined with “South Oxfordshire Local Plan 2035” (equivalent of 5c plus Vale Local Plan Part 2), with appropriate changes to the network to reflect the latest information on scheme development.

Figure 5-1, Figure 5-2 and Figure 5-3 shows the Volume over Capacity (V/C) plots for this scenario. Larger versions of these figures are available at Appendix B. The orange bands denote where link volume over capacity is between 85% and 95% and the red bands denoted where the link V/C ratio is greater than 95%. The orange circles denote where the junction V/C ratio is between 85% and 95% and the red circles denote where junction V/C is greater than 95%. For greater legibility of the plots, where junctions are between 0% and 85%, green circles have not been shown. In the AM the A34 has a high V/C ratio along much of the route, Abingdon Road, Oxford Road, roads around Chiselhampton and Milton Interchange are areas where V/C is also large. In the inter peak there are fewer links with a high V/C ratio due to the lower traffic volumes, in the PM peak the A34 and A4074 have a high V/C ratio.

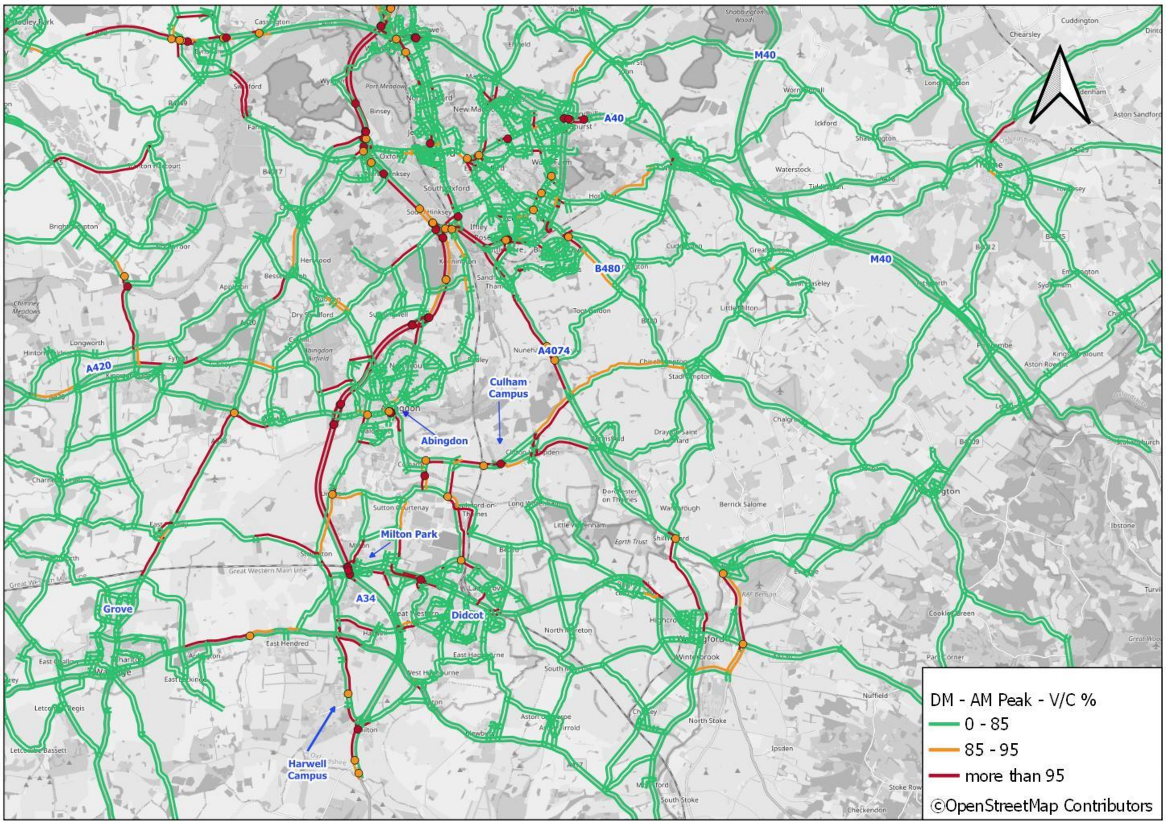


**Figure 5-1 - Volume/Capacity DM AM Peak hour**

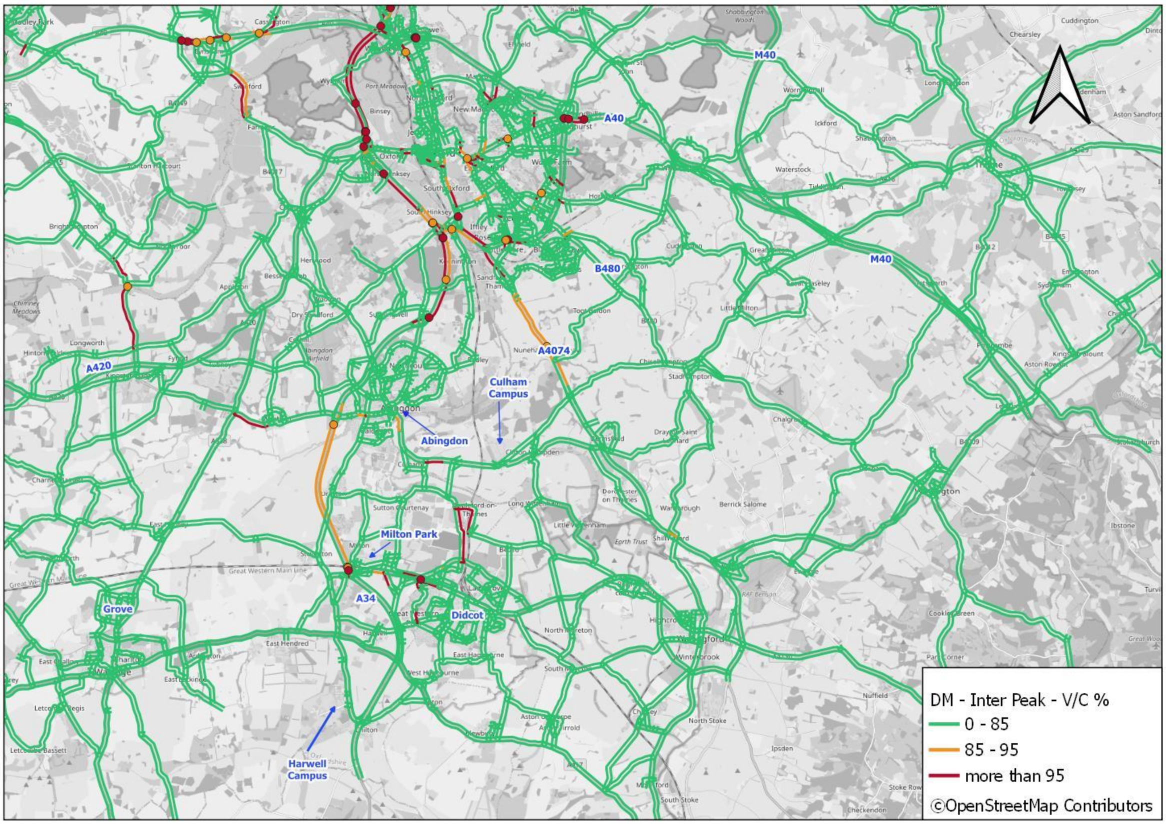


**Figure 5-2 - Volume/Capacity DM Inter Peak hour**

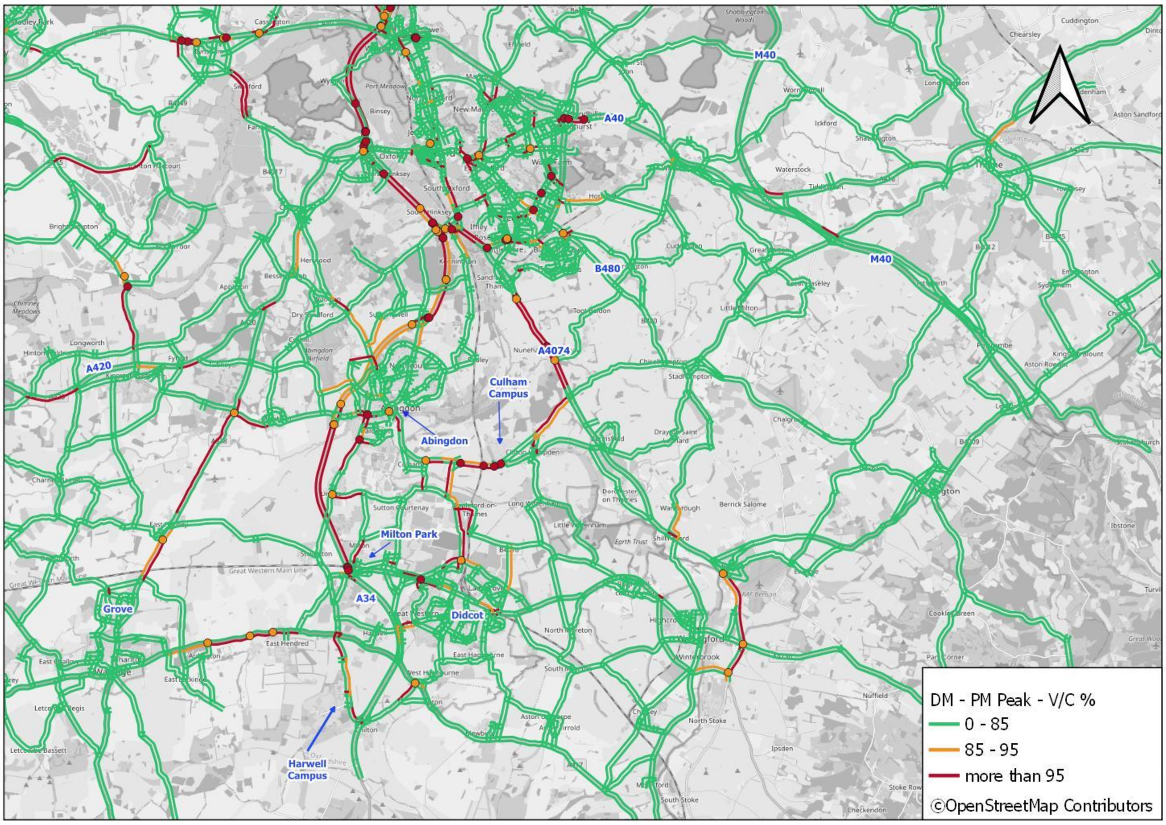


**Figure 5-3 - Volume/Capacity DM PM Peak hour**

# 6. 2041 Emerging Joint Local Plan (DS) Scenario results

## 6.1 Introduction

The 2041 Do Something scenario includes the specific land use and transport schemes that are sought to be changed as part of the Emerging South and Vale Joint Local Plan 2041. It should be noted that not all the land use and transport schemes assumptions from the DM scenario are included in the DS scenario, which would be the usual approach. The details of the scenario differences are detailed in Chapter 4.

The standard set of model outputs was produced to assess the impact of the demand for travel between the 2041 DM and the 2041 DS scenarios.

## 6.2 Change in Travel Demand

### 6.2.1 Aggregated Demand for the Entire Model

Table 6-1 summarises the change in travel demand by time-period and mode from the DM to DS scenario. This shows how the redistribution of development and the removal of some highway schemes (and a bus route) impact the overall demand by mode.

For the model as a whole, there are very few noticeable changes in demand between the DM and DS scenarios, with minor decreases seen across all the modes. These are due to the fact that both the total number of dwellings and the number of jobs is lower in the DS scenario than in DM. Rail trips decrease largely due to the deallocation of Land at Chalgrove Airfield, as there are significant number of trips to/from London from this zone. The removal of the bus service between Chalgrove and Didcot also has an impact on other zones along the route due to the change in cost and so sees decreases in demand, this bus service is used to access rail. The table does not include LGV and HGV demand.

**Table 6-1 - Change in Travel by Mode and Time period (2041 DM to 2041 DS)**

| Time period / Mode | DM | DS | Change between DM and DS |
|---|---|---|---|
| **AM Peak period (07:00 – 10:00)** | | | |
| Reg car (veh.) | 329,105 | 328,032 | -1,073 (-0.33%) |
| P&R (veh.) | 7,131 | 7,098 | -33 (-0.46%) |
| Bus only (pass.) | 37,419 | 37,343 | -76 (-0.2%) |
| Rail (pass.) | 20,461 | 19,775 | -686 (-3.35%) |
| TOTAL (persons) | 494,836 | 492,608 | -2,227 (-0.45%) |
| **IP Period (10:00 – 16:00)** | | | |
| Reg car (veh.) | 632,706 | 631,002 | -1,705 (-0.27%) |
| P&R (veh.) | 4,962 | 4,987 | 24 (0.49%) |
| Bus only (pass.) | 64,874 | 64,863 | -11 (-0.02%) |
| Rail (pass.) | 25,437 | 24,955 | -482 (-1.9%) |
| TOTAL (persons) | 945,285 | 942,523 | -2,762 (-0.29%) |
| **PM peak period (16:00-19:00)** | | | |
| Reg car (veh.) | 429,134 | 427,710 | -1,425 (-0.33%) |
| P&R (veh.) | 5,347 | 5,312 | -35 (-0.66%) |
| Bus only (pass.) | 36,238 | 36,131 | -107 (-0.3%) |
| Rail (pass.) | 22,157 | 21,504 | -654 (-2.95%) |
| TOTAL (persons) | 617,416 | 614,739 | -2,677 (-0.43%) |
| **12 hours (07:00 – 19:00)** | | | |
| Reg car (veh.) | 1,390,945 | 1,386,743 | -4,202 (-0.3%) |
| P&R (veh.) | 17,440 | 17,396 | -44 (-0.25%) |
| Bus only (pass.) | 138,531 | 138,337 | -194 (-0.14%) |
| Rail (pass.) | 68,055 | 66,234 | -1,821 (-2.68%) |
| TOTAL (persons) | 2,057,537 | 2,049,870 | -7,666 (-0.37%) |

### 6.2.2 Overall Mode Share for the Entire model

Table 6-2 summarises the changes in overall mode share by time period (AM Peak, Inter-Peak, PM Peak) between the DM and the DS scenarios, which show no material impact.

**Table 6-2 - Change in Mode Share by Time period (2041 DM to 2041 DS)**

| Time period / Mode | DM | DS | Relative change between DS and DM |
|---|---|---|---|
| **AM Peak period (07:00 – 10:00)** | | | |
| Reg car | 86.9% | 87.0% | 0.11% |
| P&R | 1.6% | 1.6% | 0.00% |
| Bus only | 7.6% | 7.6% | 0.02% |
| Rail | 4.1% | 4.0% | -0.12% |
| **IP period (10:00 – 16:00)** | | | |
| Reg car | 89.9% | 89.9% | 0.02% |
| P&R | 0.6% | 0.6% | 0.00% |
| Bus only | 6.9% | 6.9% | 0.02% |
| Rail | 2.7% | 2.6% | -0.04% |
| **PM peak period (16:00-19:00)** | | | |
| Reg car | 89.4% | 89.5% | 0.09% |
| P&R | 1.0% | 1.0% | 0.00% |
| Bus only | 5.9% | 5.9% | 0.01% |
| Rail | 3.6% | 3.5% | -0.09% |
| **12 hours (07:00 – 19:00)** | | | |
| Reg car | 89.0% | 89.1% | 0.06% |
| P&R | 0.9% | 0.9% | 0.00% |
| Bus only | 6.7% | 6.7% | 0.02% |
| Rail | 3.3% | 3.2% | -0.08% |

It is pertinent to re-iterate that the car mode share, although increased from the DM, is only marginally greater and no additional mitigation measures have been tested.

### 6.2.3 Aggregated Demand for each district

Table 6-3 summaries the change in travel demand for South Oxfordshire District by time period and mode between the DM and DS scenarios. At the daily level, this has resulted in a reduction of 7,700 car trips, 600 bus trips and 1,500 rail trips due to the removal of the Land at Chalgrove Airfield development site and additional costs resulting from the delay (and increased travel time) from the removal of some schemes. The table does not include LGV and HGV demand.

The bus patronage decrease is also attributed to the removal of the bus service to Chalgrove Airfield which would not have only served those accessing the site but improved the frequency and connectivity along other parts of the network.

Rail trips decrease largely due to the deallocation of Land at Chalgrove Airfield, as there are significant number of trips to/from London from this zone. Additionally, the removal of the bus service between Chalgrove and Didcot also has an impact on other zones along the route due to the change in cost and so sees decreases in demand, this bus service is used to access rail. The additional growth added at Land at Dalton Barracks Garden Village in DS scenario is significantly lower than the deallocation at Land at Chalgrove Airfield and does not beneficiate from a direct bus service to Didcot that would support higher usage of rail.

**Table 6-3 - Change in Travel by Mode for South Oxfordshire district and Time period (DM to DS)**

| Time period / Mode | DM | | DS | | Relative change between DM and DS | |
|---|---|---|---|---|---|---|
| | Origin | Destination | Origin | Destination | Origin | Destination |
| **AM Peak period (07:00 – 10:00)** | | | | | | |
| Reg car (veh.) | 58,904 | 43,241 | 56,942 | 42,433 | -3.33% | -1.87% |
| P&R (veh.) | 786 | 54 | 727 | 47 | -7.47% | -12% |
| Bus only (pass.) | 3,216 | 1,630 | 2,924 | 1,481 | -9.1% | -9.15% |
| Rail (pass.) | 4,277 | 2,606 | 3,667 | 2,059 | -14.27% | -20.98% |
| TOTAL (persons) | 85,373 | 60,895 | 81,833 | 59,144 | -4.15% | -2.87% |
| **IP period (10:00 – 16:00)** | | | | | | |
| Reg car (veh.) | 96,928 | 97,582 | 92,907 | 94,009 | -4.15% | -3.66% |
| P&R (veh.) | 247 | 360 | 235 | 347 | -4.93% | -3.56% |
| Bus only (pass.) | 3,000 | 2,865 | 2,830 | 2,657 | -5.65% | -7.25% |
| Rail (pass.) | 2,836 | 2,982 | 2,451 | 2,492 | -13.57% | -16.42% |
| TOTAL (persons) | 136,380 | 137,572 | 130,421 | 132,056 | -4.37% | -4.01% |
| **PM peak period (16:00-19:00)** | | | | | | |
| Reg car (veh.) | 71,695 | 84,141 | 70,018 | 81,626 | -2.34% | -2.99% |
| P&R (veh.) | 36 | 493 | 34 | 461 | -6.73% | -6.38% |
| Bus only (pass.) | 1,291 | 2,631 | 1,158 | 2,362 | -10.28% | -10.22% |
| Rail (pass.) | 2,858 | 5,066 | 2,305 | 4,484 | -19.32% | -11.49% |
| TOTAL (persons) | 96,351 | 117,050 | 93,486 | 112,922 | -2.97% | -3.53% |
| **12 hours (07:00 – 19:00)** | | | | | | |
| Reg car (veh.) | 227,527 | 224,964 | 219,867 | 218,068 | -3.37% | -3.07% |
| P&R (veh.) | 1,069 | 907 | 996 | 856 | -6.86% | -5.6% |
| Bus only (pass.) | 7,507 | 7,126 | 6,912 | 6,500 | -7.93% | -8.78% |
| Rail (pass.) | 9,971 | 10,654 | 8,424 | 9,035 | -15.52% | -15.19% |
| TOTAL (persons) | 318,105 | 315,516 | 305,739 | 304,122 | -3.89% | -3.61% |

Table 6-4 summarises the change in travel demand for Vale of White Horse District by time period and mode between DM and DS scenarios. Generally, the impact is small and there is a slight increase over the 12-hour period. At the daily level, this has resulted in an increase of 3,650 car trips, 300 bus trips and 60 rail trips This is due to the increase in dwellings at Dalton Barracks generating additional trips. For car there is a 1.51% increase over the 12 hours between the DS and DM, there is a 0.83% increase for P&R, an 2.6% increase in bus passengers and an 0.71% increase in rail passengers. The bus demand would have shown a slightly higher increase if the buses between Oxford City and Dalton Barracks would have been coded with a higher frequency. As mentioned in section 4.6.4, The frequency of the bus service passing near Dalton Barracks has not been changed between DM and DS (modelled at 1 bus per hour in both scenarios).

The rail demand shows a small increase, due to the bus connection between Dalton Barracks and the rail stations (especially Didcot) not being very attractive.

**Table 6-4 - Change in Travel by Mode for Vale of White Horse district and Time period (DM and DS)**

| Time period / Mode | DM | | DS | | Relative change between DM and DS | |
|---|---|---|---|---|---|---|
| | Origin | Destination | Origin | Destination | Origin | Destination |
| **AM Peak period (07:00 – 10:00)** | | | | | | |
| Reg car (veh.) | 59,476 | 61,389 | 60,303 | 61,515 | 1.39% | 0.21% |
| P&R (veh.) | 1,484 | 130 | 1465 | 155 | -1.26% | 19.22% |
| Bus only (pass.) | 4,413 | 3,346 | 4,593 | 3,420 | 4.07% | 2.19% |
| Rail (pass.) | 2,411 | 2,167 | 2,513 | 2,119 | 4.21% | -2.22% |
| TOTAL (persons) | 86797 | 86,105 | 88,124 | 86,306 | 1.53% | 0.23% |
| **IP period (10:00 – 16:00)** | | | | | | |
| Reg car (veh.) | 107,164 | 105,242 | 109,449 | 107,609 | 2.13% | 2.25% |
| P&R (veh.) | 456 | 608 | 492 | 615 | 7.85% | 1.18% |
| Bus only (pass.) | 5,171 | 5,230 | 5,258 | 5,338 | 1.69% | 2.06% |
| Rail (pass.) | 2,101 | 1,979 | 2,102 | 2,010 | 0.06% | 1.56% |
| TOTAL (persons) | 152,078 | 149,814 | 155,260 | 153,126 | 2.09% | 2.21% |
| **PM peak period (16:00-19:00)** | | | | | | |
| Reg car (veh.) | 74,334 | 72,342 | 74,856 | 73,454 | 0.7% | 1.54% |
| P&R (veh.) | 84 | 1,447 | 86 | 1,430 | 3.32% | -1.23% |
| Bus only (pass.) | 2,898 | 3,596 | 2,960 | 3,727 | 2.11% | 3.65% |
| Rail (pass.) | 2,293 | 2,390 | 2,249 | 2,442 | -1.89% | 2.17% |
| TOTAL (persons) | 101,620 | 101,606 | 102,278 | 103,167 | 0.65% | 1.54% |
| **12 hours (07:00 – 19:00)** | | | | | | |
| Reg car (veh.) | 240,973 | 238,972 | 244,609 | 242,578 | 1.51% | 1.51% |
| P&R (veh.) | 2,023 | 2,185 | 2,043 | 2,200 | 0.99% | 0.66% |
| Bus only (pass.) | 12,483 | 12,172 | 12,811 | 12,485 | 2.63% | 2.57% |
| Rail (pass.) | 6,805 | 6,536 | 6,864 | 6,571 | 0.88% | 0.53% |
| TOTAL (persons) | 340,495 | 337,526 | 345,661 | 342,599 | 1.52% | 1.5% |

### 6.2.4 Overall changes to the Highway network

The performance of the highway network over time is summarised by reporting the overall network performance in terms of the total number of trips, travel distance, travel time, delay, and speed. Table 6-5 summarises the changes in travel conditions for the entire highway network between the DM and the DS scenarios. These values are for the peak hours. The table includes LGV and HGV demand.

It can be observed that the average metrics of distance, travel time, delay and speed do not change significantly between the DM and DS scenarios for all modelled time periods. This is expected as the changes being tested are relatively small in relation to the model. The reduction in trips accounts for the reduction in travel distance and time, although there is a small increase in delay due to the removal of some of the highway schemes no longer improving the highway conditions.

**Table 6-5 - Overall performance of the highway network (DM to DS)**

| Time period | Change between DM and DS | | |
|---|---|---|---|
| **AM Peak hour (08:00 – 09:00)** | **Do Minimum** | **Do Something** | **Difference (DS - DM)** |
| Trips (PCUs) | 160,785 | 160,339 | -446(-0.28%) |
| Travel Distance (PCU-kms) | 6,885,330 | 6,862,604 | -22,726(-0.33%) |
| Travel Time (PCU-hrs) | 99,387 | 98,969 | -418(-0.42%) |
| Delay (PCU-hrs) | 13,742 | 13,843 | 102(0.74%) |
| Average Distance (km) per PCU | 43 | 43 | 0(-0.05%) |
| Average Travel Time (min) per PCU | 37 | 37 | 0(-0.14%) |
| Average Delay (sec) per PCU | 308 | 311 | 3(1.02%) |
| Average speed (km/h) | 69 | 69 | 0(0%) |
| **Inter-peak hour (average)** | | | |
| Trips (PCUs) | 126,665 | 126,383 | -283(-0.22%) |
| Travel Distance (PCU-kms) | 6,190,086 | 6,174,923 | -15,163(-0.24%) |
| Travel Time (PCU-hrs) | 78,231 | 78,036 | -195(-0.25%) |
| Delay (PCU-hrs) | 5,207 | 5,263 | 56(1.07%) |
| Average Distance (km) per PCU | 49 | 49 | 0(-0.02%) |
| Average Travel Time (min) per PCU | 37 | 37 | 0(-0.03%) |
| Average Delay (sec) per PCU | 148 | 150 | 2(1.3%) |
| Average speed (km/h) | 79 | 79 | 0(0%) |
| **PM Peak hour (17:00 – 18:00)** | | | |
| Trips (PCUs) | 174,141 | 173,616 | -525(-0.3%) |
| Travel Distance (PCU-kms) | 7,473,607 | 7,451,008 | -22,599(-0.3%) |
| Travel Time (PCU-hrs) | 106,343 | 106,054 | -289(-0.27%) |
| Delay (PCU-hrs) | 14,306 | 14,501 | 195(1.37%) |
| Average Distance (km) per PCU | 43 | 43 | 0(0%) |
| Average Travel Time (min) per PCU | 37 | 37 | 0(0.03%) |
| Average Delay (sec) per PCU | 296 | 301 | 5(1.67%) |
| Average speed (km/h) | 70 | 70 | 0(0%) |

### 6.2.5 Overall Changes to the Public Transport network performance

The performance of the public transport network over time is summarised by reporting on the overall network performance in terms of the number of passengers, generalised travel time, in vehicle time, walking time and waiting time. Table 6-6 summarises the overall performance on the public transport network between the DM and DS scenarios. It should be noted that bus boardings include the P&R users.

The number of trips by bus decreases by 244 person trips over a 12-hour period, with a decrease of 33 person trips for the AM Peak, an increase of 3 person trips for the average Inter-Peak and a decrease of 55 person trips in the PM Peak hour. This is caused by the removal of a bus service that directly served the Land at Chalgrove Airfield development which is no longer present in the Emerging Joint Local Plan 2041 (DS). The housing allocation has effectively moved to Dalton Barracks which is not as well served by public transport at present (but is required, by policy, to be facilitated by the development). There is minimal change across the two scenarios for the other metrics analysed.

**Table 6-6 - Overall performance of the Public Transport network (DM to DS)**

| Time period | Do Minimum | | Do Something | | Change between DM and DS | |
|---|---|---|---|---|---|---|
| | Rail | Bus | Rail | Bus | Rail | Bus |
| **AM Peak Hour (08:00-09:00)** | | | | | | |
| Demand (boardings) | 9,142 | 17,215 | 8,842 | 17,182 | -3.40% | -0.19% |
| Average GTT (mins.) | 169 | 84 | 166 | 83 | -1.69% | -0.38% |
| Average IVT (mins.) | 32 | 24 | 30 | 24 | -3.74% | -0.30% |
| Average Walk (mins.) | 49 | 20 | 48 | 20 | -1.13% | -0.55% |
| Average Wait (mins.) | 7 | 4 | 7 | 4 | -3.56% | 0.62% |
| **IP Average Hour (10:00-16:00)** | | | | | | |
| Demand (boardings) | 4,240 | 11,722 | 4,159 | 11,725 | -1.94% | 0.02% |
| Average GTT (mins.) | 185 | 81 | 184 | 81 | -0.53% | -0.38% |
| Average IVT (mins.) | 34 | 24 | 34 | 24 | -1.23% | -0.20% |
| Average Walk (mins.) | 51 | 18 | 50 | 18 | -0.28% | -0.37% |
| Average Wait (mins.) | 10 | 5 | 10 | 5 | -0.67% | -0.23% |
| **PM peak Hour (17:00-18:00)** | | | | | | |
| Demand (boardings) | 9,093 | 15,753 | 8,781 | 15,698 | -3.56% | -0.35% |
| Average GTT (mins.) | 169 | 83 | 166 | 82 | -1.65% | -0.47% |
| Average IVT (mins.) | 34 | 27 | 33 | 27 | -2.75% | -0.39% |
| Average Walk (mins.) | 48 | 17 | 48 | 17 | -1.02% | -1.20% |
| Average Wait (mins.) | 7 | 5 | 7 | 5 | -3.15% | 0.69% |
| **12 hours (07:00 – 19:00)** | | | | | | |
| Demand (boardings) | 68,055 | 158,377 | 66,234 | 158,133 | -2.75% | -0.15% |
| Average GTT (mins.) | 178 | 82 | 176 | 82 | -1.36% | -0.44% |
| Average IVT (mins.) | 34 | 25 | 33 | 25 | -2.57% | -0.27% |
| Average Walk (mins.) | 50 | 18 | 50 | 18 | -0.91% | -0.38% |
| Average Wait (mins.) | 9 | 5 | 8 | 4 | -2.95% | -0.56% |

Notes: (i) Numbers may not sum to 100 due to rounding; (ii) Local rail services only; (iii) IVT, walk and wait times are not weighted, whilst the Generalised Travel Time is total travel time from the assignment.

## 6.3 Convergence

The DS model run presented in this chapter did not achieve a convergence gap of under 0.2 in less than 40 iterations of the VDM, which is the normal criteria for convergence according to TAG. Given the fact that this was a model run with unconstrained demand, this was not unexpected. However, it was close to convergence (0.2489) and it is assumed that the changes in traffic flow between iterations are minimal in the area of interest for this particular study (presented in Figure 1-1). Hence, we believe that the level of convergence is satisfactory. On this basis the model is considered suitable for assessing the Emerging Joint Local Plan 2041.

# 6.4 Highway Results

As set out in Section 4.2 and 4.3 this scenario is the South and Vale Emerging Joint Local Plan with a plan end year of 2041.

Figure 6-1, Figure 6-2 and Figure 6-3 show the Volume over Capacity (V/C) plots for the three time periods. Larger versions of these figures are available at Appendix B. The V/C ratios are similar to the DM scenario. The notable increases in V/C ratio are around Stadhampton. Due to the removal of the bypasses, more traffic is using the existing roads and therefore the ratio increases along these routes. Even with the removal of Chalgrove traffic from the network, the increase in traffic along the A329 means that the capacity of the B480 is reduced at the roundabout resulting in a net increase in V/C.

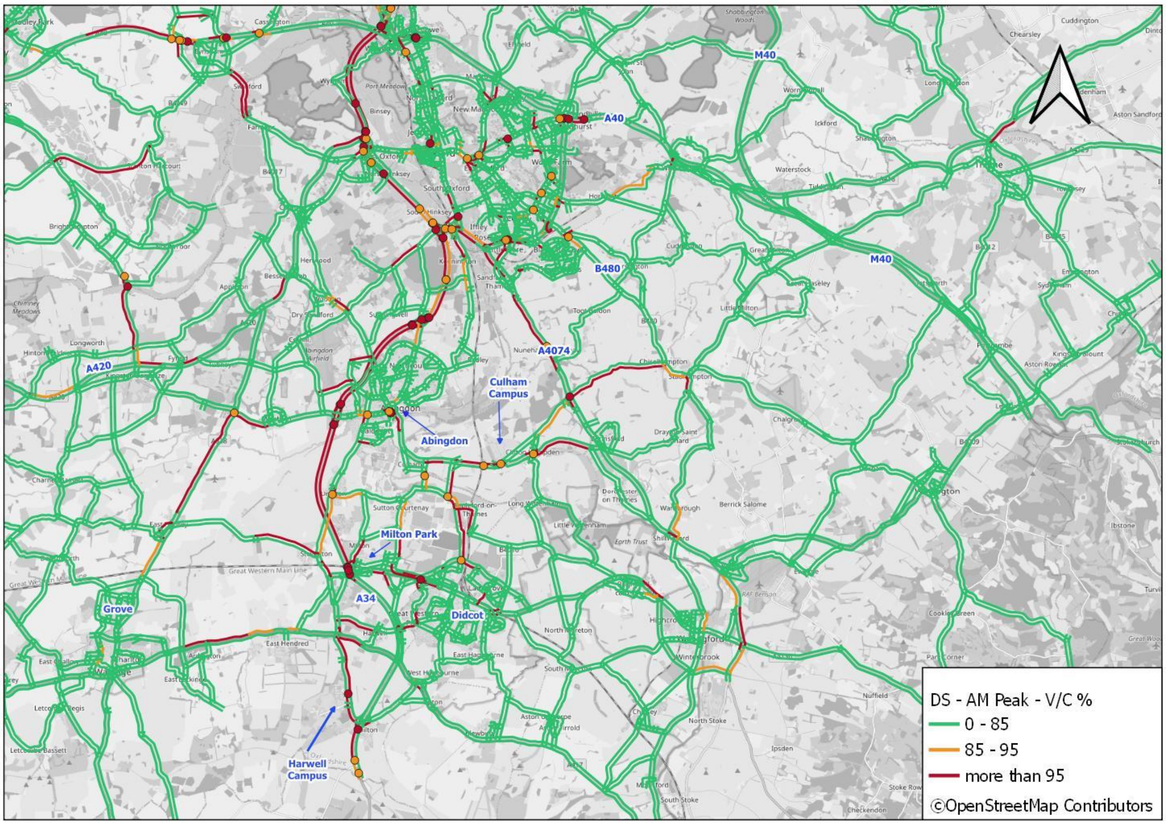


**Figure 6-1 - Volume/Capacity DS AM Peak hour**

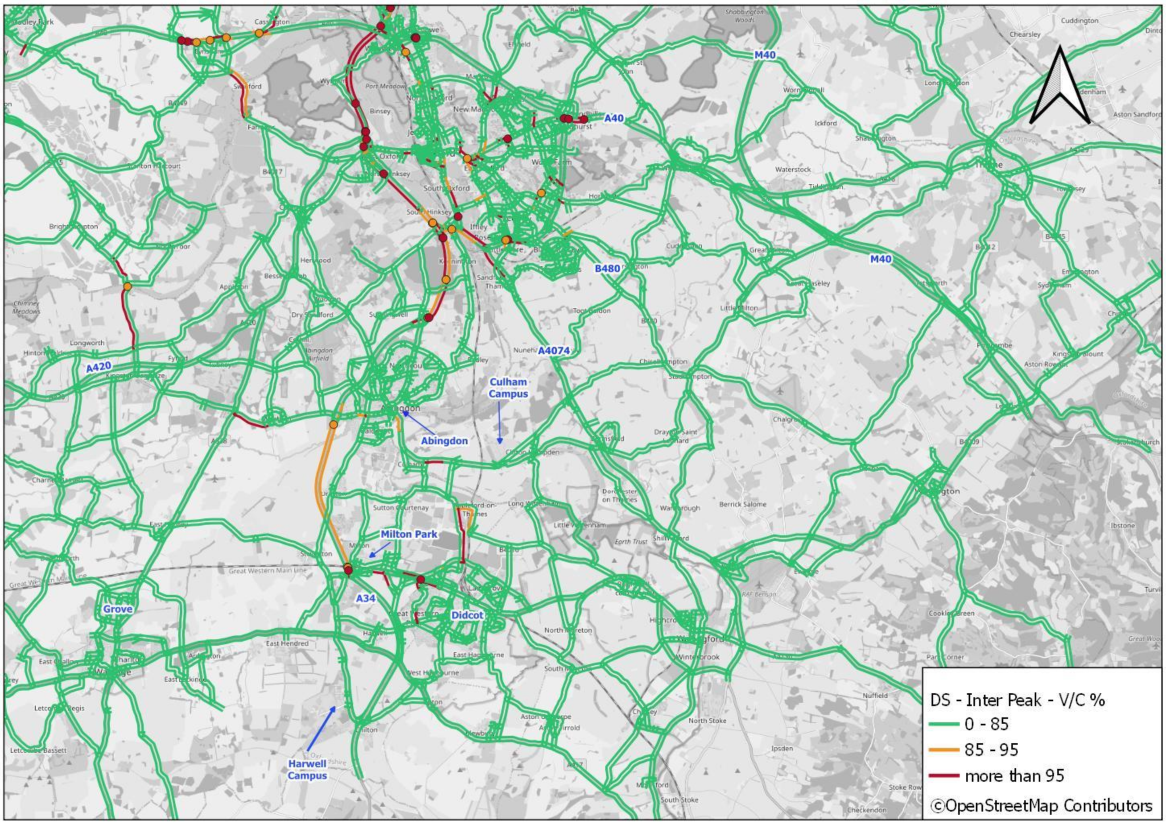


**Figure 6-2 - Volume/Capacity DS Inter Peak hour**

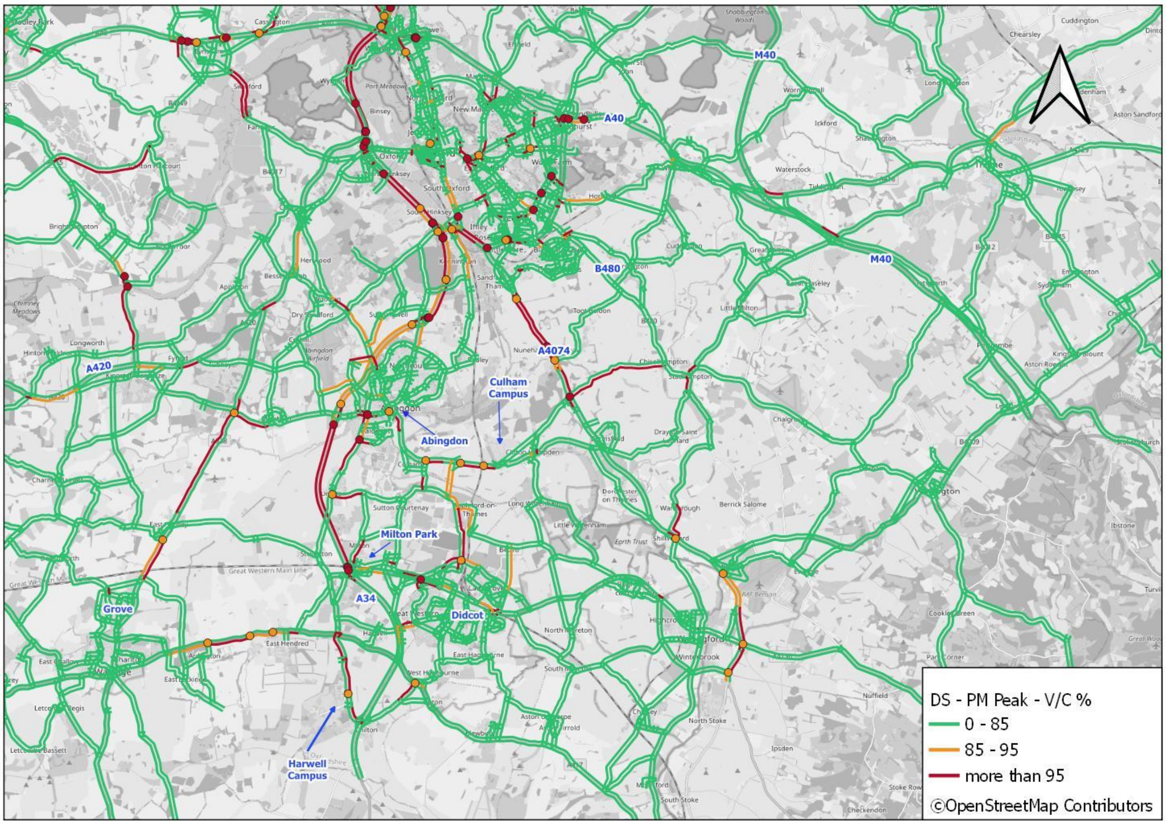


**Figure 6-3 - Volume/Capacity DS PM Peak hour**

Figure 6-4, Figure 6-5 and Figure 6-6 in this section present the flow difference between the DM and DS scenarios, by time period. Larger versions of these figures are available at Appendix B.

In the AM Peak the comparison between the two scenarios shows expected decreases in traffic flow around Chalgrove Airfield, where the development is no longer proposed. In the wider area, the removal of the bypasses causes an increase in traffic through Stadhampton. There is also a decrease in flow along B4015 Oxford Road with an increase in flow along A415 Abingdon Road where traffic re-routes to as a result of Golden Balls grade separation not being built.

In Vale there is an increase in traffic volumes around Dalton Barracks due to the increase in number of dwellings proposed. As a result of the increased traffic on Long Tow, large delays are seen at the priority junction with Wootton Road, this causes some localised re-routing and the use of Sheepstead Road and through Cothill to access the B4017. In Headington, the removal of Headington Roundabout grade separation causes local rerouting. Elsewhere on the network the traffic volumes are largely unchanged.

In the Inter-peak, flow changes show a similar pattern (with lower volumes) to the AM peak.

In the PM peak the changes seen are similar to the AM peak. Around Harwell Campus the conversion of the Fermi Avenue access to a signalised junction helps trips to leave the site and reduces the delay at that junction, however the release of traffic causes delay increases within Rowstock.

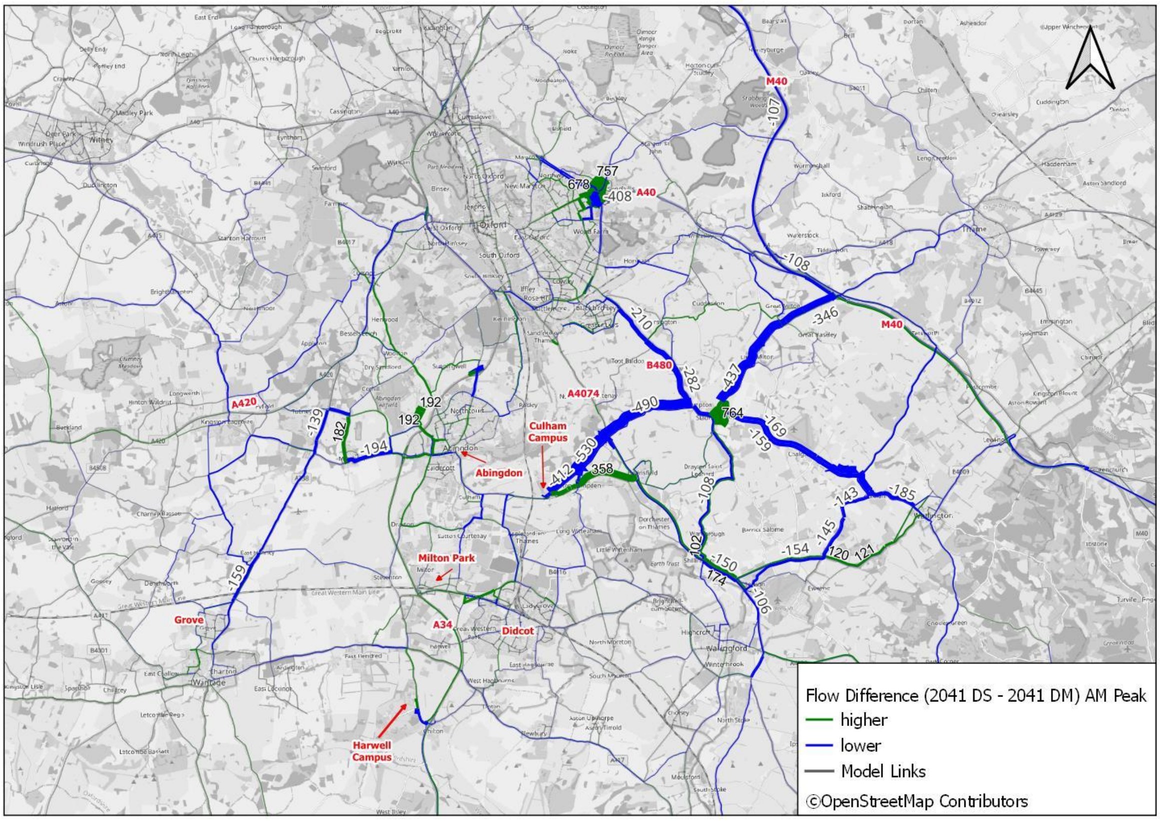


**Figure 6-4 - Highway Flow Difference in PCU's (DS – DM) AM Peak hour**

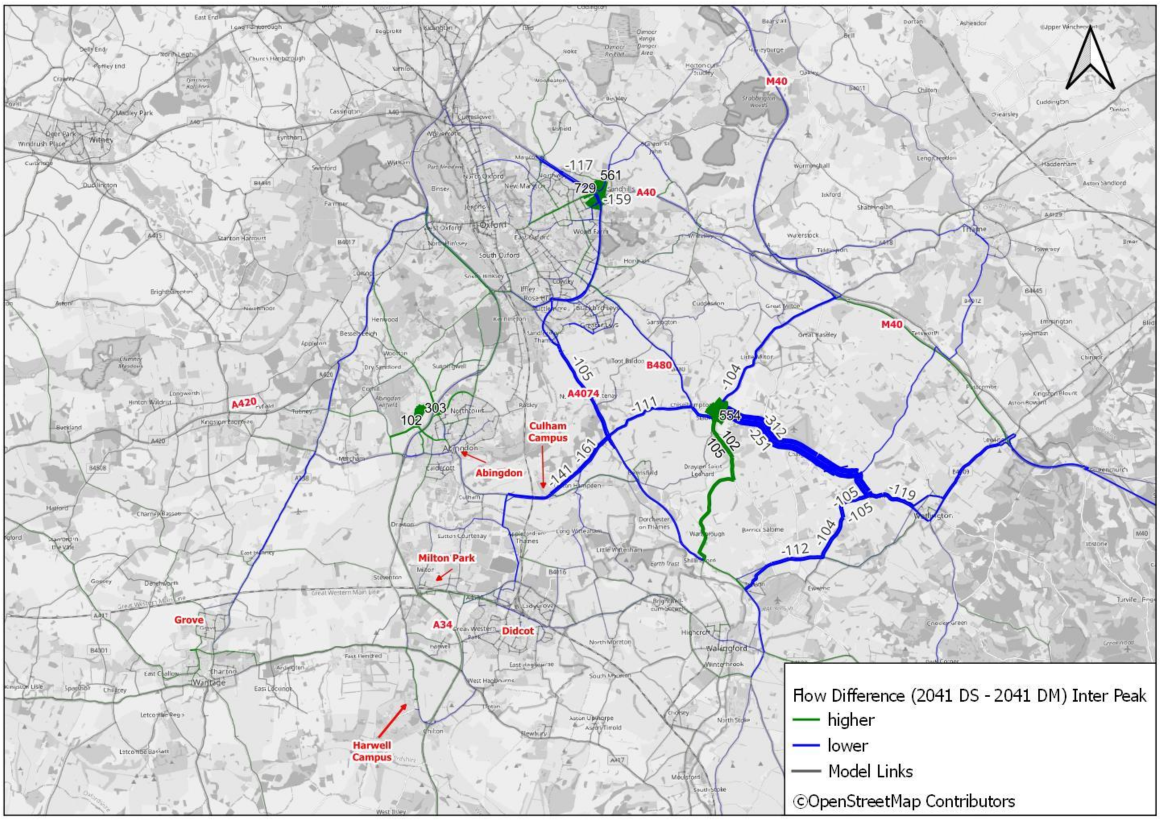


Figure 6-5 - Highway Flow Difference in PCU's (DS – DM) Inter-Peak hour

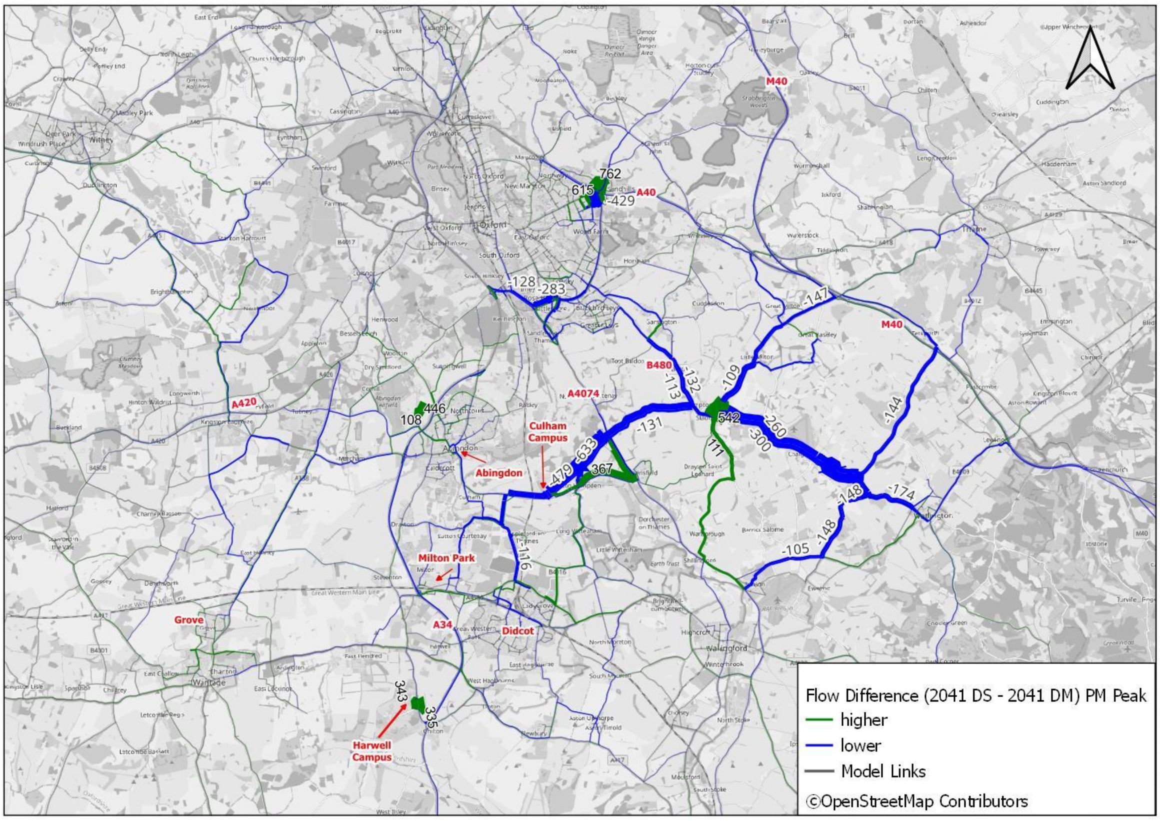


Figure 6-6 - Highway Flow Difference in PCU's (DS – DM) PM Peak hour

# 7. Summary

## 7.1 2018 Calibration

To better represent traffic in the wider South Oxfordshire and Vale of White Horse districts, the 2018 base year model has been refined. During the refinement, the traffic generated by the key employment sites of Culham Campus, Milton Park and Harwell Campus were compared to observed data to ensure the model is accurate for these large employment centres.

The model calibration for South Oxfordshire and Vale of White Horse districts showed that the link calibration for AM Peak, Inter-Peak and PM Peaks were 92%, 95% and 90% respectively. These values are above the TAG threshold of 85%. A small proportion of individual link counts scored only just outside of guidance. This confirmed that the base year is robust and suitable for carrying out traffic forecasts within the area of focus.

## 7.2 2041 Model Scenarios

A model scenario was created to 2041 Do Minimum which comprises the adopted Vale of White Horse Local Plan 2031 Parts 1 & 2 combined with South Oxfordshire Local Plan 2035 (equivalent of 5c plus Vale Local Plan Part 2). A second model scenario was created to 2041 Do Something which comprises the emerging Joint Local Plan proposals.

Network modifications were made to the 2018 base year for 2041 scenarios as explained in section 4.5.1.

The key differences between the DM and DS scenarios are:

- Removal of highway schemes (Chiselhampton Bypass, Golden Balls Grade Separation, Headington Roundabout Grade Separation, Rowstock Roundabout Improvements and Stadhampton Bypass).
- Bus route removal to Land at Chalgrove Airfield deallocation.
- The deallocations at Land at Chalgrove Airfield, and Nettlebed.
- Amendments to the allocations at Land at Dalton Barracks Garden Village, Land at Didcot Gateway, Rich's Sidings and Broadway, and North West of Grove.
- The addition of employment at Crowmarsh Gifford*.

* As identified earlier in this report, although included in the model run for the Emerging JLP (DS), the Crowmarsh Gifford allocation has subsequently been withdrawn, see section 4.3.1.

Data was extracted from both 2041 scenarios to enable comparison of the future year.

The DS scenario sees a minor proportional reduction in car trips of 0.3% compared to DM scenario over a 12-hour period, with small decreases in other modes as well. For South Oxfordshire District, there is a reduction in all modes with car trips seeing a 3% reduction across the 12 hours and Vale of White Horse district seeing an increase of 1.5% car trips. This is mainly due to the removal of the Land at Chalgrove Airfield development (in South) and the increase in size of the Land at Dalton Barracks Garden Village development (in Vale).

The model wide highway network performance metrics are similar for both scenarios, this is shown for all the three time periods. The largest changes to highway demand are localised around Chalgrove Airfield (due to the deallocation) and Stadhampton where the removal of the bypass impacts routeing in the area.

# 8. Glossary

| | |
|---|---|
| Assignment convergence | An equilibrium or balanced position between two inter-related model outputs. A converged assignment is one where the assigned flows and the resulting travel costs are consistent. A converged demand/supply loop is one where the demands are consistent with the travel costs in the supply model.<br><br>Source: TAG Unit M3.1, Appendix A |
| Convergence | Convergence is being measured according to whether the weighted demand (or cost) is different from what would be obtained in the next iteration if no further weighting occurred.<br><br>Source: TAG Unit M2.1, Appendix D, paragraph D.1.1 |
| Cordon | A cordon presents an area or a line network made up of a number of screenlines which completely enclose the specific area or district. “Lines” are composed of a collection of screenlines joined to produce a longer screenline used to separate/isolate a specific area or district from another.<br><br>Source: [http://www.ncr-trans-rcn.ca/traffic-counts/glossary/](http://www.ncr-trans-rcn.ca/traffic-counts/glossary/) |
| Demand | The number of users and their behaviour in response to infrastructure provision.<br><br>Source: TAG Unit M1, paragraph 2.2.4 |
| Generalised travel cost / disutility | All transport modelling should recognise that people’s travel choices depend upon the cost, in both time and money. It is important to combine time and money into a single disincentive to travel (“disutility”), so that demand can be assumed to rise or fall with reductions or increases in either. To do so, it is necessary to apply appropriate weights to the time and money components of this combined cost so that travellers can trade money for time, such as in choosing between a faster but more expensive mode or a slower but cheaper mode<br><br>Source: TAG Unit M2.1, paragraph 3.1.1 |
| In-vehicle time | Total time spent onboard public transport vehicles during one trip, excluding boarding time or interchange times |
| Logit choice / Pivot incremental demand modelling | When specifying an incremental hierarchical logit model, scaling parameters as provided in section 5.6 could be used. These parameters (thetas) refer to the probability of nests of alternatives or composite alternatives. They reflect the ratios of the lambdas for different response mechanisms as one moves up the model structure. The scaling parameters are applied to the logsums of the composite or nested alternatives. They should have a value between 0 and 1 if the responses have been included in the correct order in the model, such that the sensitivity of the responses changes down the hierarchy from lower to higher.<br><br>Source: TAG Unit M2.1, paragraph 6.3.4 |

| | |
|---|---|
| Screenline | A screenline is made up of a number of stations placed to count east west or north south travel which in total capture all major travel routes across the imaginary screenline. The screenlines are located along geographical barriers, i.e.: rivers, greenbelt. Generally where a number of major transportation facilities are the main flow. To be truly representative of the flow, there is a station at each intersecting road, transit, and bike/walkway path on the screenline.<br><br>Source: http://www.ncr-trans-rcn.ca/traffic-counts/glossary/ |
| Segmentation | “Segmentation” is the division of travel, traveller and transport attributes into different categories so that all travellers in the same category can be treated in the same way.<br><br>Source: TAG Unit M1, paragraph 2.6.1 |
| Supply | The cost of using the infrastructure.<br><br>Source: TAG Unit M1, paragraph 2.2.4 |
| Trip | A movement by an individual from one location to perform an activity at a different location, allocated between two zones, or within a single zone.<br><br>Source: TAG Unit M2.2, Appendix A |
| Trip end | Total number of trips starting or ending at a particular zone or sector.<br><br>Source: TAG Unit M2.2, Appendix A |

# APPENDICES

# Appendix A. Flow Calibration Results

## A.1 AM Peak

| Site ID | Road Name | Direction | Link ID | Observed Count - Total (VEH) | Modelled Flow - Total (VEH) | Diff | GEH | Combined Pass? |
|---|---|---|---|---|---|---|---|---|
| Site 2 | A4074 / A415 / Wimblestraw Rd | SB | 65230-19002 | 534 | 573 | 39 | 1.6 | ✓ |
| | | NB | 19002-65230 | 800 | 790 | -10 | 0.3 | ✓ |
| | | WB | 65905-65225 | 301 | 398 | 97 | 5.17 | ✓ |
| | | EB | 65225-65905 | 181 | 193 | 12 | 0.9 | ✓ |
| | | NB | 65895-65225 | 827 | 762 | -65 | 2.3 | ✓ |
| | | SB | 65225-65895 | 585 | 573 | -12 | 0.5 | ✓ |
| | | EB | 65900-65225 | 292 | 217 | -75 | 4.7 | ✓ |
| | | WB | 65225-65900 | 388 | 392 | 4 | 0.2 | ✓ |
| Site 3 | A415 Abingdon Road / Watery Lane / B4015 Oxford Road / High Street | SB | 95800-65235 | 302 | 266 | -36 | 2.1 | ✓ |
| | | NB | 65235-95800 | 534 | 518 | -16 | 0.7 | ✓ |
| | | WB | 65900-65235 | 388 | 408 | 20 | 1.0 | ✓ |
| | | EB | 65235-65900 | 255 | 180 | -75 | 5.07 | ✓ |
| | | NB | 66561-65236 | 395 | 466 | 71 | 3.4 | ✓ |
| | | SB | 65236-66561 | 169 | 196 | 27 | 2.0 | ✓ |
| | | EB | 65892-65236 | 436 | 420 | -16 | 0.8 | ✓ |
| | | WB | 65236-65892 | 564 | 665 | 101 | 4.1 | ✓ |
| 1703 23 Sutton Courtenay ATC 01 (TC6032) | A415 Abingdon Road W | EB | 65890-65891 | 508 | 609 | 101 | 4.3 | ✓ |
| | | WB | 65891-65890 | 511 | 430 | -81 | 3.7 | ✓ |
| 1703 23 Sutton Courtenay ATC 03 (TC6034) | Tollgate Road | NB | 65885-65890 | 449 | 453 | 3 | 0.2 | ✓ |
| | | SB | 65890-65885 | 308 | 357 | 49 | 2.7 | ✓ |
| OCC_1 | A329 South west of M40 | NB | 65075-10200 | 466 | 434 | -31 | 1.5 | ✓ |
| | | SB | 10200-65075 | 624 | 715 | 91 | 3.5 | ✓ |

| Site ID | Road Name | Direction | Link ID | Observed Count - Total (VEH) | Modelled Flow - Total (VEH) | Diff | GEH | Combined Pass? |
|---|---|---|---|---|---|---|---|---|
| OCC_2 | B480 North of Chiselhampton | NB | 65015-95946 | 219 | 439 | 221 | 12.2 | × |
| | | SB | 95946-65015 | 139 | 164 | 25 | 2.0 | ✓ |
| OCC_3 | B480 West of Stadhampton | EB | 65015-65020 | 250 | 405 | 155 | 8.6 | × |
| | | WB | 65020-65015 | 413 | 767 | 354 | 14.6 | × |
| OCC_4 | B4009 South west of M40 | NB | 65030-10140 | 436 | 460 | 24 | 1.1 | ✓ |
| | | SB | 10140-65030 | 498 | 493 | -5 | 0.2 | ✓ |
| ID04212 Chalgrove Airfield, Oxfordshire - ATC Site 2 | Marylands Green (W) to B480 (E) | EB | 65230-65015 | 339 | 254 | -85 | 4.9 | ✓ |
| | | WB | 65015-65230 | 330 | 341 | 11 | 0.6 | ✓ |
| ID04212 Chalgrove Airfield, Oxfordshire - ATC Site 4 | Thame Road (W) to Unnamed Road (E) | EB | 65025-95824 | 150 | 112 | -38 | 3.3 | ✓ |
| | | WB | 95824-65025 | 211 | 222 | 12 | 0.8 | ✓ |
| ID04212 Chalgrove Airfield, Oxfordshire - ATC Site 5 | Thame Road (S) to A329 Stadhampton Road (N) | NB | 65026-65060 | 383 | 372 | -11 | 0.6 | ✓ |
| | | SB | 65060-65026 | 575 | 591 | 17 | 0.7 | ✓ |
| ATC 10 (B480 W of Chalgrove) | B480 W of Chalgrove | EB | 95824-95825 | 141 | 172 | 32 | 2.5 | ✓ |
| | | WB | 95825-95824 | 169 | 217 | 48 | 3.4 | ✓ |
| ATC 12 (B480 at Cuxham) | B480 at Cuxham | EB | 65810-19005 | 131 | 102 | -29 | 2.7 | ✓ |
| | | WB | 19005-65810 | 137 | 130 | -6 | 0.6 | ✓ |
| TC6352 | 3906 - LON Oxford - MK - Cambridge | NB | 21185-95970 | 1155 | 1158 | 2 | 0.1 | ✓ |
| | | SB | 95970-21185 | 1085 | 924 | -161 | 5.07 | ✓ |
| TC6543_Site4 | B480 Watlington Road, 125m west of Ashville Way | EB | 21230-20763 | 750 | 695 | -55 | 2.1 | ✓ |
| | | WB | 20763-21230 | 768 | 744 | -24 | 0.9 | ✓ |
| TC6543_Site5 | B480 Watlington Road, 150m east of Berry Close | EB | 20755-20765 | 284 | 208 | -76 | 4.9 | ✓ |
| | | WB | 20765-20755 | 698 | 666 | -33 | 1.2 | ✓ |
| Site-77 | Faringdon Road, Besselsleigh, Henwood, | NB | 65171-65640 | 1315 | 1336 | 21 | 0.6 | ✓ |
| | | SB | 65640-65171 | 784 | 687 | -97 | 3.6 | ✓ |

| Site ID | Road Name | Direction | Link ID | Observed Count - Total (VEH) | Modelled Flow - Total (VEH) | Diff | GEH | Combined Pass? |
|---|---|---|---|---|---|---|---|---|
| | Vale of White Horse, Oxfordshire, England, OX13 5PY, United Kingdom | | | | | | | |
| Site-86 | Wantage Road, Wantage, Vale of White Horse, Oxfordshire, England, OX12 9NQ, United Kingdom | NB | 70170-66620 | 104 | 84 | -20 | 2.0 | ✓ |
| | | SB | 66620-70170 | 92 | 103 | 12 | 1.2 | ✓ |
| Site-87 | A338, Grove, Vale of White Horse, Oxfordshire, England, OX12 0DJ, United Kingdom | NB | 65380-65490 | 558 | 632 | 74 | 3.0 | ✓ |
| | | SB | 65490-65380 | 705 | 596 | -109 | 4.3 | ✓ |
| Site-122 | A4130, Milton, Vale of White Horse, Oxfordshire, England, OX14 4RY, United Kingdom | EB | 12395-95947 | 840 | 536 | -305 | 11.6 | × |
| | | WB | 95947-12395 | 1029 | 991 | -38 | 1.2 | ✓ |
| Site-135 | Frilford Road, Marcham, Vale of White Horse, Oxfordshire, England, OX13 6QL, United Kingdom | EB | 65255-66740 | 529 | 591 | 62 | 2.6 | ✓ |
| | | WB | 66740-65255 | 498 | 553 | 55 | 2.4 | ✓ |
| Site-240 | A420, Tilbury Fields, North Hinksey, Vale of White Horse, Oxfordshire, England, OX2 9ND, United Kingdom | NB | 20025-12055 | 1475 | 1324 | -150 | 4.0 | ✓ |
| | | SB | 12055-20025 | 865 | 927 | 62 | 2.1 | ✓ |
| Site-282 | The Causeway, Culham, South Oxfordshire, | NB | 55025-55026 | 543 | 584 | 42 | 1.8 | ✓ |
| | | SB | 55026-55025 | 534 | 724 | 190 | 7.6 | × |

| Site ID | Road Name | Direction | Link ID | Observed Count - Total (VEH) | Modelled Flow - Total (VEH) | Diff | GEH | Combined<br>Pass? |
|---|---|---|---|---|---|---|---|---|
| | Oxfordshire, England, OX14 3HP, United Kingdom | | | | | | | |
| Site-573 | Brewery Tap, 40-42, Ock Street, Caldecott, Abingdon on Thames, Abingdon, Vale of White Horse, Oxfordshire, England, OX14 5BZ, United Kingdom | WB | 55010-85255 | 346 | 430 | 84 | 4.3 | ✓ |
| Site-667 | Challow Park, Challow Road, East Challow, Vale of White Horse, Oxfordshire, England, OX12 9LQ, United Kingdom | EB | 60010-60145 | 432 | 417 | -15 | 0.7 | ✓ |
| | | WB | 60145-60010 | 277 | 344 | 67 | 3.8 | ✓ |

## A.2 Inter-Peak

| Site ID | Road Name | Direction | Link ID | Observed Count - Total (VEH) | Modelled Flow - Total (VEH) | Diff | GEH | Combined<br>Pass? |
|---|---|---|---|---|---|---|---|---|
| Site 2 | A4074 / A415 / Wimblestraw Rd | SB | 65230-19002 | 421 | 452 | 31 | 1.5 | ✓ |
| | | NB | 19002-65230 | 427 | 441 | 14 | 0.7 | ✓ |
| | | WB | 65905-65225 | 186 | 192 | 6 | 0.44 | ✓ |
| | | EB | 65225-65905 | 206 | 202 | -4 | 0.3 | ✓ |
| | | NB | 65895-65225 | 470 | 461 | -9 | 0.4 | ✓ |
| | | SB | 65225-65895 | 463 | 445 | -19 | 0.9 | ✓ |
| | | EB | 65900-65225 | 239 | 161 | -78 | 5.5 | ✓ |
| | | WB | 65225-65900 | 219 | 159 | -60 | 4.4 | ✓ |

| Site ID | Road Name | Direction | Link ID | Observed Count - Total (VEH) | Modelled Flow - Total (VEH) | Diff | GEH | Combined Pass? |
|---|---|---|---|---|---|---|---|---|
| Site 3 | A415 Abingdon Road / Watery Lane / B4015 Oxford Road / High Street | SB | 95800-65235 | 226 | 292 | 66 | 4.1 | ✓ |
| | | NB | 65235-95800 | 230 | 315 | 85 | 5.2 | ✓ |
| | | WB | 65900-65235 | 208 | 156 | -52 | 3.9 | ✓ |
| | | EB | 65235-65900 | 206 | 154 | -52 | 3.87 | ✓ |
| | | NB | 66561-65236 | 151 | 168 | 16 | 1.3 | ✓ |
| | | SB | 65236-66561 | 192 | 143 | -48 | 3.7 | ✓ |
| | | EB | 65892-65236 | 323 | 365 | 42 | 2.3 | ✓ |
| | | WB | 65236-65892 | 282 | 364 | 81 | 4.5 | ✓ |
| 1703 23 Sutton Courtenay ATC 01 (TC6032) | A415 Abingdon Road W | EB | 65890-65891 | 324 | 298 | -26 | 1.5 | ✓ |
| | | WB | 65891-65890 | 338 | 338 | -1 | 0.1 | ✓ |
| 1703 23 Sutton Courtenay ATC 03 (TC6034) | Tollgate Road | NB | 65885-65890 | 195 | 205 | 10 | 0.7 | ✓ |
| | | SB | 65890-65885 | 204 | 159 | -44 | 3.3 | ✓ |
| OCC_1 | A329 South west of M40 | NB | 65075-10200 | 272 | 245 | -27 | 1.7 | ✓ |
| | | SB | 10200-65075 | 260 | 310 | 50 | 3.0 | ✓ |
| OCC_2 | B480 North of Chiselhampton | NB | 65015-95946 | 169 | 175 | 6 | 0.4 | ✓ |
| | | SB | 95946-65015 | 213 | 175 | -38 | 2.7 | ✓ |
| OCC_3 | B480 West of Stadhampton | EB | 65015-65020 | 355 | 334 | -20 | 1.1 | ✓ |
| | | WB | 65020-65015 | 300 | 408 | 109 | 5.8 | × |
| OCC_4 | B4009 South west of M40 | NB | 65030-10140 | 289 | 319 | 30 | 1.7 | ✓ |
| | | SB | 10140-65030 | 351 | 361 | 10 | 0.5 | ✓ |
| ID04212 Chalgrove Airfield, Oxfordshire - ATC Site 2 | Marylands Green (W) to B480 (E) | EB | 65230-65015 | 169 | 161 | -8 | 0.6 | ✓ |
| | | WB | 65015-65230 | 178 | 235 | 57 | 4.0 | ✓ |
| ID04212 Chalgrove Airfield, Oxfordshire - ATC Site 4 | Thame Road (W) to Unnamed Road (E) | EB | 65025-95824 | 121 | 139 | 18 | 1.6 | ✓ |
| | | WB | 95824-65025 | 128 | 164 | 36 | 3.0 | ✓ |
| ID04212 Chalgrove | Thame Road (S) to A329 | NB | 65026-65060 | 241 | 222 | -20 | 1.3 | ✓ |

| Site ID | Road Name | Direction | Link ID | Observed Count - Total (VEH) | Modelled Flow - Total (VEH) | Diff | GEH | Combined Pass? |
|---|---|---|---|---|---|---|---|---|
| Airfield, Oxfordshire - ATC Site 5 | Stadhampton Road (N) | SB | 65060-65026 | 240 | 253 | 13 | 0.8 | ✓ |
| ATC 10 (B480 W of Chalgrove) | B480 W of Chalgrove | EB | 95824-95825 | 81 | 131 | 50 | 4.9 | ✓ |
| | | WB | 95825-95824 | 80 | 165 | 86 | 7.7 | ✓ |
| ATC 12 (B480 at Cuxham) | B480 at Cuxham | EB | 65810-19005 | 76 | 75 | -1 | 0.1 | ✓ |
| | | WB | 19005-65810 | 75 | 100 | 24 | 2.6 | ✓ |
| TC6352 | 3906 - LON Oxford - MK - Cambridge | NB | 21185-95970 | 675 | 763 | 88 | 3.3 | ✓ |
| | | SB | 95970-21185 | 708 | 781 | 74 | 2.71 | ✓ |
| TC6543_Site4 | B480 Watlington Road, 125m west of Ashville Way | EB | 21230-20763 | 658 | 599 | -59 | 2.4 | ✓ |
| | | WB | 20763-21230 | 687 | 463 | -225 | 9.4 | × |
| TC6543_Site5 | B480 Watlington Road, 150m east of Berry Close | EB | 20755-20765 | 343 | 268 | -75 | 4.3 | ✓ |
| | | WB | 20765-20755 | 316 | 276 | -40 | 2.3 | ✓ |
| Site-77 | Faringdon Road, Besselsleigh, Henwood, Vale of White Horse, Oxfordshire, England, OX13 5PY, United Kingdom | NB | 65171-65640 | 711 | 719 | 8 | 0.3 | ✓ |
| | | SB | 65640-65171 | 737 | 724 | -13 | 0.5 | ✓ |
| Site-86 | Wantage Road, Wantage, Vale of White Horse, Oxfordshire, England, OX12 9NQ, United Kingdom | NB | 70170-66620 | 74 | 84 | 10 | 1.1 | ✓ |
| | | SB | 66620-70170 | 66 | 67 | 1 | 0.1 | ✓ |
| Site-87 | A338, Grove, Vale of White Horse, Oxfordshire, England, OX12 0DJ, United Kingdom | NB | 65380-65490 | 405 | 493 | 88 | 4.2 | ✓ |
| | | SB | 65490-65380 | 378 | 465 | 87 | 4.2 | ✓ |

| Site ID | Road Name | Direction | Link ID | Observed Count - Total (VEH) | Modelled Flow - Total (VEH) | Diff | GEH | Combined Pass? |
|---|---|---|---|---|---|---|---|---|
| Site-122 | A4130, Milton, Vale of White Horse, Oxfordshire, England, OX14 4RY, United Kingdom | EB | 12395-95947 | 751 | 669 | -82 | 3.1 | ✓ |
| | | WB | 95947-12395 | 747 | 601 | -146 | 5.6 | × |
| Site-135 | Frilford Road, Marcham, Vale of White Horse, Oxfordshire, England, OX13 6QL, United Kingdom | EB | 65255-66740 | 412 | 502 | 90 | 4.2 | ✓ |
| | | WB | 66740-65255 | 472 | 587 | 115 | 5.0 | ✓ |
| Site-240 | A420, Tilbury Fields, North Hinksey, Vale of White Horse, Oxfordshire, England, OX2 9ND, United Kingdom | NB | 20025-12055 | 872 | 930 | 59 | 2.0 | ✓ |
| | | SB | 12055-20025 | 863 | 900 | 36 | 1.2 | ✓ |
| Site-282 | The Causeway, Culham, South Oxfordshire, Oxfordshire, England, OX14 3HP, United Kingdom | NB | 55025-55026 | 369 | 425 | 56 | 2.8 | ✓ |
| | | SB | 55026-55025 | 309 | 347 | 38 | 2.1 | ✓ |
| Site-573 | Brewery Tap, 40-42, Ock Street, Caldecott, Abingdon on Thames, Abingdon, Vale of White Horse, Oxfordshire, England, OX14 5BZ, United Kingdom | WB | 55010-85255 | 440 | 487 | 47 | 2.2 | ✓ |
| Site-667 | Challow Park, Challow Road, East Challow, Vale of White Horse, Oxfordshire, | EB | 60010-60145 | 256 | 209 | -48 | 3.1 | ✓ |
| | | WB | 60145-60010 | 262 | 216 | -46 | 3.0 | ✓ |

| Site ID | Road Name | Direction | Link ID | Observed Count - Total (VEH) | Modelled Flow - Total (VEH) | Diff | GEH | Combined Pass? |
|---|---|---|---|---|---|---|---|---|
| | England, OX12 9LQ, United Kingdom | | | | | | | |

# A.3 PM Peak

| Site ID | Road Name | Direction | Link ID | Observed Count - Total (VEH) | Modelled Flow - Total (VEH) | Diff | GEH | Combined Pass? |
|---|---|---|---|---|---|---|---|---|
| Site 2 | A4074 / A415 / Wimblestraw Rd | SB | 65230-19002 | 803 | 678 | -125 | 4.6 | ✓ |
| | | NB | 19002-65230 | 565 | 650 | 85 | 3.5 | ✓ |
| | | WB | 65905-65225 | 284 | 362 | 78 | 4.33 | ✓ |
| | | EB | 65225-65905 | 291 | 317 | 26 | 1.5 | ✓ |
| | | NB | 65895-65225 | 680 | 658 | -22 | 0.8 | ✓ |
| | | SB | 65225-65895 | 746 | 648 | -98 | 3.7 | ✓ |
| | | EB | 65900-65225 | 209 | 208 | -1 | 0.1 | ✓ |
| | | WB | 65225-65900 | 374 | 291 | -83 | 4.6 | ✓ |
| Site 3 | A415 Abingdon Road / Watery Lane / B4015 Oxford Road / High Street | SB | 95800-65235 | 360 | 273 | -87 | 4.9 | ✓ |
| | | NB | 65235-95800 | 359 | 451 | 92 | 4.6 | ✓ |
| | | WB | 65900-65235 | 348 | 251 | -97 | 5.6 | ✓ |
| | | EB | 65235-65900 | 187 | 202 | 15 | 1.07 | ✓ |
| | | NB | 66561-65236 | 272 | 283 | 11 | 0.7 | ✓ |
| | | SB | 65236-66561 | 489 | 250 | -239 | 12.4 | × |
| | | EB | 65892-65236 | 422 | 521 | 99 | 4.6 | ✓ |
| | | WB | 65236-65892 | 364 | 424 | 60 | 3.0 | ✓ |
| 1703 23 Sutton Courtenay ATC 01 (TC6032) | A415 Abingdon Road W | EB | 65890-65891 | 443 | 384 | -58 | 2.9 | ✓ |
| | | WB | 65891-65890 | 546 | 574 | 28 | 1.2 | ✓ |
| 1703 23 Sutton Courtenay | Tollgate Road | NB | 65885-65890 | 272 | 323 | 52 | 3.0 | ✓ |
| | | SB | 65890-65885 | 440 | 393 | -47 | 2.3 | ✓ |

| Site ID | Road Name | Direction | Link ID | Observed Count - Total (VEH) | Modelled Flow - Total (VEH) | Diff | GEH | Combined Pass? |
|---|---|---|---|---|---|---|---|---|
| ATC 03 (TC6034) | | | | | | | | |
| OCC_1 | A329 South west of M40 | NB | 65075-10200 | 602 | 544 | -58 | 2.4 | ✓ |
| | | SB | 10200-65075 | 474 | 475 | 1 | 0.0 | ✓ |
| OCC_2 | B480 North of Chiselhampton | NB | 65015-95946 | 151 | 84 | -67 | 6.2 | ✓ |
| | | SB | 95946-65015 | 238 | 218 | -20 | 1.3 | ✓ |
| OCC_3 | B480 West of Stadhampton | EB | 65015-65020 | 436 | 418 | -18 | 0.9 | ✓ |
| | | WB | 65020-65015 | 294 | 380 | 85 | 4.6 | ✓ |
| OCC_4 | B4009 South west of M40 | NB | 65030-10140 | 428 | 423 | -5 | 0.2 | ✓ |
| | | SB | 10140-65030 | 525 | 608 | 83 | 3.5 | ✓ |
| ID04212 Chalgrove Airfield, Oxfordshire - ATC Site 2 | Marylands Green (W) to B480 (E) | EB | 65230-65015 | 335 | 207 | -128 | 7.8 | ✓ |
| | | WB | 65015-65230 | 352 | 304 | -48 | 2.7 | ✓ |
| ID04212 Chalgrove Airfield, Oxfordshire - ATC Site 4 | Thame Road (W) to Unnamed Road (E) | EB | 65025-95824 | 199 | 141 | -58 | 4.4 | ✓ |
| | | WB | 95824-65025 | 196 | 153 | -43 | 3.2 | ✓ |
| ID04212 Chalgrove Airfield, Oxfordshire - ATC Site 5 | Thame Road (S) to A329 Stadhampton Road (N) | NB | 65026-65060 | 544 | 462 | -82 | 3.6 | ✓ |
| | | SB | 65060-65026 | 411 | 377 | -35 | 1.7 | ✓ |
| ATC 10 (B480 W of Chalgrove) | B480 W of Chalgrove | EB | 95824-95825 | 161 | 159 | -1 | 0.1 | ✓ |
| | | WB | 95825-95824 | 134 | 165 | 32 | 2.6 | ✓ |
| ATC 12 (B480 at Cuxham) | B480 at Cuxham | EB | 65810-19005 | 126 | 98 | -28 | 2.6 | ✓ |
| | | WB | 19005-65810 | 126 | 105 | -21 | 2.0 | ✓ |
| TC6352 | 3906 - LON Oxford - MK - Cambridge | NB | 21185-95970 | 1242 | 1069 | -173 | 5.1 | × |
| | | SB | 95970-21185 | 1105 | 1023 | -82 | 2.50 | ✓ |
| TC6543_Site4 | B480 Watlington Road, 125m west of Ashville Way | EB | 21230-20763 | 805 | 1031 | 226 | 7.5 | × |
| | | WB | 20763-21230 | 612 | 438 | -174 | 7.6 | × |
| TC6543_Site5 | B480 Watlington Road, 150m east of Berry Close | EB | 20755-20765 | 849 | 791 | -58 | 2.0 | ✓ |
| | | WB | 20765-20755 | 347 | 316 | -31 | 1.7 | ✓ |

| Site ID | Road Name | Direction | Link ID | Observed Count - Total (VEH) | Modelled Flow - Total (VEH) | Diff | GEH | Combined Pass? |
|---|---|---|---|---|---|---|---|---|
| Site-77 | Faringdon Road, Besselsleigh, Henwood, Vale of White Horse, Oxfordshire, England, OX13 5PY, United Kingdom | NB | 65171-65640 | 828 | 824 | -4 | 0.1 | ✓ |
| | | SB | 65640-65171 | 1337 | 1238 | -99 | 2.7 | ✓ |
| Site-86 | Wantage Road, Wantage, Vale of White Horse, Oxfordshire, England, OX12 9NQ, United Kingdom | NB | 70170-66620 | 101 | 143 | 42 | 3.8 | ✓ |
| | | SB | 66620-70170 | 84 | 103 | 19 | 1.9 | ✓ |
| Site-87 | A338, Grove, Vale of White Horse, Oxfordshire, England, OX12 0DJ, United Kingdom | NB | 65380-65490 | 815 | 743 | -72 | 2.6 | ✓ |
| | | SB | 65490-65380 | 501 | 721 | 220 | 8.9 | × |
| Site-122 | A4130, Milton, Vale of White Horse, Oxfordshire, England, OX14 4RY, United Kingdom | EB | 12395-95947 | 1047 | 972 | -75 | 2.4 | ✓ |
| | | WB | 95947-12395 | 815 | 868 | 53 | 1.8 | ✓ |
| Site-135 | Frilford Road, Marcham, Vale of White Horse, Oxfordshire, England, OX13 6QL, United Kingdom | EB | 65255-66740 | 461 | 506 | 45 | 2.1 | ✓ |
| | | WB | 66740-65255 | 739 | 528 | -212 | 8.4 | × |
| Site-240 | A420, Tilbury Fields, North Hinksey, Vale of White Horse, Oxfordshire, England, OX2 9ND, United Kingdom | NB | 20025-12055 | 1002 | 1153 | 151 | 4.6 | ✓ |
| | | SB | 12055-20025 | 1404 | 1359 | -45 | 1.2 | ✓ |

| Site ID | Road Name | Direction | Link ID | Observed Count - Total (VEH) | Modelled Flow - Total (VEH) | Diff | GEH | Combined |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Pass? |
| Site-282 | The Causeway, Culham, South Oxfordshire, Oxfordshire, England, OX14 3HP, United Kingdom | NB | 55025-55026 | 477 | 556 | 79 | 3.5 | ✓ |
| | | SB | 55026-55025 | 453 | 526 | 73 | 3.3 | ✓ |
| Site-573 | Brewery Tap, 40-42, Ock Street, Caldecott, Abingdon on Thames, Abingdon, Vale of White Horse, Oxfordshire, England, OX14 5BZ, United Kingdom | WB | 55010-85255 | 365 | 461 | 96 | 4.7 | ✓ |
| Site-667 | Challow Park, Challow Road, East Challow, Vale of White Horse, Oxfordshire, England, OX12 9LQ, United Kingdom | EB | 60010-60145 | 318 | 304 | -13 | 0.8 | ✓ |
| | | WB | 60145-60010 | 372 | 374 | 2 | 0.1 | ✓ |

# Appendix B. Future Year Results

# B.1 V/C plots for 2041 DM

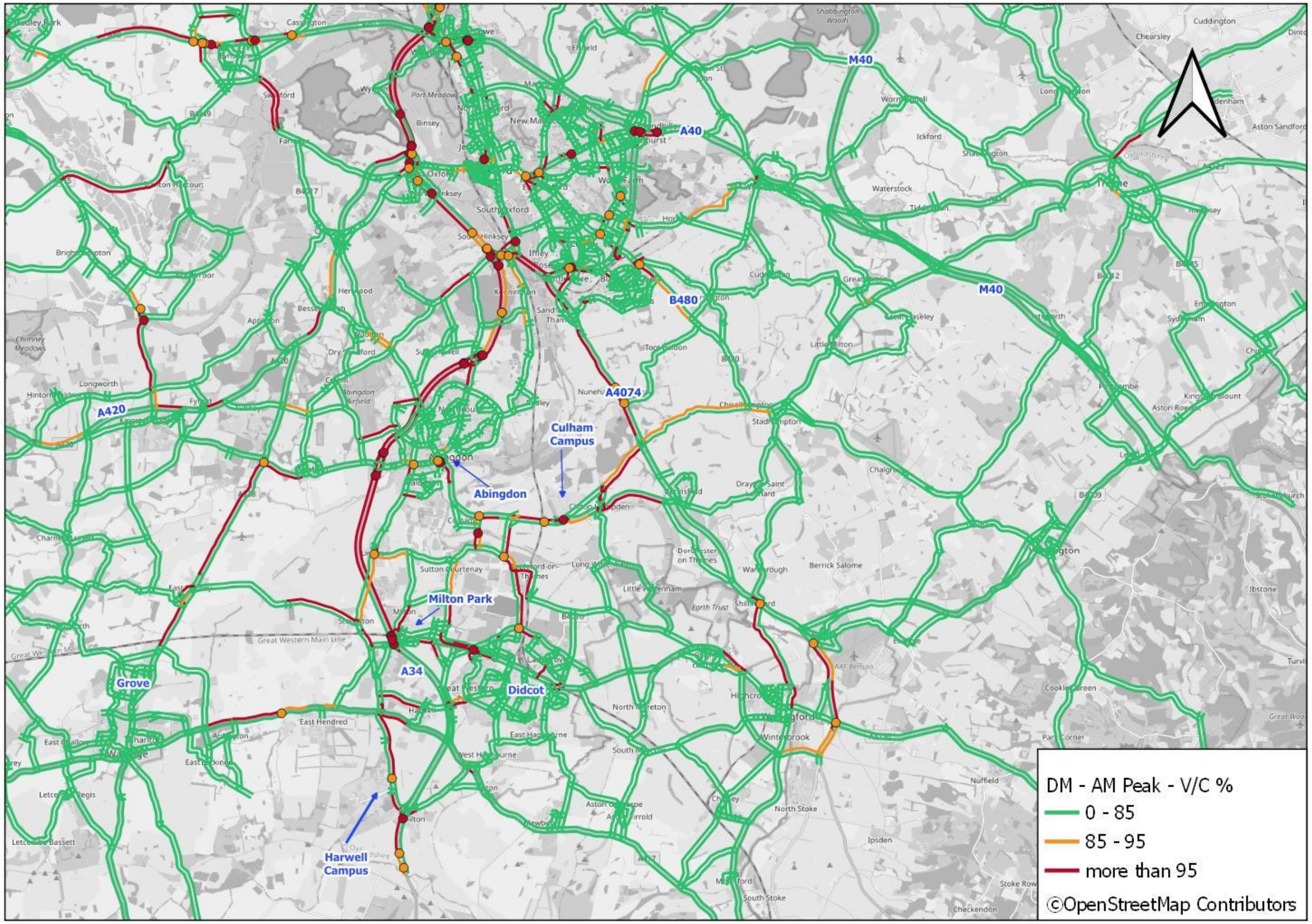


Figure B-1 – Volume/Capacity DM AM Peak hour

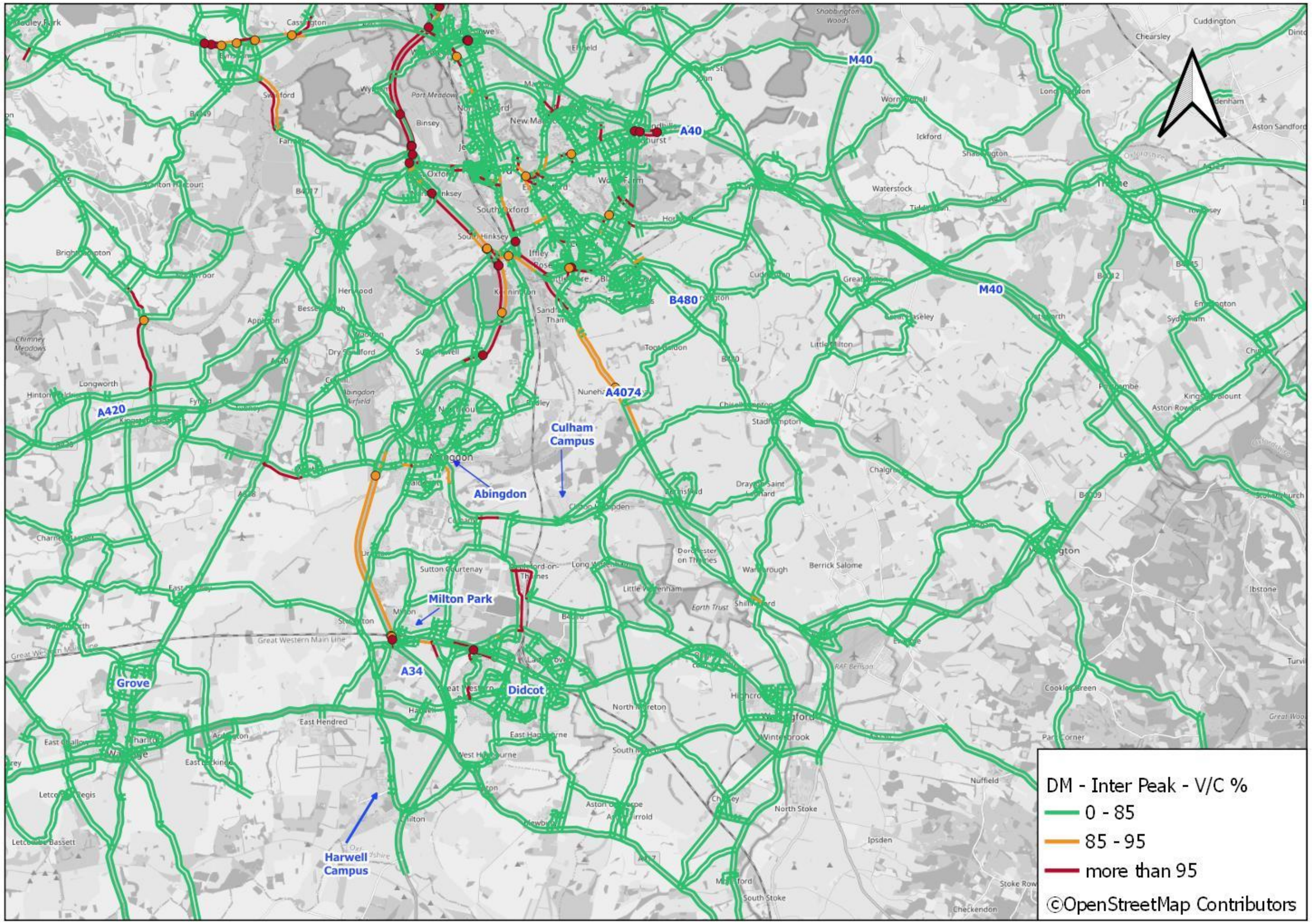


**Figure B-2 – Volume/Capacity DM Inter Peak hour**

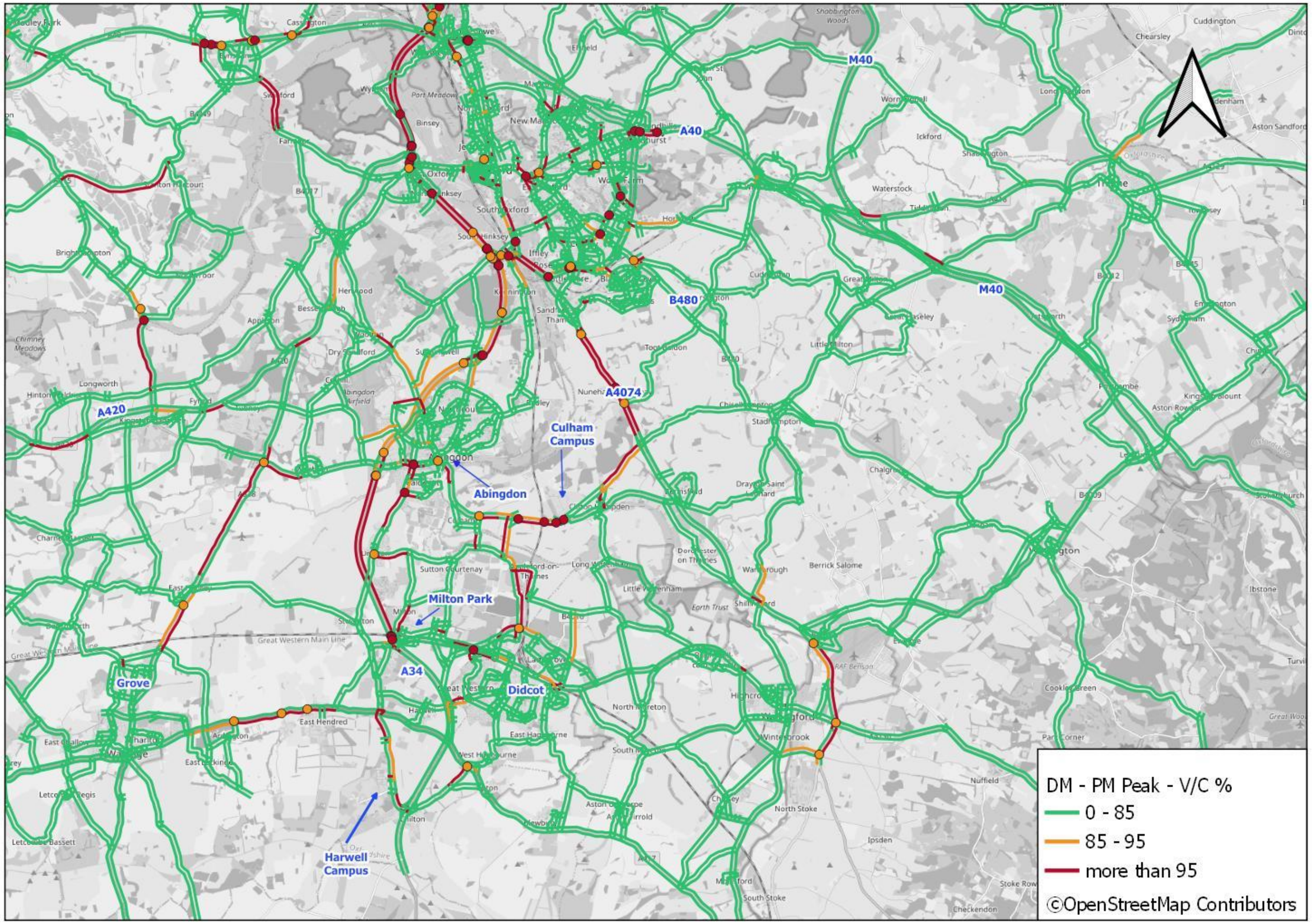


**Figure B-3 – Volume/Capacity DM PM Peak hour**

## B.2 V/C plots for 2041 DS

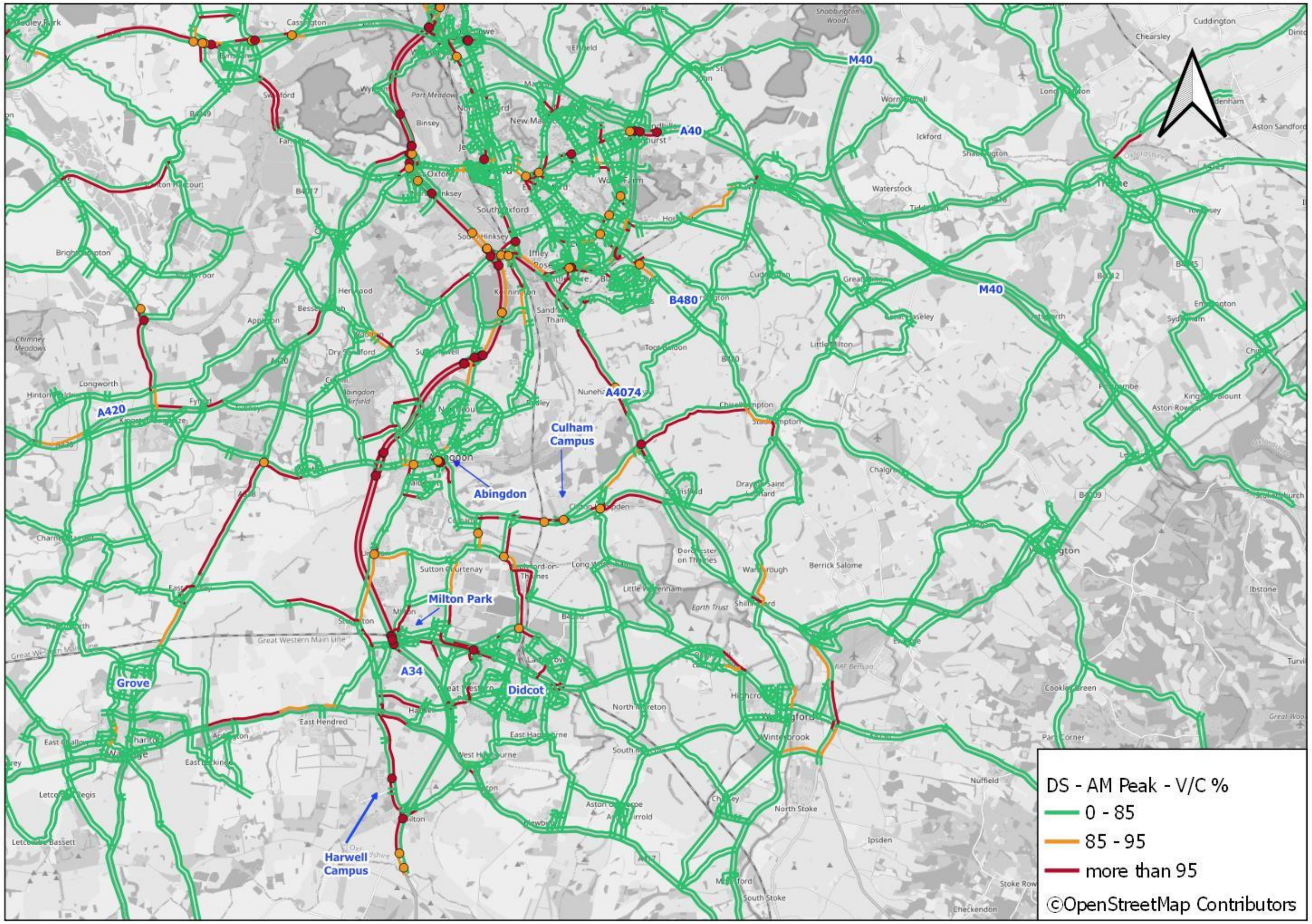


**Figure B-4 – Volume/Capacity DS AM Peak hour**

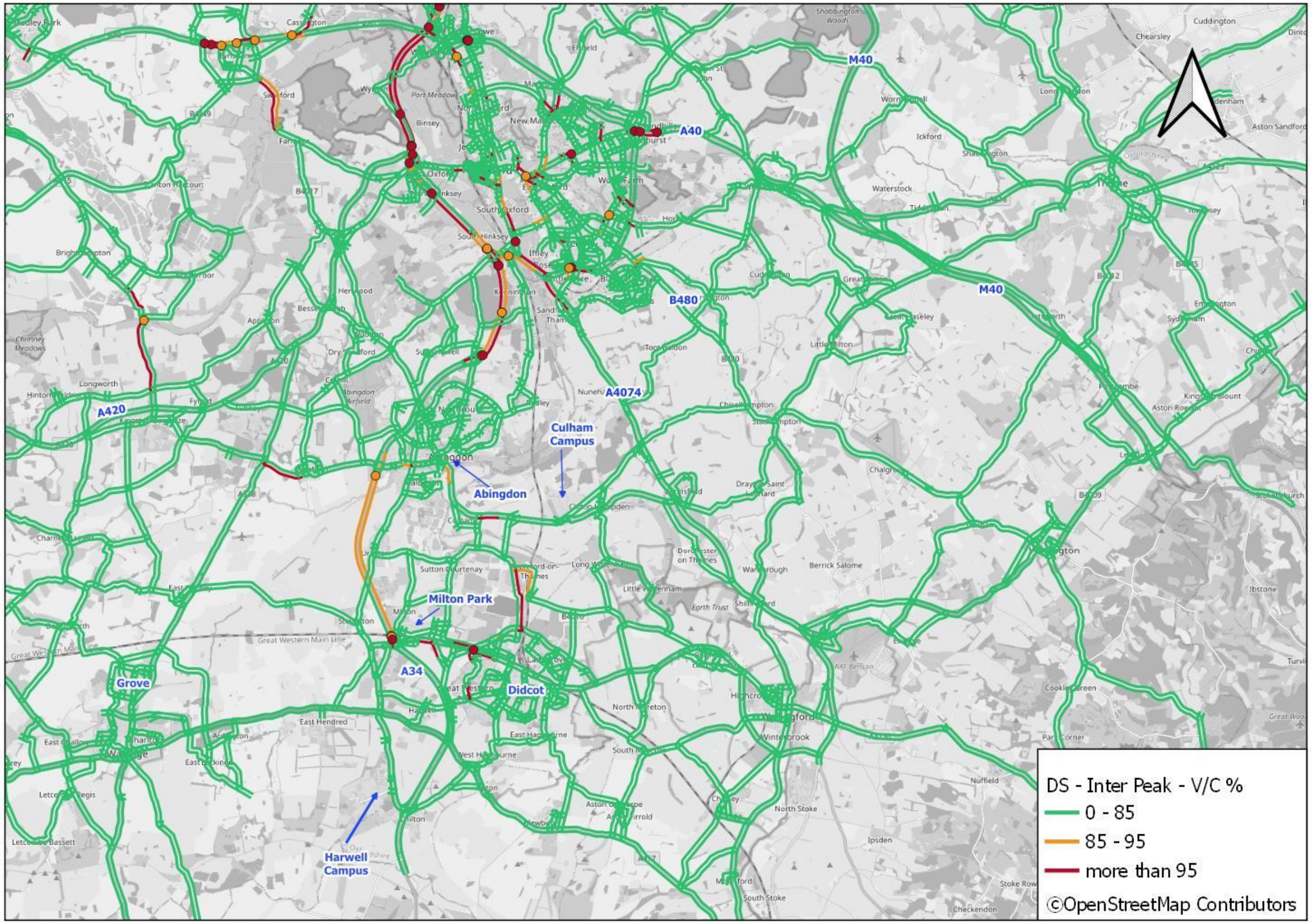


**Figure B-5 – Volume/Capacity DS Inter Peak hour**

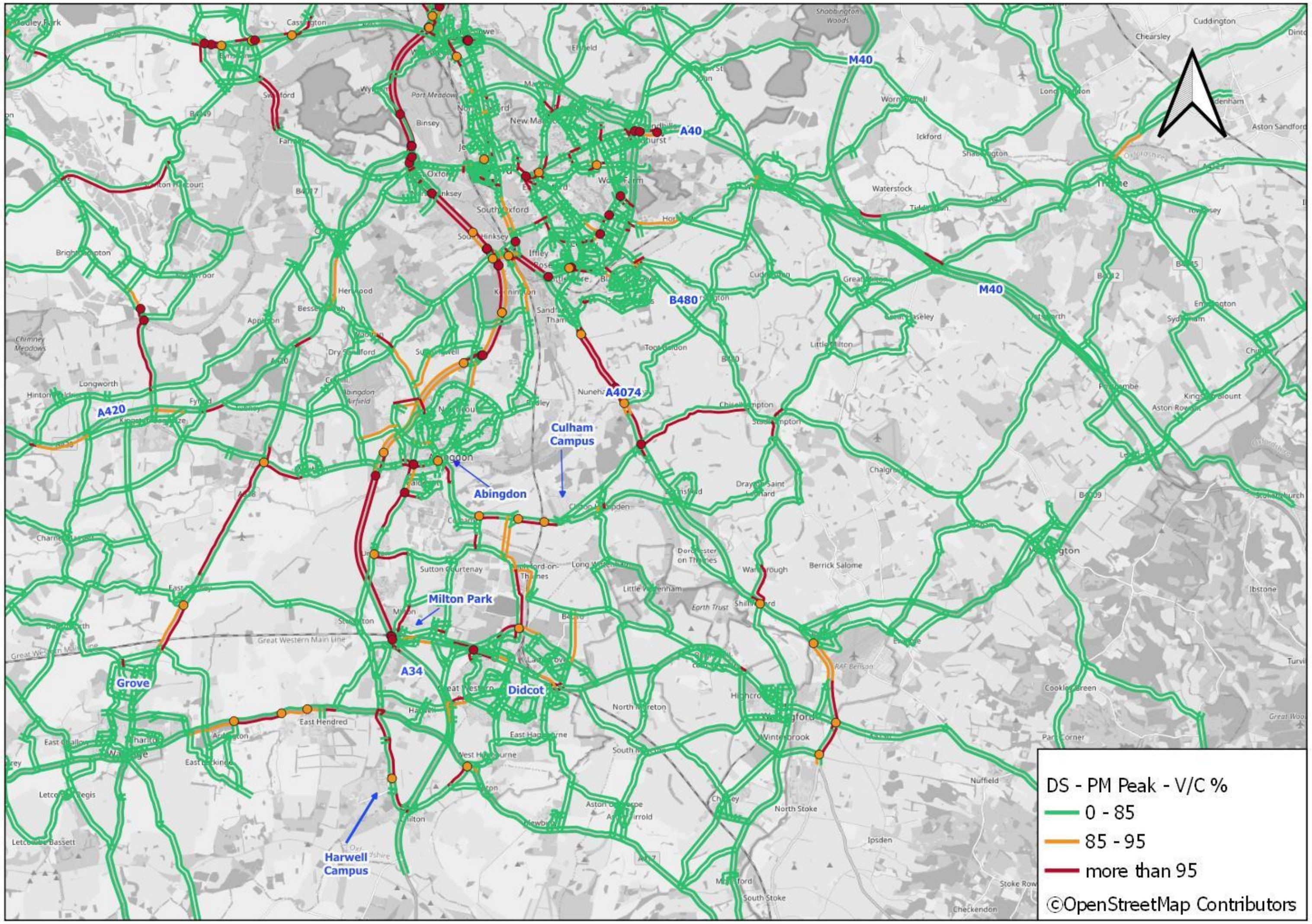


**Figure B-6 – Volume/Capacity DS PM Peak hour**

## B.3 Flow difference plots for 2041 DS - DM

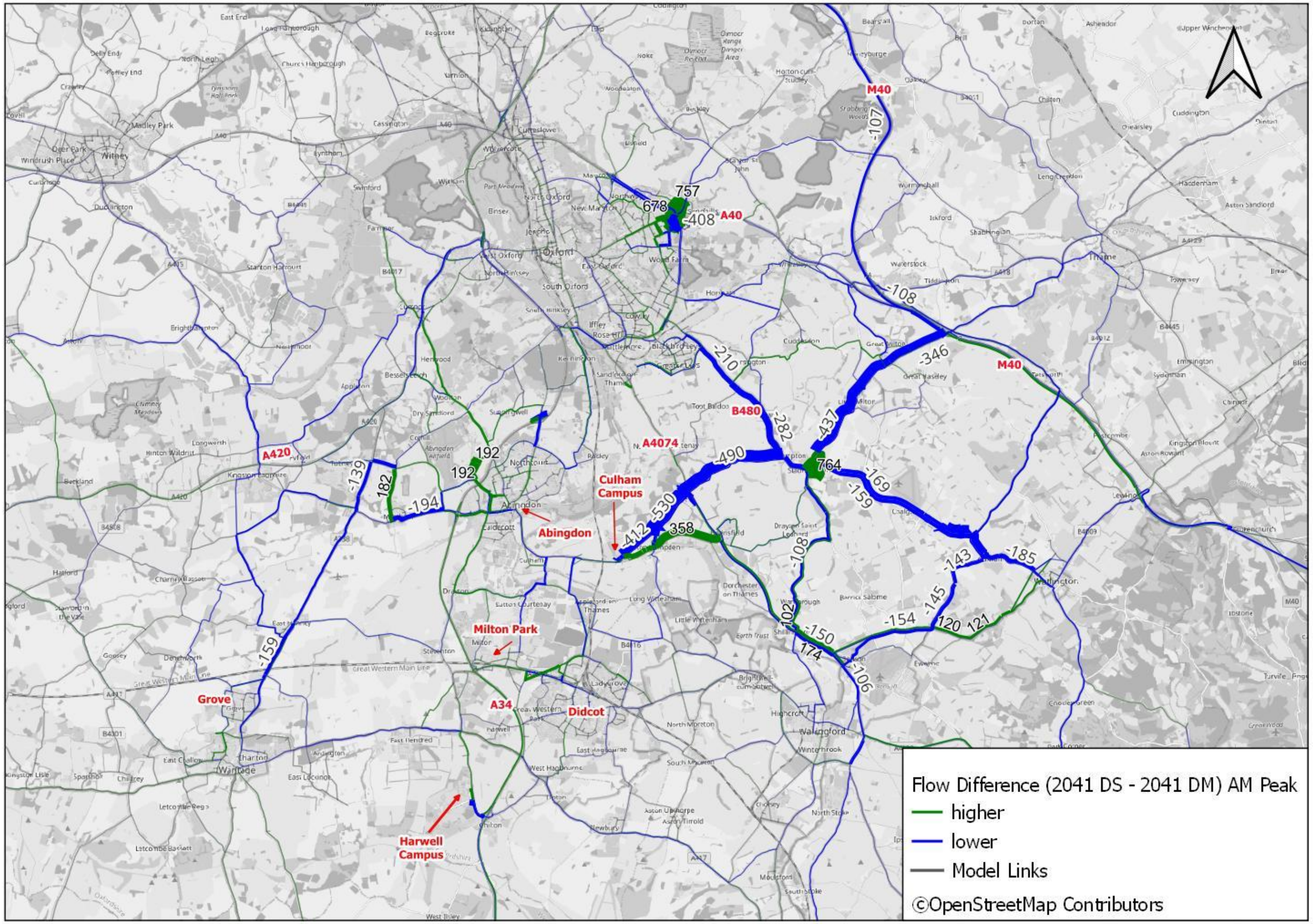


Figure B-7 - Highway Flow Difference in PCU's (DS – DM) AM Peak hour

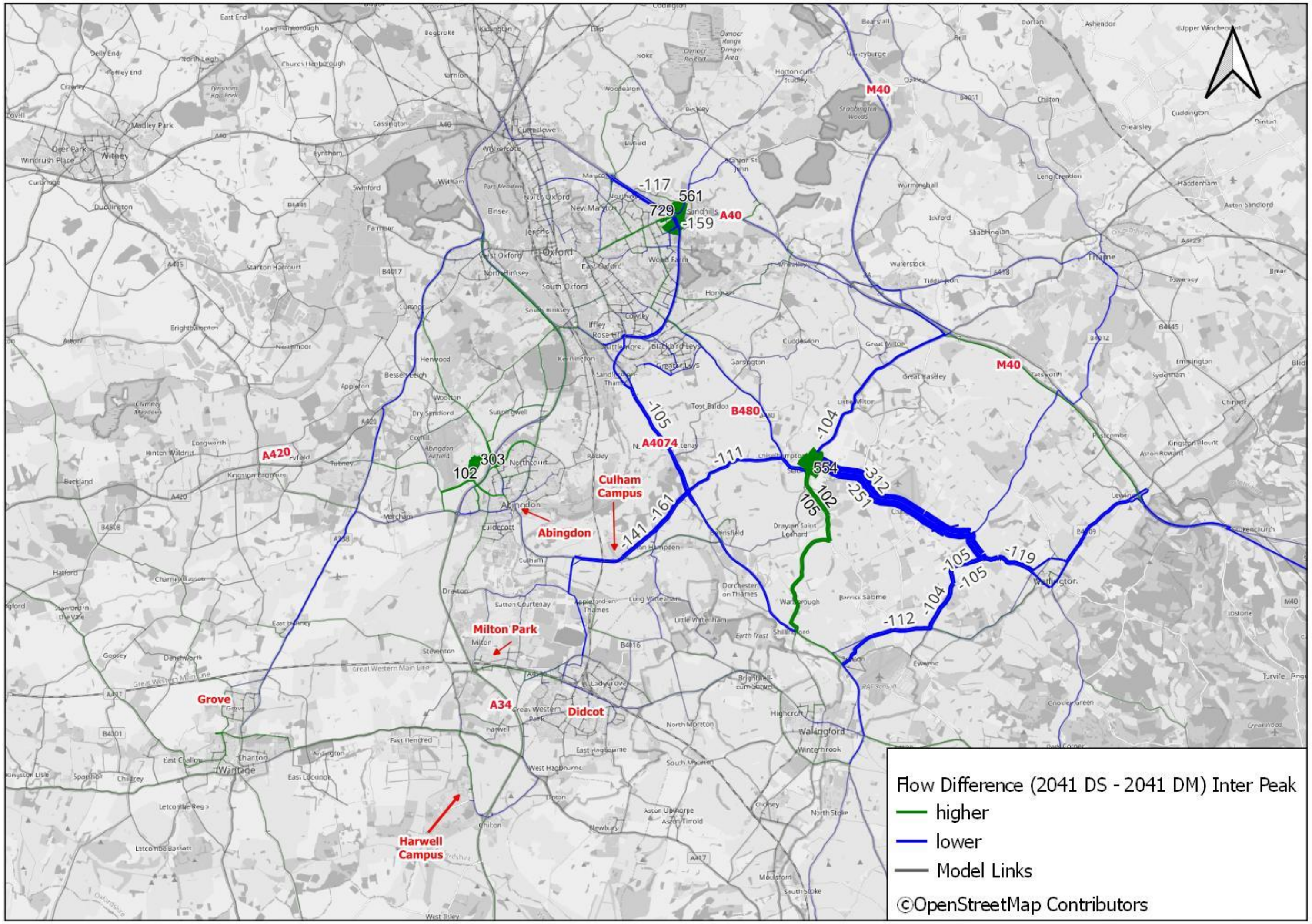


**Figure B-8 - Highway Flow Difference in PCU's (DS – DM) Inter-Peak hour**

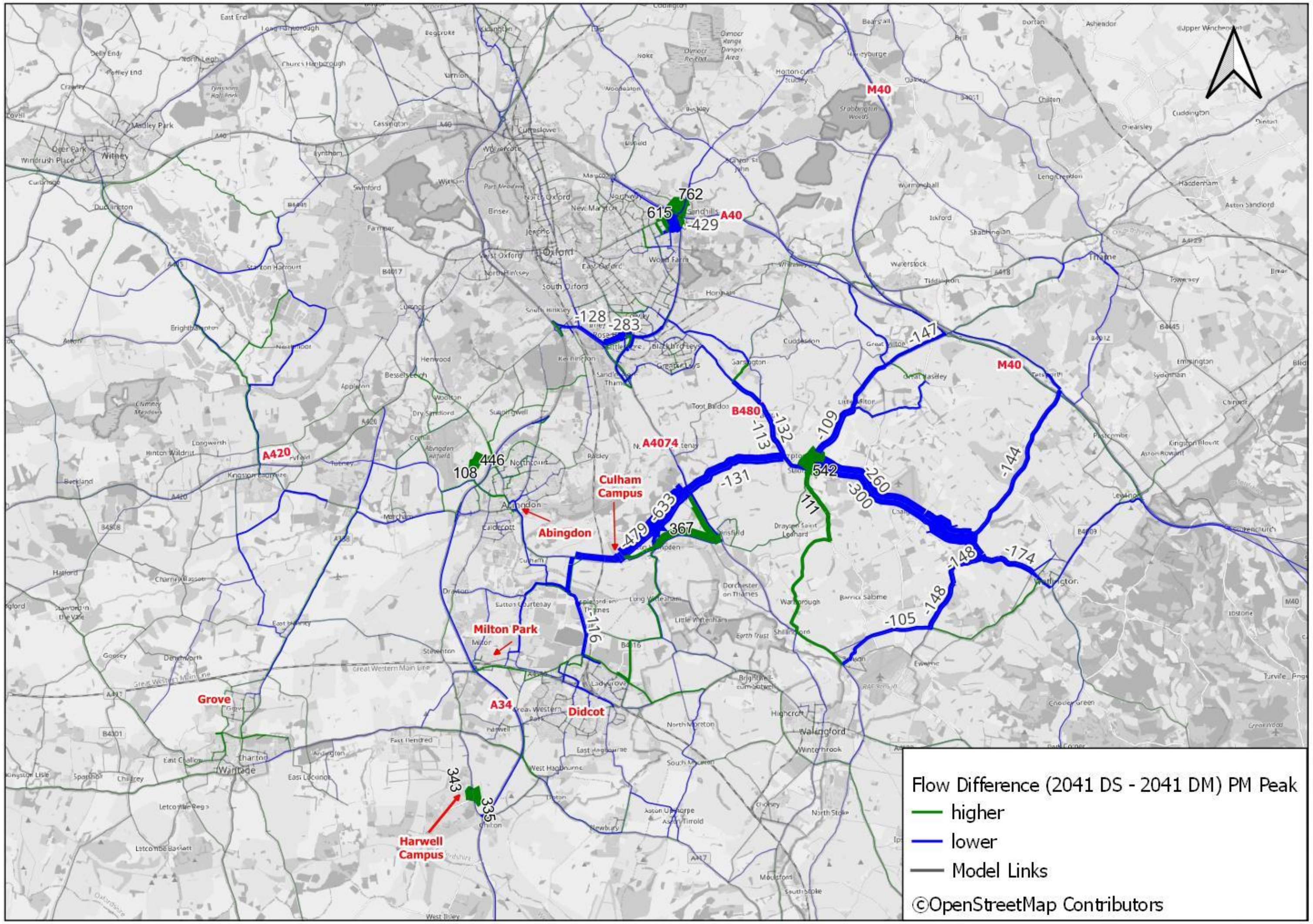


**Figure B-9 - Highway Flow Difference in PCU's (DS – DM) PM Peak hour**

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