

South Oxfordshire District Council Local Plan

Evaluation of Transport Impacts: Stage 2 -
Development Scenarios and Mitigation
Testing

Oxfordshire County Council

10 October 2017



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1. Introduction

Atkins have been commissioned by Oxfordshire County Council (OCC) and South Oxfordshire District Council (SODC) to undertake an additional preliminary Evaluation of Transport Impacts (ETI) in relation to the emerging SODC Local Plan. The Local Plan sets out a policy framework for the delivery of sustainable development across the District up to 2033. It sets out the spatial strategy and strategic policies for the District to deliver sustainable development. It identifies the number of new homes and employment land to be provided in the area and makes provision for retail, leisure and commercial development and the infrastructure needed to support them.

One of the main purposes of the ETI is to inform the selection of strategic development sites to be allocated in the Local Plan 2033 and to help identify a package of highway mitigation to ensure the plan contributes towards the delivery of sustainable development. The ETI forms part of the evidence base to inform the Local Plan 2033 alongside other evidence, including: Landscape Capacity Study, Strategic Flood Risk Assessment, Sustainability Appraisal, Green Belt Review, and others.

This is Stage 2 of the work associated with the ETI commission. The first stage firstly considered the suitability of the Oxfordshire Strategic Model (OSM) to assess Local Plan impacts. The subsequent part of stage 1 evaluated the transport impacts of five Local Plan scenarios. This second stage of the work will look in more detail at the impacts of the emerging development scenario, and prospective mitigation measures to support the final Local Plan.

The base model performance check undertaken during the Stage 1 (Network and Model Performance Review) of this work determined where OSM is more suitable for the assessment of transport impacts in the District. In general, the areas where the model was found to be more suitable aligns well with the spatial distribution of proposed additional growth within the scenarios tested. Where the Network and Model Performance Review work identified that the model is less suitable for assessment, SODC are investigating alternative methods for assessing potential transport impacts.

Atkins has undertaken a technical modelling assessment of the Local Plan to understand likely transport impacts on the strategic highway network. The modelling assessment is part of a staged process to inform decision making. More detailed work is on-going between the District Council, County Council and others to review local impacts of proposed developments and potential mitigation measures associated with growth.

1.1. Previous Work

1.1.1. Previous Local Plan Assessments

Transport modelling of previous versions of the Local Plan has been undertaken. At the time, these models were calibrated and validated using transport surveys collected locally. The calibration and validation of these models was within acceptable limits of modelling guidance at the time and they were deemed suitable for assessment of the Local Plan. These previous models, alongside their accompanying reports have now been superseded.

Since this previous round of work, the base model has been updated significantly and the 2031 forecast model planning data has also been updated. Comparing the most recent forecasting presented in this report against model runs from 2015 is not comparing like with like, the older modelling has marked differences to the latest modelling, which in-turn includes improvements to the model, such as updating to the latest version of TEMPRO, the two rounds of modelling are not directly comparable.

Specifically, differences in model performance have been identified around Watlington between the models prepared in 2007 and used for testing in 2015 and the most recent work undertaken in 2017 which used the updated Oxfordshire Strategic Model (OSM) which was calibrated and validated to a base year of 2013. Identified differences are likely to be as a result of changes to demand and supply (network), different model coding practices and application of new versions of the modelling software. The analysis undertaken during Stage 1 of this work gives comfort that results of the most up to date base year model are generally robust in those areas where significant growth has been tested.

This report should be considered in the context of SODC ETI modelling work undertaken in previous stages and summarised in Table 1 recognising the evolution of the models and inherent differences within them.

Table 1 Summary of ETI Stages

ETI and Local Plan Stage	Growth and Infrastructure Tested	Summary of Conclusions
South Oxfordshire ETI technical note, January 2015 (used previous version of the Oxfordshire transport model)	<p>The land use assumptions tested and summarised are</p> <p>Core Strategy – 9,100 houses apportioned with 55% of houses in Didcot and the remainder split 60% to Market Towns and 40% to the larger villages;</p> <p>Scenario A – Additional 6,000 homes apportioned as per the Core Strategy distribution;</p> <p>Scenario B – Additional 6,000 homes focussed on Science Vale (60%) with remainder across 'sustainable settlements';</p> <p>Scenario C – Additional 6,000 homes all in Science Vale;</p> <p>Scenario D – Additional 6,000 homes all in a single new settlement (in this case around Milton Common);</p> <p>Scenario E – Additional 6,000 homes dispersed evenly across all settlements (in this case 143 in each site);</p> <p>Scenario F – Additional 6,000 homes next to neighbouring major urban areas (in this case split 3,000 near Reading and 3,000 near Oxford near Grenoble Road).</p>	<p>Overall, there was limited difference between scenarios in terms of resulting impacts on the highway network during either time period, although differences are more prominent between scenarios during the AM peak than the PM peak. Bearing this in mind Scenario C results in the greatest negative impact upon the South Oxfordshire network during both time periods.</p> <p>This is closely followed by Scenario D, whilst the impacts of Scenarios A and B could be considered identical and again very similar to Scenario E.</p> <p>Scenario F has the least impact upon the network during both time periods, however the trips generated by the proposed development are not accurately represented in the model due to the location of the development sites being on the periphery of the study area.</p>
Evaluation of Transport Impacts: Stage 1: Network and Model Performance Review	<p>Undertook an assessment of planned growth locations and recently observed traffic surveys against 2013 base year modelled flows to determine the suitability of using the OSM highway assignment model to assess the potential impacts of identified developments in the forthcoming South Oxfordshire Local Plan.</p>	<p>OSM developed as a strategic model to provide evidence base for planning and development mitigation as well as the appraisal of major transport schemes. Analysis undertaken suggested that it may require some refinements to ensure the model reflects recent observations. Model network coverage generally relates well to the development locations within the Local Plan.</p> <p>It was concluded that the model is generally suitable for testing strategic transport impacts, particularly in the central/ northern part of the District around Didcot, Chalgrove, Wheatley, Watlington and Stadhampton.</p>
Evaluation of Transport Impacts: Stage 1: Development Scenarios (to support LP preferred options consultation)	<p>In addition to the Do Minimum assumptions, the quantum of growth for each development scenario is presented in Table 2</p>	<p>Impact of the Local Plan scenarios are compared considering speeds along the key corridors against the Do Minimum scenario, specifically for the morning peak hour:</p>

ETI and Local Plan Stage	Growth and Infrastructure Tested	Summary of Conclusions
	<p>There are no differences between the Do Minimum and the modelled scenario tests in terms of transport supply assumptions (highway, park and ride and public transport).</p>	<p>Scenario 1, with dwellings around the B480 and the A4074, average speed is forecast to reduce by 54% along the B480 and also reduce speeds along the A4074 by 7%;</p> <p>Scenario 2, with dwellings around the A4074 and A415, is forecast to reduce speeds by 10% along the A4074 and 1% along A415;</p> <p>Mitigation (b1), with dwellings around the B480 and the A4074, is forecast to have a minor impact along the corridors considered;</p> <p>Mitigation (b2), with dwellings around the A40 and the A329, is forecast to reduce speeds on the A329 by 7% and to reduce speeds on the A40 by 3%;</p> <p>Scenario 5, with dwellings around the B480, A4074, A415 and the A329, is forecast to reduce speeds by 54% on the B480, 10 % on the A4074, 1% on the A415 and 5% on the A329.</p>
<p>Evaluation of Transport Impacts: Stage 2: Mitigation Scenarios (to support LP consultation)</p>	<p>In addition to the Do Minimum assumptions, the quantum of growth for development scenario in Local Plan and its mitigation scenarios presented in Table 3.</p> <p>There are no differences between the Do Minimum and the Local Plan modelled scenario test in terms of transport supply assumptions (highway, park and ride and public transport).</p> <p>However, the transport supply assumptions for the mitigation scenarios would change with respect to the removal of non-funded highway schemes from the local plan transport supply network in Mitigation Scenario (a) and addition of highway schemes to the local plan transport supply network in Mitigation (b1) and (b2) scenarios.</p>	<p>Impact of the Local Plan Scenario is compared considering speeds along the key corridors against the Do Minimum Scenario, and for the Mitigation Scenarios against the Local Plan Scenario specifically for the morning peak hour:</p> <p>Local Plan, with dwellings around the A415 and the B480, average speed is forecast to reduce by 55% along the A415 and also reduce speeds along the B480 by 23% compared to Do Minimum Scenario;</p> <p>Mitigation (a), with dwellings around the A415 and the B480, average speed is forecast to increase by 27% along the A415, by 3% along B480 and A329 and reduce speeds along the A34 by 3% compared to Local Plan;</p> <p>Mitigation (b1), with dwellings around the A415, A4074 and the B480, average speed is forecast to reduce by 5% along the A415, by 6% along A4074 and 4% along B480, and increase by 3% along A329 compared to the Local Plan;</p> <p>Mitigation (b2), with dwellings around the A415, A4074 and the B480, average speed is forecast to reduce by 5% along the A415, by 4% along A4074, 2% along B480, and 3% along B4009 and increase by 3% along A329 compared to the Local Plan;</p>

Table 2 Summary of land use assumptions- Stage 1

	Do Minimum	Scenario 1	Scenario 2	Scenario 4	Scenario 5
Do Minimum	11079	11079	11079	11079	11079
Preferred Options	-	8732	8732	8732	12232
Windfall Allowance	-	683	683	683	683
Total dwellings	11079	20494	20494	20494	23994

Table 3 Summary of land use assumptions- Stage 2

	Do Minimum	Local Plan	Mitigation (a)	Mitigation (b1)	Mitigation (b2)
Do Minimum	11079	11079	11079	11079	11079
Strategic Development	-	11301	11301	11301	11301
Total Dwellings	11079	22380	22380	22380	22380

1.1.2. Network Changes

The transport supply assumptions (highway, park and ride and public transport) are consistent between the Do Minimum and Local Plan Scenario. The highway network changes were made to the Mitigation Scenario's and the network changes in Stage 2 are as follows

- Mitigation (a) – Removal of non-funded schemes from Local Plan Scenario
 - Culham to Didcot Thames River Crossing
 - Clifton Hampden Bypass
 - Science Bridge
 - A4130 dualling
- Mitigation (b1) – with non-funded schemes back in (identified under Mitigation (a)) and addition of network improvement schemes
 - Stadhampton Bypass
 - Watlington Bypass
 - Roundabout improvement at Golden Balls
- Mitigation (b2) – Addition of network improvement schemes to Mitigation (b1) Scenario network
 - Benson Bypass
 - Nuneham Courtenay Bypass

The model network coding for the mitigation scenarios were updated to reflect the respective mitigation scenario and we will monitor the impacts of the Local Plan scenario at these locations in the study area.

1.1.3. Model Output Summary

Table 4 shows the highway network performance for the South Oxfordshire District for the morning and evening peak conditions.

In the Local Plan scenario, for both morning and evening peak the model forecast to increase in delay, travel time and travel distance, and reduction in average speed compared to the Do-Minimum scenario.

In the Mitigation Scenario (a), in the morning peak the model forecasts a decrease in delay, travel time and travel distance and a small increase in average speed compared to the Local Plan scenario. In the evening peak the model forecasts an increase in delay, whereas decrease in travel time, travel distance and small reduction in average speed. The reduction in network statistics can be attributed to the traffic using alternative routes that are outside South Oxfordshire, likely to be represented by the reduction in total distance travelled by around 6000 pcu-hours during the morning and evening peaks.

In the Mitigation Scenario (b1), in the morning peak the model forecasts a decrease in delay, travel time, travel distance and a small decrease in average speed compared to the Local Plan scenario. In the evening peak the model forecasts a decrease in delay and travel time, and an increase in travel distance and

average speed. The addition of mitigation measures reduces the delay in the South Oxfordshire, however there is likely to be additional congestion along the B480 at Chiselhampton, along A4074 at Golden Balls Roundabout and along the A415 corridor at Culham Science Centre which may be associated with increased vehicle flow at the junctions crossing the A329 and B4015/Oxford Road related to the proposed Stadhampton Bypass and Golden Balls Roundabout mitigation measures. Possible increases to forecast congestion relate to the decrease in the total distance travelled in the morning peak compared to the Local Plan.

In the Mitigation Scenario (b2), in the morning peak the model forecasts a decrease in delay, travel time, travel distance and a small decrease in average speed compared to the Local Plan scenario. In the evening peak the model forecasts a decrease in delay and travel time, and an increase in travel distance and average speed. The addition of mitigation measures is forecast to reduce delay further in the South Oxfordshire, however additional congestion is forecast along the B480 at Chiselhampton and on the A4074 at Golden Balls Roundabout and along the A415 corridor at Culham Science Centre this is likely to be related to increased flow at the junctions with the A329 and B4015/Oxford Road associated with mitigation measures at Stadhampton Bypass and Golden Balls Roundabout. Modelled increases to congestion forecasts relate to the decrease in the total distance travelled in the morning peak and minor increase in distance travelled during evening peak compared to the Local Plan.

It has been suggested that the forecast cumulative transport impacts of the proposed South Oxfordshire Local Plan in addition to the Vale of White Horse Local Plan, be considered as part of an additional sensitivity test.

Appendix A provides a summary of traffic flow volume to capacity percentage forecasts for Year 2031 modelled Do Minimum (DM), Local Plan (LP) and Mitigation Option b2 scenarios along each highway corridor considered for morning and evening peak.

Table 4 Highway Network Performance -Summary

Performance Parameters	South Oxfordshire								
	Morning Peak					Difference			
	Do Minimum	Local Plan	Mitigation Scenario (a)	Mitigation Scenario (b1)	Mitigation Scenario (b2)	Local Plan *	Mitigation Scenario (a) **	Mitigation Scenario (b1) **	Mitigation Scenario (b2) **
Delay (pcuh)	518	961	906	936	906	443	-55	-26	-55
Total Time (pcuh)	6039	6815	6683	6796	6788	776	-131	-19	-27
Total Distance (pcukm)	375965	393554	387763	391964	391088	17589	-5791	-1589	-2465
Average Speed (km/h)	62.3	57.8	58	57.7	57.6	-4.5	0.2	-0.1	-0.2
	Evening Peak					Difference			
	Do Minimum	Local Plan	Mitigation Scenario (a)	Mitigation Scenario (b1)	Mitigation Scenario (b2)	Local Plan *	Mitigation Scenario (a) **	Mitigation Scenario (b1) **	Mitigation Scenario (b2) **
	Do Minimum	Local Plan	Mitigation Scenario (a)	Mitigation Scenario (b1)	Mitigation Scenario (b2)	Local Plan *	Mitigation Scenario (a) **	Mitigation Scenario (b1) **	Mitigation Scenario (b2) **
Delay (pcuh)	618	951	1044	844	810	332	94	-107	-141
Total Time (pcuh)	6689	7398	7344	7368	7353	710	-54	-30	-45
Total Distance (pcukm)	406097	426439	420490	427628	426603	20342	-5950	1189	164
Average Speed (km/h)	60.7	57.6	57.3	58	58	-3.1	-0.3	0.4	0.4

NOTE: *- compared to Do Minimum , ** - compared to Local Plan

2. Modelling Approach

2.1. Background

The ETI work is being undertaken to inform the preparation of the preferred South Oxfordshire Local Plan 2033, and has been completed in stages with the agreement of SODC, following the agreed methodological proposal.

2.2. Description of the model

The work is based on the Oxfordshire Strategic Model (OSM) developed by Atkins for Oxfordshire County Council (OCC). The OSM modelling system was developed to represent travel conditions in 2013 and consists of three key elements:

- a Highway Assignment Model (HAM) representing vehicle-based movements within and across the Oxfordshire County for a 2013 October 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) representing bus and rail-based movements across the same area and for the same time periods; and
- a five-stage multi-modal Demand Model (MMDM) 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 the 24-hour period (07:00 – 07:00). It does this incrementally from the Base Year.

The entire OSM model covers the whole of Great Britain with different degrees of detail.

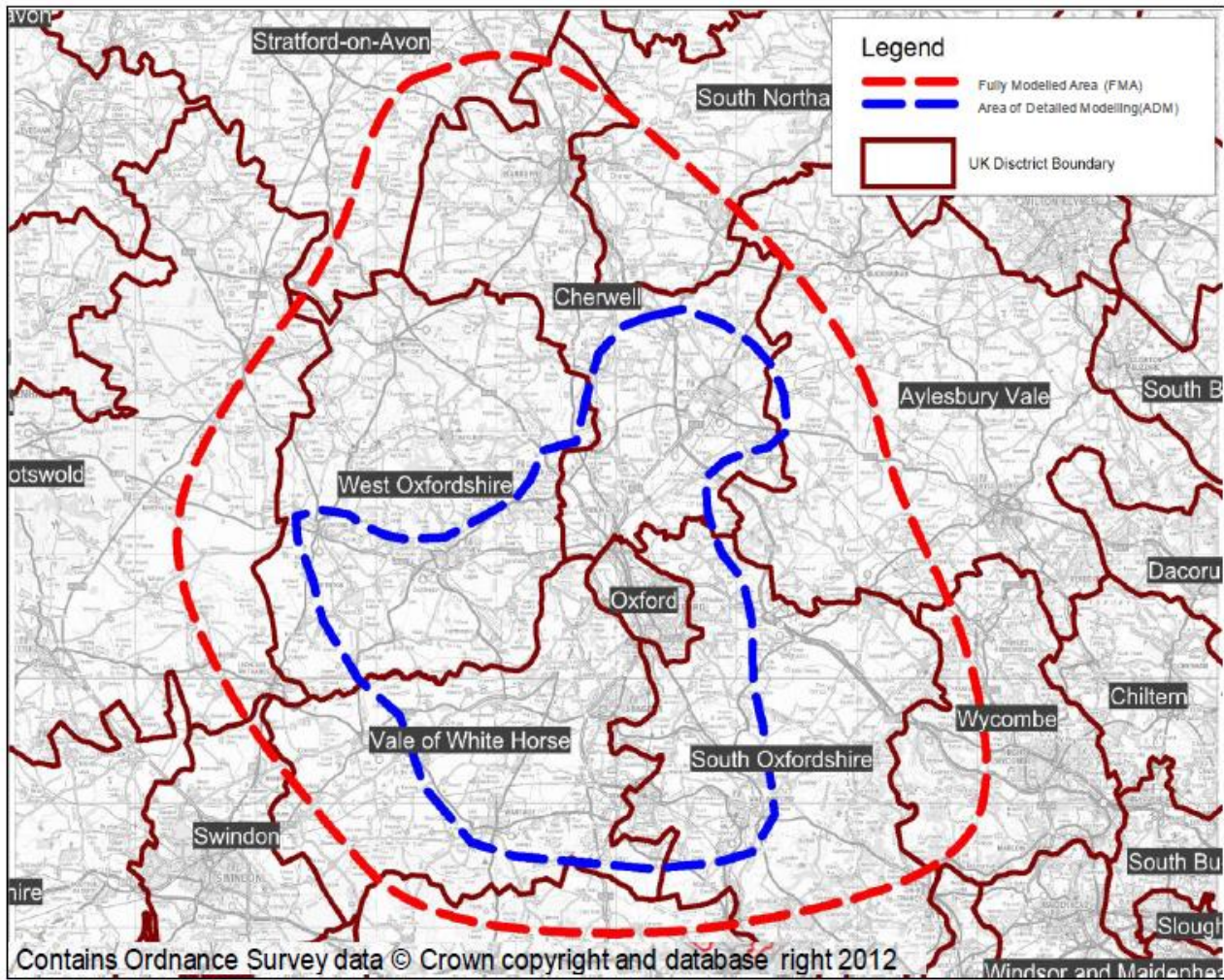
The OSM covers the strategic links in Oxfordshire and has a detailed modelled area and a fully modelled area as shown in Figure 1.

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 outside the detailed modelling area would be characterised by: representation of all trip movements; larger zones and less network detail compared to the Area of Detailed Modelling; and speed/flow modelling (primarily link-based 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.

South Oxfordshire is partially situated inside the detailed modelled area (ADM), meaning that everything within that area has been subject to calibration and validation exercises. In the fully modelled area where strategic growth for South Oxfordshire is planned, model validation checks have been undertaken using the latest available transport and traffic data. This assessment is summarised in the Stage 1, Network and Model Performance Review Report, October 2016.

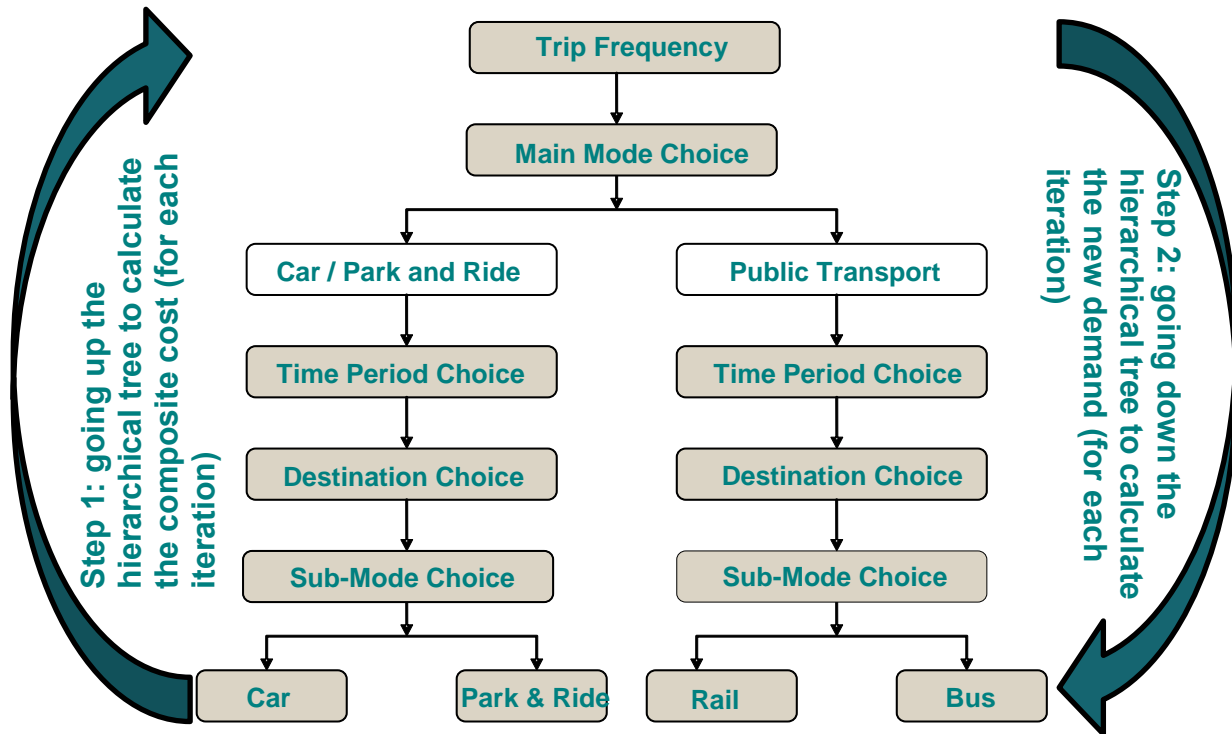
Figure 1 Detailed Modelled Area



2.3. Description of the Demand Model

The MMDM has a hierarchical logit choice structure as shown in Figure 2. Following WebTAG¹, it has an incremental demand modelling approach which responds to changes in travel 'cost' between the 2013 Base Year and the 2031 future year scenario. The process passes through different iterations until it converges.

Figure 2 Demand Model Hierarchy



2.4. Approach

Figure 3 summarises the approach taken for every scenario that is tested in OSM. The model allows changes both in terms of supply and/or demand for each scenario. These inputs enter the Demand model, which will estimate how these changes will impact on the distribution of the demand over different time periods, different modes and different routes.

Once a demand model run has finished, a set of checks is performed to confirm the suitability of the results:

- Check that the additional demand is assigned to the expected zones and the level of post demand is consistent with the inputs;
- Check convergence of the demand model;
- Check convergence of the highway model;
- Check performance of the network near the added schemes; and
- Check delays on the highway network.

As a result of this process, some improvements might be necessary to be implemented into the network:

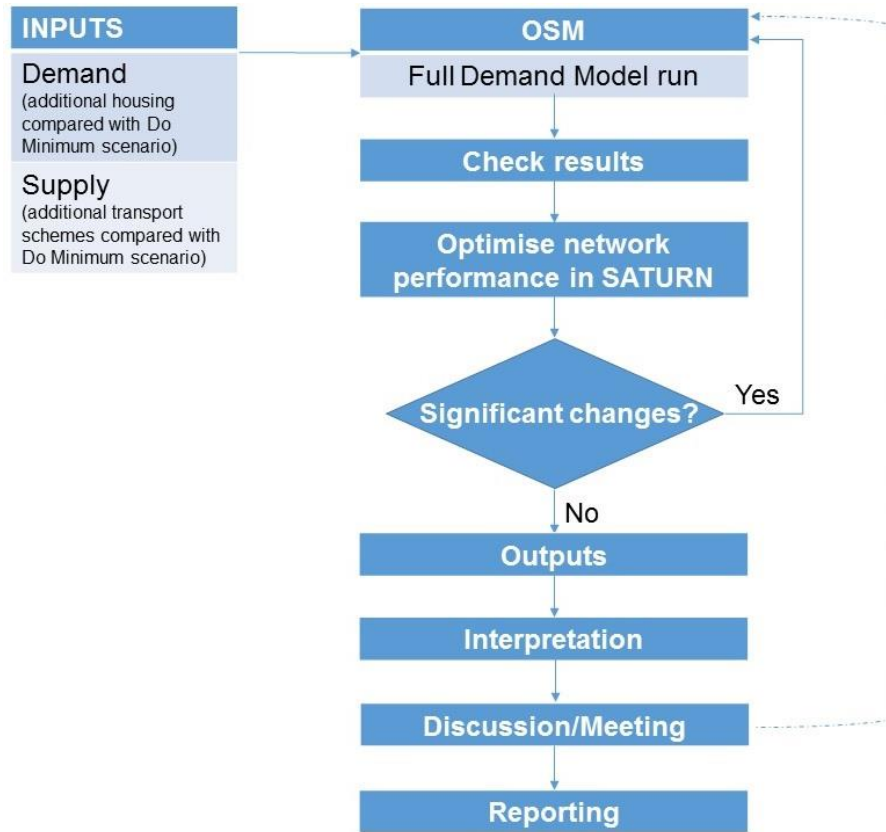
- Review of centroid connectors; and
- Optimisation of signal timings.

¹ Department for Transport (DfT) Transport analysis guidance: WebTAG, provides information on the role of transport modelling and appraisal. <https://www.gov.uk/guidance/transport-analysis-guidance-webtag>

If the changes are significant (e.g. changed centroid connectors or change of a number of signal timings on main routes), the demand model is rerun with the new inputs.

Once the performance of the model is satisfactory, the results are analysed and the necessary outputs are prepared.

Figure 3 Approach taken for this work



2.5. Modelled Scenarios and Land-use assumptions

For the purpose of the Local Plan ETI, the emerging Local Plan scenario is evaluated with respect to the Do Minimum and its mitigation scenarios. It should be noted that the Local Plan year (2033) is different to the reference case year (2031) and therefore the results present a situation in which the 2033 SODC Local Plan is built out 2 years earlier than planned.

The Local Plan scenario provided by SODC, contains additional dwellings, when compared with the Do Minimum scenario, to meet the SODC assessed housing need. The mitigation scenario includes changes in the supply side of the highway network.

- *Do Minimum scenario*: has 2013 as Base Year and 2031 as Future Year. The updated Do Minimum scenario used for this assessment includes homes delivered since 2013, current commitments (homes with planning approval) and 2012 Core Strategy sites. The transport schemes included under Do Minimum scenario for highway and public transport are provided in section 4.2 and 4.4 respectively.
- *Local Plan*: Local Plan allocation 2033 which includes Do- minimum housing scenario and numbers of dwellings from the proposed new Local Plan.
- *Mitigation (a)*: As Local Plan, with variation of removal of non-funded mitigation schemes
- *Mitigation (b1)*: with non-funded schemes included and addition of mitigation measures in Stadhampton, Watlington and at Golden Balls roundabout.
- *Mitigation (b2)*: As Mitigation (b1), with addition of mitigation measures in Benson and Nuneham Courtenay area.

Table 5 is a summary of the development assumptions for each scenario tested in the South Oxfordshire District and Table 6 shows the local plan development distribution. Figure 4 shows the local plan development sites location and highways scheme mitigation measures under each mitigation scenario.

The new South Oxfordshire Local Plan will allocate development growth to 2033. As the strategic model currently has a forecast year of 2031, all local plan development to 2033 within the defined scenarios is added to the 2031 forecast year model for testing.

It is also important to note that the Scenario testing work outlined in this report has been undertaken in the period between the second preferred options document consulted upon in March 2017, and the new publication version of the plan document planned for consultation in October 2017. As such, this report includes testing of the proposed quantum and distribution of development in line with the last consultation, and proposed mitigations. The numbers for different settlements are set out in Table 6 below. It is recognised that the final allocations and proposed dwelling figures for development outlined in the latest publication version of the plan are slightly different to those outlined. As such, further more detailed assessment of site impacts and transport evidence will continue to be needed to be undertaken between the District Council, County Council, developers and South Oxfordshire communities to inform, in particular, the development of infrastructure delivery linked to housing growth, including relevant evidence to support Neighbourhood Plans. The testing outlined in this report also considers updated information on planning commitments, taking into account development sites with new planning approvals.

Table 5 Summary of tested land use assumptions

Developments 2031	Local Plan (LP)	Mitigation (a)	Mitigation (b1)	Mitigation (b2)
Houses	22380	22380	22380	22380
Jobs	4282	4282	4282	4282

Table 6 Local Plan Development Distribution

SI No.	Settlement	Number of dwellings
1	Culham	3500
2	Chalgrove	3000
3	Berinsfield	2100**
4	Henley	677* (***)
5	Thame	452* (***)
6	Holton	300
7	Goring	251*
8	Wallingford	226* (***)
9	Watlington	183*
10	Sonning Common	169*
11	Cholsey	135*
12	Woodcote	135*
13	Crowmarsh	134*
14	Nettlebed	39
Total Dwellings		11301
Notes:		
*To be delivered through Neighbourhood Plans		
** At the time of study Berinsfield final housing figures was unknown, so higher figure was used to provide a		

worst case scenario.

*** Are the proposed allocations at the time of study but have since changed.

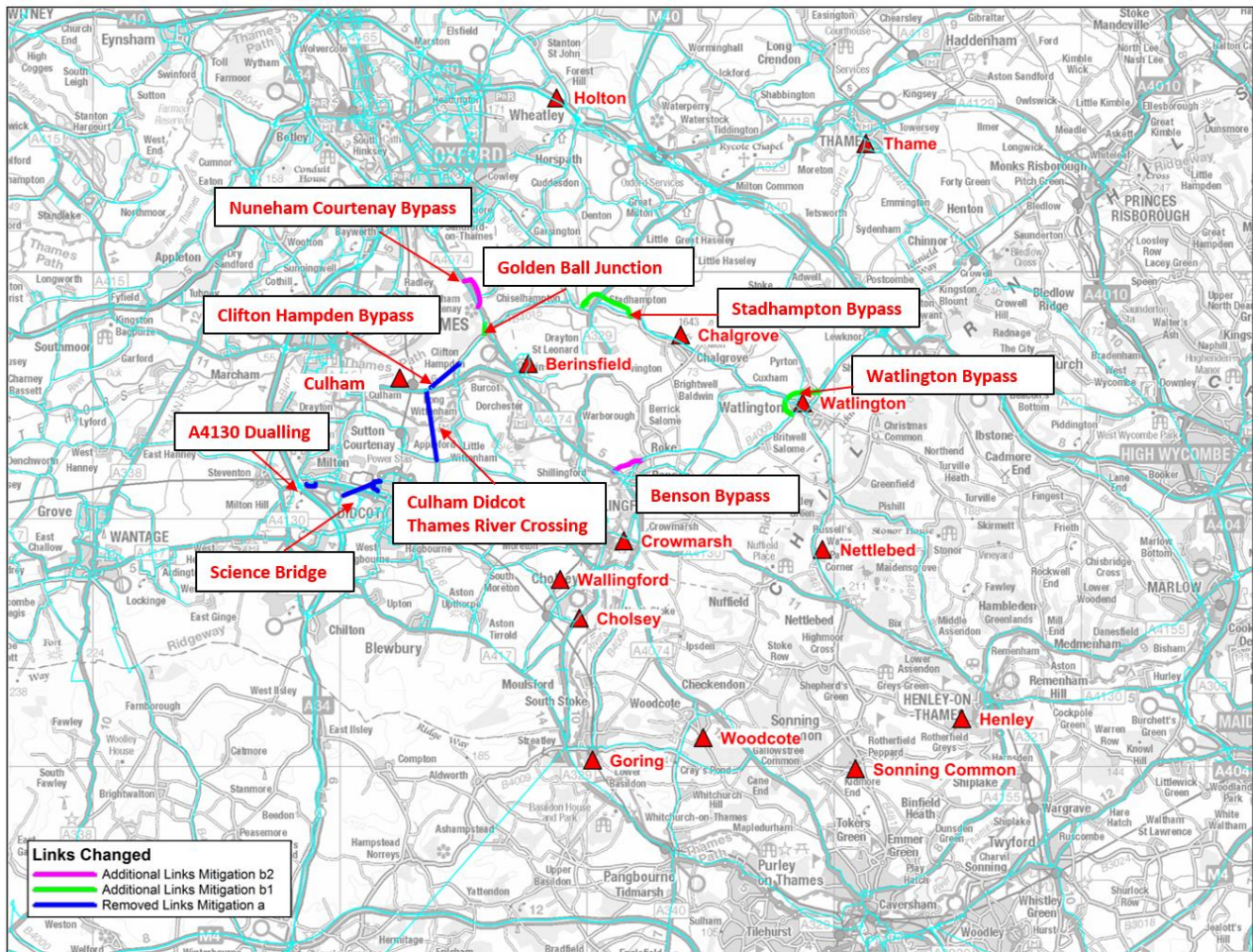
2.6. Transport Network Assumptions

There are no differences between the Reference case (Do Minimum scenario) and the Local Plan scenario test in terms of transport supply assumptions (highway, park and ride and public transport). Whereas, the transport supply assumptions for the Mitigation Scenario (a) change with respect to the removal of non-funded highway schemes from the local plan transport supply network and in Mitigation (b1) and (b2) scenarios with respect to addition of highway schemes to the local plan transport supply network.

The Network changes done for the mitigation scenario are as follows

- Mitigation (a) – Removal of non-funded schemes from Local Plan Scenario
 - Culham to Didcot Thames River Crossing
 - Clifton Hampden Bypass
 - Science Bridge
 - A4130 dualling between Milton Interchange and Science Bridge
- Mitigation (b1) – with non-funded schemes back in (identified under Mitigation (a)) and addition of Highway Mitigation Schemes
 - Stadhampston Bypass
 - Watlington Bypass
 - Roundabout improvement at Golden Balls – includes provision of left turn filter lane at Oxford Road (B4015) approach for northbound vehicles accessing the A4074.
- Mitigation (b2) – Addition of highway mitigation schemes to the Mitigation Scenario (b1)
 - Benson Bypass
 - Nuneham Courtenay Bypass

Figure 4 Development Sites and Highways Schemes Mitigation Locations



3. Demand Model results

This chapter presents the growth in travel demand results for the Base Year 2013 and Forecast Year 2031 and its scenarios.

3.1. Convergence

The convergence of the Demand Model is checked for all scenarios before preparing the results/outputs. WebTAG guidance suggests a convergence level of 0.2 within 25 iterations, which was achieved for the Do Minimum scenario, Local Plan and all the Mitigation scenarios.

3.2. Growth in demand

Table 7 summarises the growth in travel demand between the 2013 Base Year, the 2031 Do Minimum scenario, Local Plan and the Mitigation scenario across the model area. Between the 2013 Base Year and the 2031 Do Minimum scenario, overall travel demand for all districts in Oxfordshire is forecast to grow by 43% over a 12 hour-period. Between the 2031 Do Minimum scenario and the proposed scenarios, overall travel demand is estimated to additionally increase by 2% for Local Plan, Mitigation (a), Mitigation (b1) and Mitigation (b2). The table does not include LGV and HGV demand.

In the Mitigation Scenario (a) compared to the Local Plan, Table 7 shows forecast increase of around 300 total person trips and also increase of around 1500 trips by cars and parallel decrease of around 1600 trips from Public Transport (Bus and Rail). The mode shift from bus and rail to the car suggests that public transport accessibility may need to be considered further as part of the Local Plan.

Table 7 Summary of Demand Model results for the entire model – 12 hour period

Entire model	Base Year (BY)	Do Minimum (DM)	Local Plan (LP)	Mitigation (a) (Ma)	Mitigation (b1) (Mb1)	Mitigation (b2) (Mb2)
Reg car (veh.)	974,474	1,357,920	1,387,528	1,389,059	1,387,536	1,387,558
P&R (veh.)	6,477	8,143	8,195	8,213	8,197	8,204
Bus only (pax)	102,649	135,555	137,048	135,978	136,943	136,941
Rail (pax)	30,238	54,583	57,310	56,789	57,344	57,412
TOTAL (persons)	1,358,105	1,941,287	1,983,710	1,984,020	1,983,669	1,983,771

The car and public transport mode share for all the scenarios are consistent when compared to Do Minimum scenario, since there are no changes to the transport supply with respect to the public transport and the results are presented in Table 8.

Table 8 Mode share – 12 hour period

Entire model	Local Plan(LP)	Mitigation (a) (Ma)	Mitigation (b1) (Mb1)	Mitigation (b2) (Mb2)
Car mode share	90%	90%	90%	90%
PT mode share	10%	10%	10%	10%

Table 9 and Table 10 summarise travel demand across the District. The growth in travel demand between the 2013 base year and the 2031 Do Minimum scenario shows an increase of around 20% for the SODC

area as an origin and destination when considering the trips to/from other districts over a 12-hour period. The growth in travel demand between the 2031 Do Minimum scenario and 2031 Local Plan scenarios shows an additional increase of around 14% for the SODC area.

For the Mitigation Scenario (a) compared to the Local Plan, Table 9 shows forecast reduction of around 1000 total persons trips originating in the South Oxfordshire area and also reduction in car trips (around 450) and bus trips (around 400), and Table 10 shows forecast reduction of around 2000 total person trips destined for South Oxfordshire and also reduction in car trips (around 1300) and bus trips (around 300), suggesting that increased congestion and reduced accessibility in Culham, Didcot and Clifton Hampden area due to removal of mitigation schemes in these areas reduces the trips made in or destined for the South Oxfordshire area.

In the modelling, the trips are constrained to their origins or destinations. The OSM demand model is constrained to trips originating from dwellings (origins), which would include all the trips from the housing developments enabling the impacts from the proposed Local Plan housing developments to be identified.

Table 9 Summary of Demand Model results for SODC - Origins 12 hour

SODC as origin	Base Year (BY)	Do Minimum (DM)	Local Plan (LP)	Mitigation (a) (Ma)	Mitigation (b1) (Mb1)	Mitigation (b2) (Mb2)
Reg car (veh.)	159,453	188,572	214,988	214,546	214,992	214,998
P&R (veh.)	385	480	550	549	549	547
Bus only (pax)	4,185	5,009	5,870	5,469	5,802	5,774
Rail (pax)	3,801	5,003	6,533	6,639	6,548	6,568
TOTAL (persons)	207,726	252,373	288,952	287,989	288,908	288,901

Table 10 Summary of Demand Model results for SODC - Destinations 12 hour

SODC as destination	Base Year (BY)	Do Minimum (DM)	Local Plan (LP)	Mitigation (a) (Ma)	Mitigation (b1) (Mb1)	Mitigation (b2) (Mb2)
Reg car (veh.)	157,434	186,008	211,450	210,177	211,426	211,317
P&R (veh.)	300	381	430	430	430	428
Bus only (pax)	3,526	4,429	5,287	4,973	5,212	5,179
Rail (pax)	3,608	4,862	6,248	6,315	6,252	6,263
TOTAL (persons)	204,257	248,263	283,420	281,355	283,320	283,140

Appendix B provides a summary of demand model results for the entire model and for South Oxfordshire for the morning peak, inter peak and evening peak periods.

4. Do Minimum Highway Network Performance - 2031

4.1. Introduction

Highway network performance is measured in a number of ways: at a high level using network wide statistics and specific statistics and journey times along identified corridors. The metrics used to measure the performance of the highway network are delay (pcu-hours), total time (pcu-hours), total distance (pcu-km) and average speed (km/hr), as defined:

- Delay (pcu-hours) – Delay experienced by the vehicles on the highway network.
- Total Travel Time (pcu-hours) – Total time spent by the vehicles to travel on the highway network.
- Travel Distance (pcu-km) – Total distance travelled by the vehicles on the highway network.
- Overall Average Speed (km/h) – Average speed of the vehicles on the highway network.

Passenger Car Unit (PCU) is representation of the various types of vehicles including cars, LGV (Light Goods Vehicle) and HGV (Heavy Goods Vehicle) into a single class (equivalent to car) in the model. For conversion of cars and LGVs to PCU a unit of 1 was applied and for conversion of HGVs to PCU a unit of 2.3 was applied consistent with previous stages of the modelling work.

In addition, the model can be used to present graphics showing flow on the highway network, and link and junction volume to capacity ratios as well as changes in flow between different scenarios. More detailed analysis of model results has been undertaken along specific corridors within the District and also includes for the A34 corridor outside the District, since it is relevant to study area:

- A40 between Wheatley and M40 Junction 5
- A4074 between Shillingford and the Oxford Eastern By-pass
- B480 between Stadhampton and Watlington
- A329 between Thame and Shillingford
- B4009 between Benson and Chinnor
- A415 between Abingdon and Berinsfield
- A34 between Chilton and Botley

Understanding the impacts of the tested development scenarios on the highway sections covered by these corridors enables an assessment of modelled responses of committed and planned transport infrastructure in relation to increased levels of demand and begins to identify where highway mitigation and infrastructure interventions may need to be considered.

The volume to capacity ratio represents the level of congestion in the network and is represented by the ratio of volume or flow of traffic to the available capacity of the highway network. It is represented in percentages with volume to capacity between 0% - 85 % representing that the network is performing below capacity, between 85% - 95 % representing that the network is performing at operational capacity, and at 95% and above representing that the network is performing above capacity.

The analysis focuses on network performance, where the network is said to be operating:

- at operational capacity (i.e. conditions are such that traffic speed has dropped on links and with traffic flow reaching capacity) with a volume to capacity ratio between 85% and 95%; and
- above capacity (i.e. it is not practically possible for additional traffic to proceed along the link) with a volume to capacity ratio of 95% and above.

Analysis of network performance and performance along relevant corridors has been undertaken to compare the Do Minimum and the development scenarios for the modelled morning and evening peak hours.

4.2. Highway assumptions

Table 11 summarises all the highway schemes that have been included in the Do Minimum scenario as an addition to the Base Year network, and hence assumed to come forward for delivery by 2031.

Table 11 Highway schemes included in the Do Minimum scenario (additional to 2013 Base Year network)

District	Highway scheme description
Cherwell	A41 / Neunkirchen Way roundabout (Rodney House)
Cherwell	A41 Oxford Road / Boundary Way roundabout improvement scheme
Cherwell	Bicester Town Centre changes
Cherwell	M40 J10 Improvements
Cherwell	M40 J9 Phase 2
Cherwell	Oxford Road / Pingle Drive junction
Cherwell	Bucknell Road/A4095 Howes Lane new priority junction
Cherwell	Pioneer Roundabout
Cherwell	Upper Heyford improvement
Cherwell	Updated Bicester SE Perimeter Road as indicated by OCC, Langford Lane is not included in the model for being only a local access
Cherwell	Spine Road Through SE Bicester – modelled at a speed of 40 mph (64 km/h) as indicated by OCC
Cherwell	Upgrade of the SE Segment of the A4421
Cherwell	Improvements to Skimmingdish Lane
Cherwell	Tunnel under the rail line – Howes Lane Realignment and the off-site mitigation at Lords Lane
Cherwell	London Road is not available as a through route in the model to reflect the severe restrictions of the level crossing by 2031
Cherwell	Charbridge Lane – dualled
Cherwell	Banbury schemes (Banbury East of M40 J11 Link Road, Banbury Hennef Way Corridor improvements, Banbury Salt Way, Banbury Bridge Street Junction (and other town centre)) were not modelled as Banbury is just outside the simulation area.
Cherwell	Recent changes to the road design of A40-A44 link to the west of A34
Cherwell	Realignment and signalisation of the A4260/ A4095 junctions as part of the Shipton Quarry permitted use
City	Becket Street extension and new junction with Oxpens Road – New site access and link road through Oxpens site
City	Botley interchange – Capacity improvements on circulatory and approaches
City	Cuttislowe and Wolvercote Roundabouts
City	Eastern Arc
City	Frideswide Square including changes to Beckett Street
City	Hinksey Hill – A423 to A34 southbound
City	Hinksey Hill – Science Transit
City	Kennington Roundabout Improvements
City	The Plain and Longwall Street junction – Signal retiming at Longwall Street and cycle improvements
City	West Way / Botley Road Junction
City	Worcester Street/George Street junction
City	Infrastructure around Northern Gateway, which includes the internal link road open to through traffic, the A40-A44 link and improvements to Peartree Interchange
City	Updated Barton site access and bus link
City	Headington roundabout - phase 1 (completed)

District	Highway scheme description
City	Horspath Driftway (being completed as part of Access to Headington Package)
City	Includes Access to Headington Package.
City	<p>2031 Oxford's transport mitigation packages – in this context, this refers to the latest layout around Northern Gateway development, given that the Do Minimum scenario only included the layout as defined in the spring of 2016. A new layout has been approved in November 2016 and this version will be included in the amended Do Minimum. This new version includes:</p> <ul style="list-style-type: none"> • Updated layout along A40 and A44; • Updated signal timings at Peartree Interchange and Wolvercote Roundabout • Updated layout and signal timings at Cutteslowe Roundabout; • Decrease of penalty on Banbury Road, north of Cutteslowe Roundabout; • Include penalty on Godstow Road to avoid re-routing from A34.
West	A4095/B4022 Staple Hall - Two mini-roundabouts connected by a short connecting link (2014 situation)
West	A415 Ducklington Lane/Station Lane junction improvement - Capacity increase on the Station Lane approach.
West	Brize Norton Village Traffic Calming - Capacity constraint on Minster Road between Elm Grove and Manor Road to reflect link layout change.
West	Downs Road/A40 new junction - At grade roundabout access for Downs Road connecting onto the A40.
West	B4477 Capacity Enhancement through widening (still single carriageway)
West	Straightening of the existing road between the A40 at Minster Lovell south to the roundabout junction north of Brize Norton
West	Includes bus lane eastbound between Eynsham and Duke's Cut Bridge and the related improvements to Eynsham and Cassington junction to accommodate the bus lane
West	Shilton Link Road from B4020 to Elmhurst Way
Vale/South	Harwell Link Road Section 1 (B4493 to A417)
Vale/South	Didcot Northern Perimeter Road Stage 3
Vale/South	Wantage Eastern Link Road (WELR)
Vale/South	A34 Milton Interchange Hamburger
Vale/South	A34 Chilton Northern Slip Roads
Vale/South	Foxhall Bridge Widening
Vale/South	Access to Harwell Section 2 (Hagbourne Hill)
Vale/South	Grove Northern Link Rd
Vale/South	Rowstock Roundabout improvements
Vale/South	Featherbed/Steventon Lights junction improvements
Vale/South	Great Western Park access
Vale/South	Valley Park spine road (A4130 – B4493)
Vale/South	Coding to reflect traffic management measures in villages (Harwell)
Vale/South	Harwell Oxford all access points junction improvements
Vale/South	Improvements to traffic signals at Frilford Junction (A415/A336)
Vale/South	Junctions on A4130
Vale/South	A420 Western Vale infrastructure (Faringdon – access to The Steeds development)
Vale/South	Lodge Hill Interchange (South facing slip roads onto the A34)
Vale/South	Clifton Hampden Bypass
Vale/South	Culham to Didcot Thames River Crossing
Vale/South	Science Bridge modelled with two roundabouts as in the OCC layout & A4130 Capacity Improvements
Vale/South	South Access to Valley Park Spine Road modelled according to the layout provided by Brookbanks (5 arm roundabout).
Vale/South	A420-Highworth Road, Shrivenham

4.3. Park and Ride assumptions

The six proposed peripheral Park and Ride sites were not included in the updated Do Minimum scenario with the exception of Eynsham (OCC, May 2016). The location and accesses of Eynsham P&R site have been provided by WODC when defining the scope of this work. All the existing P&R sites will be kept open and the catchment areas will be the ones defined for the A40 Corridor Study (October 2015).

4.4. Public Transport assumptions

Table 12 and Table 13 summarises all the public transport schemes that have been included in the Do Minimum scenario as an addition to the Base Year network. The details have been provided by OCC.

Table 12 Public Transport Schemes included in the scenarios - Bus

District	Bus scheme description
Cherwell	2 new buses per hour to Banbury via Bankside plus enhancement of service S4 between Deddington and Banbury via main road
Cherwell	Create additional services between Upper Heyford and Bicester, also Upper Heyford with Oxford with an additional frequency of 1 bph for all time periods. (new frequency 2 buses per hour)
Cherwell	Create new bus service from NW Bicester to Bicester Town Centre with a frequency of 6 buses per hour in each direction
Cherwell	Create new bus service between Bicester Town Centre and Oxford going through Graven Hill (using Spine Road Through SE Bicester and Bicester SE Perimeter Road) with a frequency of 2 buses per hour in each direction
Cherwell	Update of the bus service S5 to stop at Graven Hill;
Cherwell	S5 has two additional variants: <ul style="list-style-type: none"> S5a with 2 buses per hour and the following route: Glory Farm – Manorsfield Road – A41 – A34 – Bicester Road – Banbury Road – Headley Way – Brookes University S5b with 2 buses per hour and the following route: Manorsfield Road – Launton Road – Charbridge Lane – South East Bicester link Road – A41 – A34 – Bicester Road – Banbury Road – Oxford (City Centre)
Cherwell	As a consequence of the ban on London Road, all the buses using this segment previously were re-routed via Charbridge Lane.
Cherwell	Route 25A Oxford-Kirtlington-Upper Heyford-Bicester, now operating with a frequency of 2 bph; Remove Route 25 Woodstock-Kirtlington-Wendlebury-Bicester
City/Cherwell	S4 service Banbury-Deddington-Kidlington-Oxford now operating with a frequency of 2 bph
City/Cherwell	Bus service 500 became 4 buses per hour with the following route: Woodstock/Airport P&R – Bladon – Langford Lane – A44 – Water Eaton P&R – Oxford
City/Cherwell	Bus service 700 became 4 buses per hour with the following route: Woodstock/Airport P&R – Bladon – Langford Lane – A44 – Water Eaton P&R – Headington
City	Remove Route 17 Cutteslowe - Oxford
City	Frequency update for services 800 and 900
City	Bus services serving Barton development (re-routing of bus service 8 and new shuttle service between Barton and John Radcliffe Hosp. with a frequency of 2bph);
City	There are 2 new bus stops and a signalised pedestrian crossing on the A4165 (Oxford Road) adjacent to Oxford Parkway rail station. These are served by: <ul style="list-style-type: none"> Service 2 (and all its variations) serve these stops Service S5 (and all its variants) serve these stops Service S4 serves these stops Service 25A served these stops Services 500 and 700 serve both the Park & Ride site and also the stops on the A4165.
City/West	S7 service for Northern Gateway now operating all day with a frequency of 4 bph;
City/West	S2 service now operating with a frequency of 4 bph to serve Eynsham P&R, topped up by an additional 4 buses per hour Eynsham-Wolvercote-Oxford (new service S2a)

District	Bus scheme description
City/West	S1 service now operating via B4044 with a frequency of 4 bph
City/West	Remove Route 18 Oxford-Woodstock Road-A40-Eynsham-Bampton
West	2 buses per hour (Chipping Norton – Banbury) (currently one bus per hour)
Vale/South	Faringdon - Increase 66 service (Swindon-Oxford) to 3 buses/hour
Vale/South	Wallingford - Increase X39 service (Wallingford-Oxford) to 3 buses/hour
Vale/South	Thame - Increase 280 (Thame - Oxford) to 4 buses/hour
Vale/South	2 buses per hour Harwell-Crab Hill-Grove Airfield-Milton Park-Didcot (service 36) plus diversion of 2 buses per hour Wantage-Oxford through site (either x30 or 31)
Vale/South	“North East Didcot, 4 buses per hour to Didcot Town Centre and Station and then 2 of these extended to Milton Park and on to Harwell”
Vale/South	“Valley Park, 2 buses per hour Didcot-Wantage Road-Valley Park-Milton Park plus 2 buses per hour Didcot - main road - Valley Park – Harwell”
Vale/South	“Great Western Park, same pattern as at Valley Park, 4 per hour to Didcot Town Centre, 2 to Milton Park, 2 to Harwell”

Table 13 Public Transport Schemes included in the scenarios - Rail

Line	Rail scheme description
East West Rail	East West Rail comprises four new services:
	• Reading – Bedford with a headway of 60 minutes all day;
	• Reading – Milton Keynes with a headway of 60 minutes all day;
	• Bletchley – Milton Keynes with a headway of 60 minutes all day;
	• Milton Keynes – Marylebone with a headway of 60 minutes all day.
Evergreen 3	Evergreen3 from Chiltern Railway consists in the creation of a new service between Oxford and London Marylebone, with a headway of 30 minutes all day.
North Cotswolds Line	The services inherited from the Base Year have been substituted by the following (for all time periods):
	• Worcester to/from London Paddington – 1 tph
	• Hanborough to/from London Paddington – 1 tph
	• Hanborough to/from Oxford – 1 tph
Culham Station	The following services now stop at Culham and Radley (in all time periods):
	• Reading to/from Bedford – 1 tph
	• Reading to/from Milton Keynes – 1 tph
Oxford to Didcot	Additionally, two more trains per hour stop at Radley and 1 train per hour stops at Appleford (in all time periods).
Didcot Parkway	For the service between Swindon and London Paddington, 1 more train per hour was added to the ones inherited from the Base Year, making a total of 3 tph (only AM and PM).
Henley-on-Thames	Shuttle service between Henley and Twyford with a frequency of 2 tph, allowing the transfer to the services to London and Oxford.
Banbury to Oxford	The direct service between Banbury and London Paddington was substituted by a shuttle between Banbury and Didcot (in AM and PM) and Banbury and Oxford (in IP) with a frequency of 1 tph.
Oxford to Heathrow	A service with 2 tph already exists between Oxford – Didcot Parkway – Reading – Heathrow – London Paddington. Updated journey time.
Oxford - Swindon/Bristol	New regional service between (Nottingham – Loughborough - Leicester – Kettering - Wellingborough -) Bedford – Bletchley – Bicester Village – Oxford Parkway – Oxford – Didcot – Swindon – Chippenham - Bath – Bristol with 1 tph.
Cowley Branch	New service between Bicester and Oxford Retail Park with a frequency of 1 tph. The line and service are coded but not currently used in the PT model as it creates instability.

4.5. Do Minimum Housing Scenario 2031

4.5.1. Network Performance

The modelled highway network performance within the District for the Do Minimum Scenario for 2031 is shown in the Table 14. Comparisons against these statistics will provide a high-level summary of how the model has responded to the changes in land use assumptions associated with the scenarios. As identified during Stage 1, while some of the District is outside the detailed simulation area, these statistics are an average for the District as a whole and include all links (simulation and buffer) and all links (motorways, A-roads, B-roads and minor roads). Hence, the average speed may be higher than expected since the detailed junction modelling is not included in the buffer network.

Table 14 South Oxfordshire District modelled network performance – 2031 Do Minimum

Do Minimum	South Oxfordshire	
	Morning Peak	Evening Peak
Delay (pcu-hr)	518	618
Total Time (pcu-hr)	6039	6689
Total Distance (pcu-km)	375965	406097
Average Speed (km/hr)	62.3	60.7

4.5.2. Corridor Performance

The key corridors for highway network performance are described in Section 4.1. This section describes the corridor performance in the Do Minimum scenario for the morning and evening peak hours based on the volume to capacity ratios on the highway network. The volume-capacity plots are presented for the Do Minimum in Figure 5 and Figure 6.

4.5.2.1. A40

The A40 connects multiple settlements within Oxfordshire; in South Oxfordshire, it connects Oxford, Wheatley, and Tetsworth.

The Do Minimum scenario shows that the A40 is forecast to be operating below operational capacity in the northbound and southbound directions between Wheatley and the M40 Junction for both the morning and evening peak hours.

The eastbound and westbound approaches at Headington roundabout are forecast to be operating above operational capacity.

4.5.2.2. A4074

The A4074 provides one of three north-south routes through the District, in this case between Shillingford and the Oxford Eastern By-pass. The route consists of traffic travelling from / to Oxford, Sandford-on-Thames, Nuneham Courtenay, Berinsfield, Burcot, Dorchester and Shillingford.

The Do Minimum forecast suggests that the A4074 is operating at or above operational capacity in the morning peak hour in the northbound direction between Berinsfield roundabout and the Golden Balls roundabout and above capacity in the northbound direction between Heigh View and Lower Farm Lane, Benson Lane and Church Road, Golden Balls roundabout and Baldon Lane. In the evening peak hour, the Do Minimum modelling suggests that the A4074 is operating at or above operational capacity in the northbound direction between Baldon Lane and Lower Farm and above capacity between the Golden Balls roundabout and Baldon Lane in both directions and between Church Road and Crowmarsh roundabout southbound.

4.5.2.3. B480

The B480 caters for north-south movements between Oxford, Stadhampton, Chalgrove, Cuxham and Watlington.

The Do Minimum forecast shows that the B480 is forecast to be below operational capacity in both morning and evening peak hours.

4.5.2.4. A329

The A329 provides a route between the M40 at Milton Common and the A4074 at Shillingford passing through Little Milton, Stadhampton, Newington and Warborough in the east – west direction.

The Do Minimum morning peak model results suggest that the A329 eastbound is forecast to be at operational capacity at Stadhampton between School Lane and B480/A329 roundabout and above capacity southbound on Milton Road, east of B480/A329 roundabout. In the evening peak, the A329 eastbound is forecast to be above operational capacity at Stadhampton between School Lane and B480/A329 roundabout, at capacity southbound on Milton Road, east of B480/A329 roundabout and above capacity southbound at Thame Road/ A329 at north of Shillingford Roundabout.

4.5.2.5. B4009

The B4009 provides an east-west route through the District between the M40 at Lewknor, Shirburn, Watlington, Britwell Salome and Benson. The Do Minimum results show that the B4009 is forecast to be below operational capacity in both the morning and evening peak hours.

4.5.2.6. A415

The A415 links the A420, A34 and the A4074 and provides an east-west route through the western part of the District between Abingdon-on-Thames, Culham, Clifton Hampden, and Berinsfield.

The Do Minimum results suggest that the A415 is forecast to be above capacity in the morning and evening peak hours westbound between Tollgate Road and Thame Lane and eastbound between A415 / High St and Thame Lane / A415 junctions.

Figure 5 SODC volume-capacity ratio (%) – 2031 DM AM peak hour

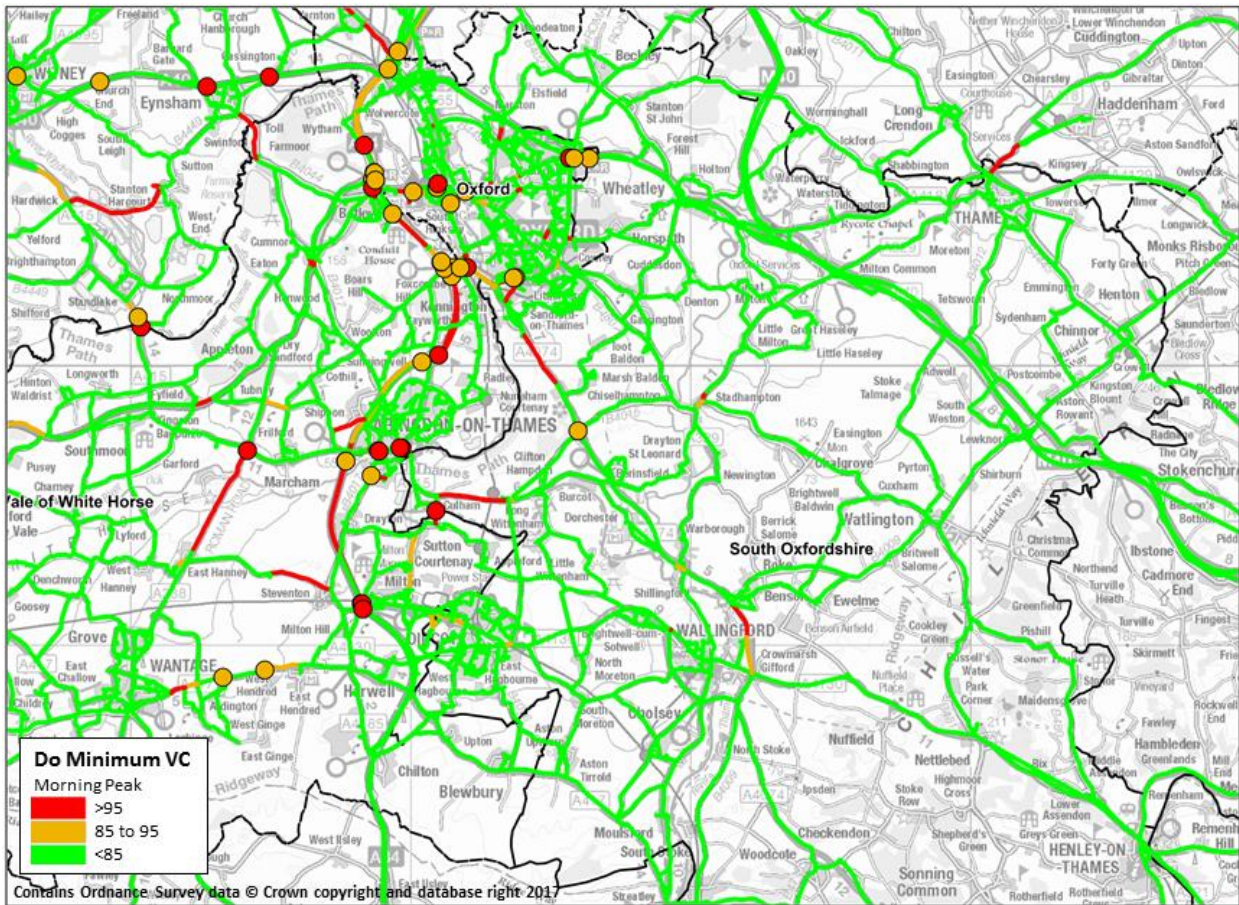
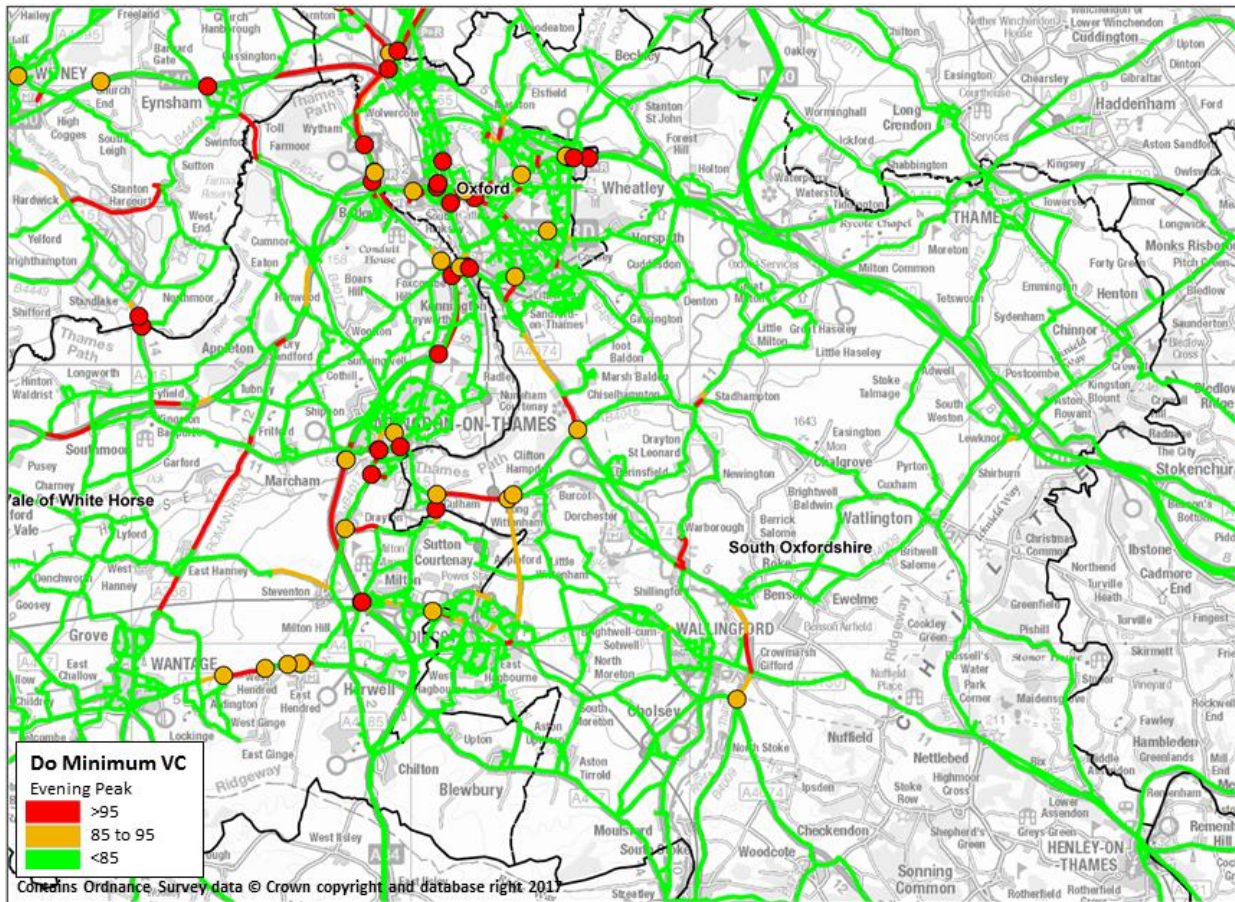


Figure 6 SODC volume-capacity ratio (%) – 2031 DM PM peak hour



5. Local Plan Scenario Highway Network Performance

5.1. Introduction

The highway network performance of the Local Plan scenario is measured using the metrics discussed in section 4.1.

This section presents, for Local Plan scenario, the forecast impact of the development on study corridors and will also describe the modelled changes in flow and volume-capacity ratio between Do Minimum and Local Plan scenario.

5.2. Local Plan

The Local Plan scenario includes the Do Minimum housing scenario as well as the Local Plan housing allocation numbers, including strategic sites (identified under Table 6 section 2.5). In total, the model includes 11301 additional dwellings in Local Plan scenario compared to the Do Minimum scenario.

5.2.1. Network Performance

The modelled highway network performance within the District for the Do Minimum and Local Plan are shown in Table 15 and Table 16. These statistics give a high-level summary of how the model has responded to the changes in land use assumptions.

The trips generated by the additional dwellings are forecast to increase delays, travel times and travel distances within the District during the morning and evening peak hours and have the effect of reducing average speed.

The forecast increase in average delay compared to Do Minimum Scenario during the morning and evening peak would be around 30 seconds per vehicle and 17 seconds per vehicle respectively in the South Oxfordshire District.

Table 15 South Oxfordshire District modelled network performance - morning peak 2031

	South Oxfordshire		
	Do Minimum (DM)	Local Plan (LP)	Difference (LP-DM)
Delay (pcu-hr)	518	961	443
Total Time (pcu-hr)	6039	6815	776
Total Distance (pcu-km)	375965	393554	17589
Average Speed (km/hr)	62.3	57.8	-4.5

Table 16 South Oxfordshire District modelled network performance - evening peak 2031

	South Oxfordshire		
	Do Minimum (DM)	Local Plan (LP)	Difference (LP-DM)
Delay (pcu-hr)	618	951	333
Total Time (pcu-hr)	6689	7398	709
Total Distance (pcu-km)	406097	426439	20342
Average Speed (km/hr)	60.7	57.6	-3.1

5.2.2. Flow Impacts

The forecast flow difference between Local Plan and Do Minimum model across the District is shown in Figure 7 and Figure 8. For the purposes of the report, we focus on changes along the A34, A40, A415, A329, A4074, B480 and B4009 corridors and where relevant will provide commentary on forecast impacts on other links.

The model forecasts show minor changes along the A40 in both the morning and evening peak hours. In the morning peak hours along the M40/A40 corridor, the modelling suggests a slight increase in trips in northbound direction and slight reduction in trips in the southbound direction. In the evening peak hours along the M40/A40 corridor, the model suggests a slight reduction in trips along the M40/A40 corridor. The reduction in trips is likely to be related to some of the traffic moving away from South Oxfordshire to other locations which may be more attractive in transport terms.

In the morning peak hour, the model forecasts suggest an increase in flows along the A415 westbound between the A415 / A4074 junction and the A415 / B4015 junction. In the evening peak hour, there is forecast to be an increase in both directions along the same section of the A415, in the vicinity of the proposed developments at Berinsfield and Culham.

In the evening peak hour, the flow is forecast to decrease along the A329 northbound section between the A329 / B480 roundabout at Stadhampton and the A329 / M40 roundabout. In the morning peak hour and evening peak hour, there is forecast to be some small change in the flow along the A329 section in both directions between the A329 / B480 roundabout and Shillingford roundabout.

In both the morning and evening peak hours, the flow is forecast to increase along the A4074, northbound between Berinsfield roundabout and the Golden Balls Roundabout and southbound between Berinsfield roundabout and Shillingford roundabout.

In both the morning and evening peak hours, the flow is forecast to increase in both directions along the B480 between the A4142 / B480 Cowley Interchange and the B480 / A329 roundabout at Stadhampton and forecast to increase on the B480 section towards B480 / B4009 at Watlington. This increase is likely to be related to the additional dwellings at Chalgrove and Watlington with a similar pattern observed on the B4009 south of Chalgrove.

Figure 7 South Oxfordshire flow difference (LP - DM) (PCU/hr) – 2031 AM peak hour

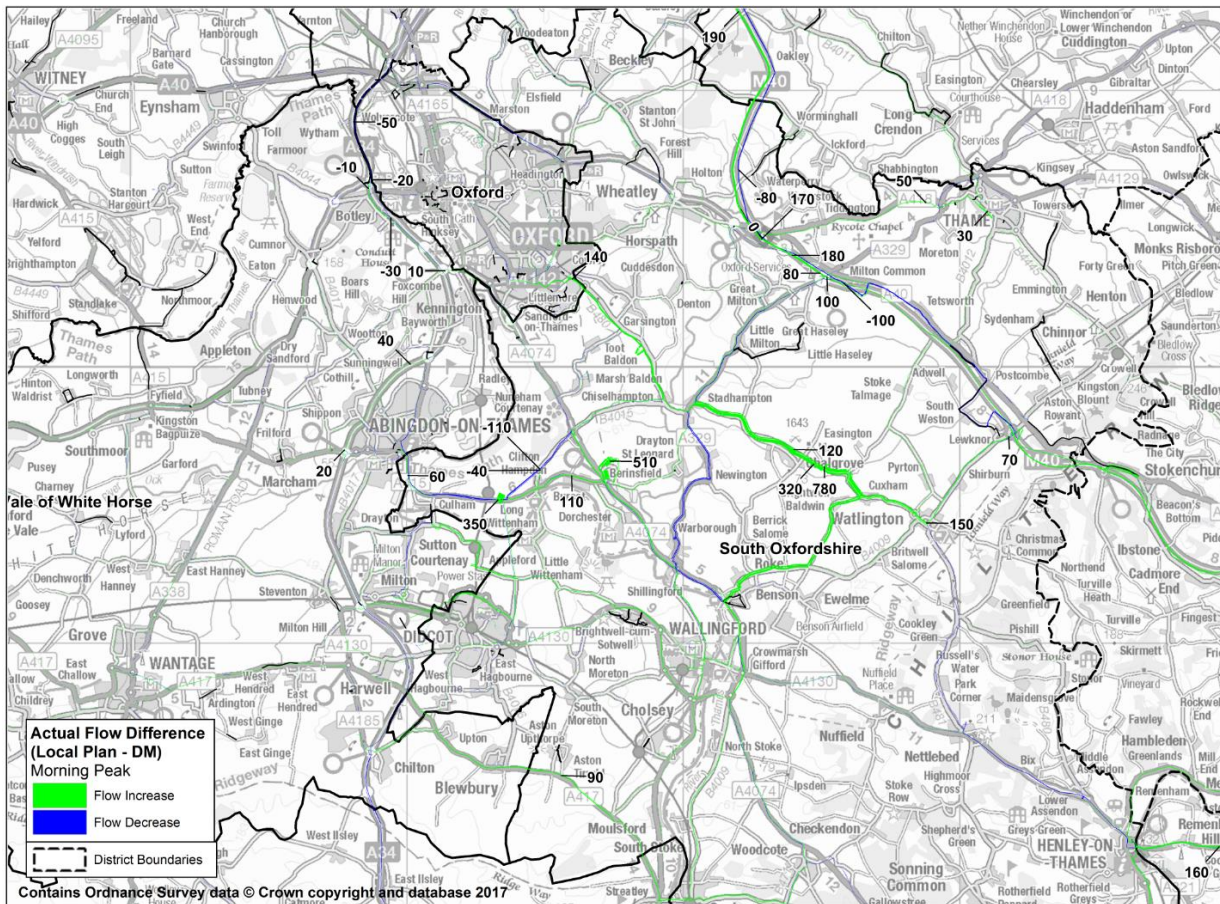
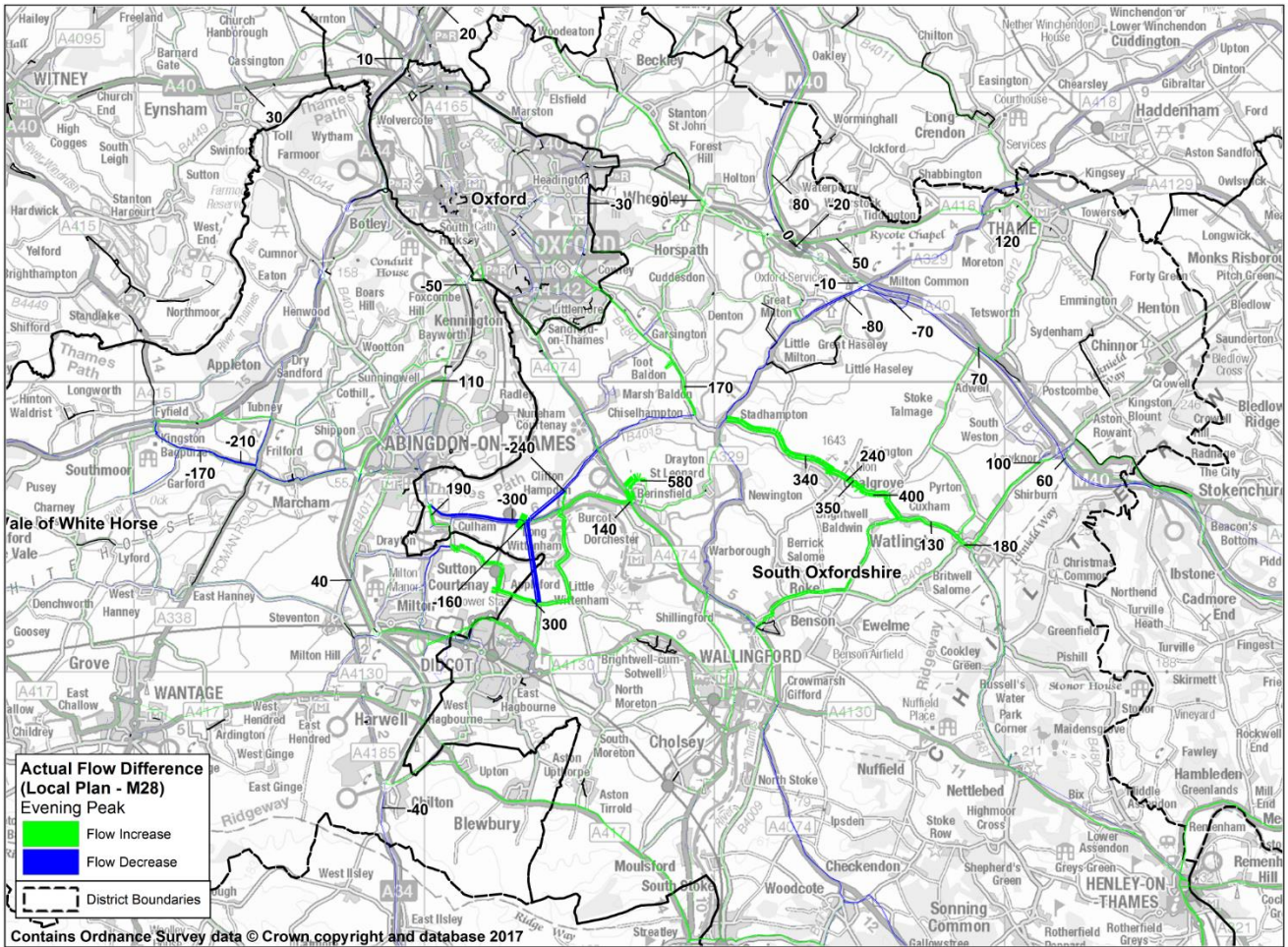


Figure 8 South Oxfordshire flow difference (LP - DM) (PCU/hr) – 2031 PM peak hour



5.2.3. Capacity impacts

The forecast volume to capacity plots for Local Plan across the District are shown in Figure 9 and Figure 10.

In the Local Plan scenario, the forecast shows the following junctions and links along the B480 are over capacity:

- In the morning and evening peak hours, the B480 / A329 roundabout at Stadhampton.
- northbound link between B480/Monument Road junction and B480 / A329 roundabout and between B480/Newington Road junction to B480/ Clifton Hampden Road junctions.

The A415 is forecast to exceed capacity at the following links and junctions:

- In the morning and evening peak hours, the A415 westbound between Tollgate Road and Thame Lane and eastbound between A415 / High Street and Thame Lane / A415 junctions.
- Proposed junction of A415/ Culham Didcot Thames river crossing.

The model forecasts show that the A4074 is forecast to exceed capacity at the following links and junctions:

- In the morning peak hour, A4074 northbound between Berinsfield and Henley Road / A4074 junction, southbound between Warborough Road/A4074 junction to Shillingford roundabout, south and northbound between A4074 / Church Road junction and A4074 / Benson Lane junction, southbound between Benson Lane / A4074 junction and Crowmarsh roundabout.
- The A4074 is operating above operational capacity in the evening peak hour between Benson and Crowmarsh and between Golden Balls roundabout and Baldon Lane and at or above operational capacity between Baldon Lane and Henley Road.
- In the morning and evening peak, Golden Balls roundabout and A4074/ Church Road junction are forecast to be at or above operational capacity.
- In the evening peak, Crowmarsh roundabout, Shillingford roundabout and Benson Lane/A4074 junction are forecast to be at or above operational capacity.

The A329 is forecast to exceed capacity at the following links and junctions:

- In the morning, the A329 northbound between Stadhampton Road and A329 / B480 junction and between Cratlands Close and Thame Road / Milton Road are forecast to be operating at or above capacity.
- In the evening, northbound between Newington Road / B480 Thame Road junction and Milton Road / Thame Road junction are forecast to be at or above capacity. The westbound direction between Sinodun View and Shillingford roundabout are forecast to be operating above capacity.

The A40 is forecast to remain below capacity in both the morning and evening peak hours except:

- The westbound approaches at Headington roundabout are forecast to be above operational capacity and eastbound approaches are forecast to be at or above operational capacity.

The B4009 is forecast to remain below capacity in both the morning and evening peak hours.

Figure 9 South Oxfordshire V/C for links and junctions – 2031 Local Plan AM peak hour

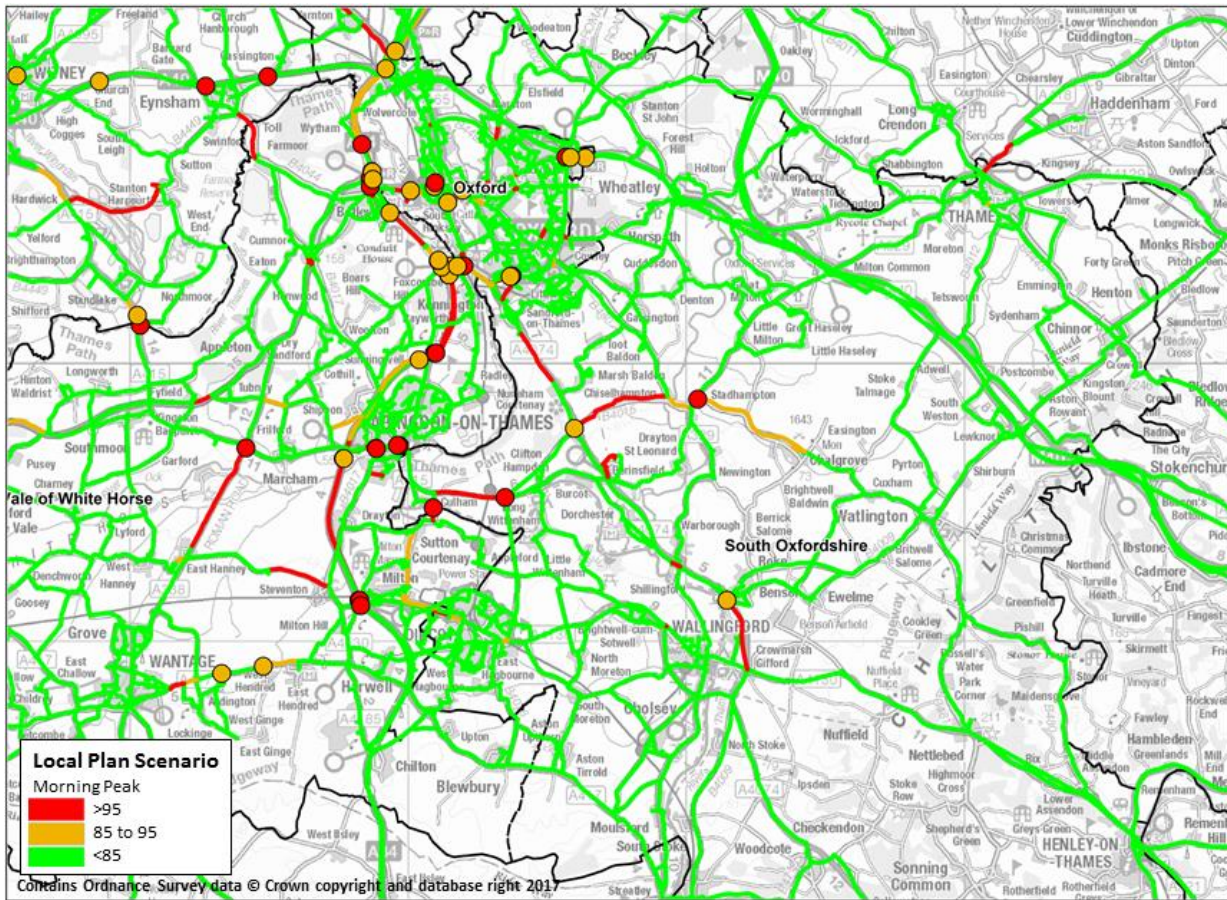
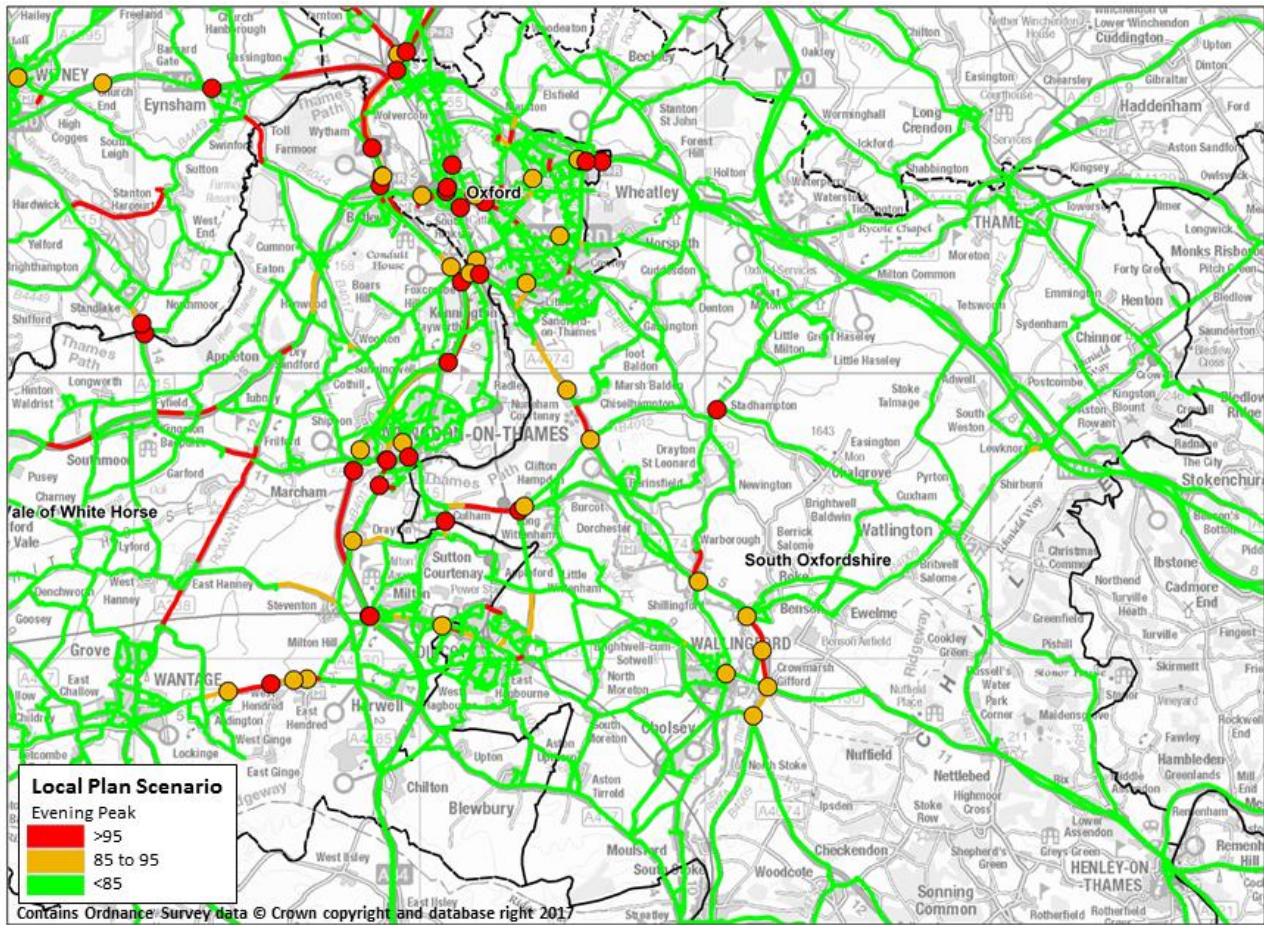


Figure 10 South Oxfordshire V/C for links and junctions – 2031 Local Plan PM peak hour



5.2.4. Corridor Performance

5.2.4.1. A34 Corridor

The A34 corridor lies outside the study area. This corridor is added to the study to provide perspective to the forecast results and understand the variation in flows due to various mitigation measures.

The network performance for Local Plan along the A34 corridor is shown in Table 17 and Table 18 for the morning and evening peak hours respectively. In the morning and evening peak hour, the model forecasts suggest an increase in delay, total time, and the total distance and reduction in average speed.

The forecast increase in average delay compared to Do Minimum Scenario during the morning and evening peak would be around 8 seconds per vehicle and 15 seconds per vehicle respectively.

Table 17 A34 corridor performance in the morning peak hour in 2031

	A34		
	Do Minimum (DM)	Local Plan (LP)	Difference (LP - DM)
Delay (pcu-hr)	633	676	43
Total Time (pcu-hr)	2996	3053	57
Total Distance (pcu-km)	190986	191968	982
Average Speed (km/hr)	63.8	62.9	-0.9

Table 18 A34 corridor performance in the evening peak hour in 2031

	A34		
	Do Minimum (DM)	Local Plan (LP)	Difference (LP - DM)
Delay (pcu-hr)	764	859	95
Total Time (pcu-hr)	3089	3214	125
Total Distance (pcu-km)	190705	192933	2228
Average Speed (km/hr)	61.7	60	-1.7

5.2.4.2. A40 Corridor

The network performance for Local Plan along the A40 corridor is shown in Table 19 and Table 20 for the morning and evening peak hours respectively.

In the morning peak hour, the model forecasts suggest a small increase in delay, total time and total distance and the average speed is forecast to decrease. In the evening peak hour, the delay is forecast to decrease while the travel time, travel distance and average speed are increasing.

The forecast increase in average delay would be around one second per vehicle compared to DM scenario during both morning and evening peak.

Table 19 A40 corridor performance in the morning peak hour in 2031

	A40		
	Do Minimum (DM)	Local Plan (LP)	Difference (LP - DM)
Delay (pcu-hr)	141	148	7
Total Time (pcu-hr)	509	519	10
Total Distance (pcu-km)	26942	27133	191
Average Speed (km/hr)	52.9	52.3	-0.6

Table 20 A40 corridor performance in the evening peak hour in 2031

	A40		
	Do Minimum (DM)	Local Plan (LP)	Difference (LP - DM)
Delay (pcu-hr)	95	94	-1
Total Time (pcu-hr)	518	530	12
Total Distance (pcu-km)	30667	31570	903
Average Speed (km/hr)	59.2	59.5	0.3

5.2.4.3. A415 Corridor

The modelled network performance for Local Plan along the A415 corridor is shown in Table 21 and Table 22 for the morning and evening peak hours respectively.

In both the morning and evening peaks, the increased level of demand generated by the new sites is forecast to result in increased delays and total travel times while the average speed is forecast to decrease. The travel distance is forecast to increase in the morning peak and decrease in the evening peak. The reduction in speeds and increase in delay are higher in the morning peak in comparison with the evening peak, this may be related to peak spreading in the evening peak. The new developments at Culham along A415 and Berinsfield to the east of the A415 corridor are forecast to increase traffic flow on the corridor potentially leading to the forecast increase in delay.

The forecast increase in average delay compared to Do Minimum Scenario during the morning and evening peak would be 3 minutes and 6 seconds per vehicle and 34 seconds per vehicle respectively. This forecast increase in delay maybe associated to a modelled increase in delay at Culham Didcot Thames River crossing junction with A415.

Table 21 A415 corridor performance in the morning peak hour in 2031

	A415		
	Do Minimum (DM)	Local Plan (LP)	Difference (LP - DM)
Delay (pcu-hr)	68	344	276
Total Time (pcu-hr)	214	497	283
Total Distance (pcu-km)	9305	9718	413
Average Speed (km/hr)	43.5	19.6	-23.9

Table 22 A415 corridor performance in the evening peak hour in 2031

	A415		
	Do Minimum (DM)	Local Plan (LP)	Difference (LP - DM)
Delay (pcu-hr)	117	188	72
Total Time (pcu-hr)	278	344	66
Total Distance (pcu-km)	10167	9762	-405
Average Speed (km/hr)	36.6	28.4	-8.2

5.2.4.4. A329 Corridor

The network performance for Local Plan along the A329 corridor is shown in Table 23 and Table 24 for the morning and evening peak hours respectively.

In the morning peak hour, the increased level of demand generated by the new sites is forecast to result in small increase in delays and total time and decrease in travel distance and average speed.

In the evening peak hour, the additional dwellings are forecast to result in an increase in delay and total travel time while the total distance and average speed are decreasing. The model forecasts suggest delays at the Milton Rd / Thame Rd roundabout in Stadhampton which is forecast to lead to a decrease in the performance of the corridor and modelled rerouting of vehicles onto neighbouring roads, as highlighted by a forecast reduction in total distance during the modelled evening peak.

The forecast increase in average delay compared to Do Minimum Scenario during the morning and evening peak would be 7 seconds per vehicle and 29 seconds per vehicle respectively.

Table 23 A329 corridor performance in the morning peak hour in 2031

	A329		
	Do Minimum (DM)	Local Plan (LP)	Difference (LP - DM)
Delay (pcu-hr)	25	41	16
Total Time (pcu-hr)	372	382	10
Total Distance (pcu-km)	24296	23906	-390
Average Speed (km/hr)	65.4	62.5	-2.9

Table 24 A329 corridor performance in the evening peak hour in 2031

	A329		
	Do Minimum (DM)	Local Plan (LP)	Difference (LP - DM)
Delay (pcu-hr)	36	106	70
Total Time (pcu-hr)	386	434	48
Total Distance (pcu-km)	24429	23279	-1150
Average Speed (km/hr)	63.3	53.6	-9.7

5.2.4.5. A4074 Corridor

The network performance for Local Plan along the A4074 corridor is shown in Table 25 and Table 26 for the morning and evening peak hours respectively.

In both the morning and the evening peak hours the delay, total time and total distance are forecast to increase while the average speed is forecast to decrease. The new developments along this corridor are forecast to increase traffic flow on the A4074 leading to a forecast increase in delay along the corridor.

The forecast increase in average delay during the morning and evening peak would be 18 seconds per vehicle and 6 seconds per vehicle respectively, compared to Do Minimum Scenario.

Table 25 A4074 corridor performance in the morning peak hour in 2031

	A4074		
	Do Minimum (DM)	Local Plan (LP)	Difference (LP - DM)
Delay (pcu-hr)	74	121	47
Total Time (pcu-hr)	490	551	61
Total Distance (pcu-km)	25996	26723	727
Average Speed (km/hr)	53	48.5	-4.5

Table 26 A4074 corridor performance in the evening peak hour in 2031

	A4074		
	Do Minimum (DM)	Local Plan (LP)	Difference (LP - DM)
Delay (pcu-hr)	51	69	18
Total Time (pcu-hr)	482	528	46
Total Distance (pcu-km)	26676	28147	1471
Average Speed (km/hr)	55.4	53.3	-2.1

5.2.4.6. B480 Corridor

The modelled network performance for Local Plan scenario along the B480 corridor is shown in Table 27 and Table 28 for the morning and evening peak hours respectively.

In both the morning and evening peaks, the increased level of demand generated by the new sites is forecast to result in increases in delays, travel distance and total travel times while the average speed is forecast to decrease. The new developments along this corridor, specifically at Chalgrove, are forecast to increase traffic flow on the B480 leading to an increase in delay along the corridor.

The forecast increase in average delay during the morning and evening peak would be 45 seconds per vehicle and 3 seconds per vehicle respectively, compared to Do Minimum Scenario.

Table 27 B480 corridor performance in the morning peak hour in 2031

	B480		
	Do Minimum (DM)	Local Plan (LP)	Difference (LP - DM)
Delay (pcu-hr)	2	57	55
Total Time (pcu-hr)	114	237	123
Total Distance (pcu-km)	7350	11830	4480
Average Speed (km/hr)	64.8	49.8	-15.0

Table 28 B480 corridor performance in the evening peak hour in 2031

	B480		
	Do Minimum (DM)	Local Plan (LP)	Difference (LP - DM)
Delay (pcu-hr)	1.8	5.8	4
Total Time (pcu-hr)	96	192	96
Total Distance (pcu-km)	6345	12256	5911
Average Speed (km/hr)	66.3	63.8	-2.5

5.2.4.7. B4009 Corridor

The network performance for Local Plan along the B4009 corridor is shown in Table 29 and Table 30 for the morning and evening peak hours respectively.

In both morning and evening peak hours, the model forecasts suggest an increase in delay, total travel time and total distance while the average speed is forecast to decrease. The differences presented are greater in the evening peak in comparison with the morning peak.

The forecasts show there are not likely to be increases in delay per vehicle during the Local Plan Scenario compared to the Do Minimum Scenario but the increase in total delay in pcu-hr can be attributed to the higher number of vehicles passing through the corridor for Local Plan Scenario compared to the Do Minimum. The increase in average delay during the evening peak is forecast to be 6 seconds per vehicle compared to Do Minimum Scenario.

Table 29 B4009 corridor performance in the morning peak hour in 2031

	B4009		
	Do Minimum (DM)	Local Plan (LP)	Difference (LP - DM)
Delay (pcu-hr)	5.3	6.0	1
Total Time (pcu-hr)	271	306	35
Total Distance (pcu-km)	16607	18458	1851
Average Speed (km/hr)	61.3	60.3	-1

Table 30 B4009 corridor performance in the evening peak hour in 2031

	B4009		
	Do Minimum (DM)	Local Plan (LP)	Difference (LP - DM)
Delay (pcu-hr)	45	68	23
Total Time (pcu-hr)	336	404	68
Total Distance (pcu-km)	17265	19854	2589
Average Speed (km/hr)	51.5	49.1	-2.4

6. Mitigation Scenarios Highway Network Performance

6.1. Introduction

The highway network performance of the different scenarios is measured using the metrics discussed in section 4.1.

This section presents, for each mitigation scenario, the forecast impact of the development on those corridors and will also describe the modelled changes in flow and volume-capacity ratio between different scenarios compared to the Local Plan Scenario.

6.2. Mitigation (a)

Mitigation (a) includes the land use assumptions as considered under the Local Plan Scenario, the highway network changes are the removal of the following non-funded schemes:

- Culham to Didcot Thames River Crossing
- Clifton Hampden Bypass
- Science Bridge
- A4130 dualling between Milton Interchange and Science Bridge

6.2.1. Network Performance

The modelled highway network performance within the District for the Local Plan and the Mitigation (a) are shown in the Table 31 and Table 32 These statistics give a high-level summary of how the model has responded to the changes in highway network.

Highway network performance is forecast to reduce the delays, travel times and travel distances with minimal increase in speed within the District during the morning peak hour and increase delay and reduce travel times, travel distances and speed during evening peak hours.

This reduction in network performance parameters can be attributed to the traffic using alternative routes outside the District. In the morning peak, flow is forecast to increase along the A34 corridor, which serves as a more attractive route when the non-funded schemes are excluded – it is likely that the A34 experiences increased delay, whereas delay within the District is forecast to reduce. In the evening peak, vehicles are forecast to use a parallel route within the District when the non-funded schemes are removed, which in turn sees an increase in delay.

The forecast reduction in average delay during the morning peak would be around 4 seconds per vehicle and increase in average delay of 6 seconds per vehicle during evening peak in the South Oxfordshire District, compared to Local Plan Scenario.

Table 31 South Oxfordshire District modelled network performance - morning peak 2031

	South Oxfordshire		
	Local Plan (LP)	Mitigation (a) (Ma)	Difference (Ma-LP)
Delay (pcu-hr)	961	906	-55
Total Time (pcu-hr)	6815	6683	-132
Total Distance (pcu-km)	393554	387763	-5791
Average Speed (km/hr)	57.8	58.0	0.2

Table 32 South Oxfordshire District modelled network performance - evening peak 2031

	South Oxfordshire		
	Local Plan (LP)	Mitigation (a) (Ma)	Difference (Ma-LP)
Delay (pcu-hr)	951	1044	93
Total Time (pcu-hr)	7398	7344	-54
Total Distance (pcu-km)	426439	420490	-5949
Average Speed (km/hr)	57.6	57.3	-0.3

6.2.2. Flow Impacts

The forecast flow difference between Mitigation (a) and Local Plan modelled across the District is shown in Figure 11 and Figure 12. For the purposes of the report, we focus on changes along the A34, A40, A415, A329, A4074, B480 and B4009 corridors and where relevant will provide commentary on forecast impacts on other links.

The model forecasts show minor changes along the A40 in both the morning and evening peak hours. There are likely to be minor reductions in flow in the evening peak hour on the B480 southbound from A4142/ B480 to B480/ A329 junction.

In both the morning and evening peak hour, the model forecasts suggest an increase in flows along the A415 westbound between the A415 / A4074 junction and the A415 / B4015 (Oxford Road) junction. The flow is forecast to decrease along B4015 and A415 eastbound between A415/ High Street and the A415 / Station Road junction when Culham Didcot Thames river crossing is not part of the network.

In the evening peak hour, the flow is forecast to decrease along the A329 northbound section between the A329 / B480 roundabout at Stadhampton and the A329 / M40 roundabout. In the morning peak hour and evening peak hour, there are forecast to be some small changes in the flow along the A329 section in both directions between the A329 / B480 roundabout and Shillingford roundabout.

In both the morning and evening peak hours, the flow is forecast to increase along the A4074, northbound between Berinsfield roundabout and the Golden Balls Roundabout and flow decreases along A4074 northbound between Golden Balls Roundabout and Heyford Hill Roundabout are modelled.

There are likely to be minor increases in flow along A329 eastbound from Elm Bridge Roundabout to M40/ A329 junction.

In both the morning and evening peak hour, the model forecast suggests an increase in flows along the A34 corridor (Figure 11 and Figure 12). The forecast increase in flow along the A34 corridor is likely to be due to the removal of schemes in the Culham, Clifton Hampden and Didcot area and vehicle trips transferring to the parallel adjacent route of the A34.

Figure 11 South Oxfordshire flow difference (Mitigation (a) – Local Plan) (PCU/hr) – 2031 AM peak hour

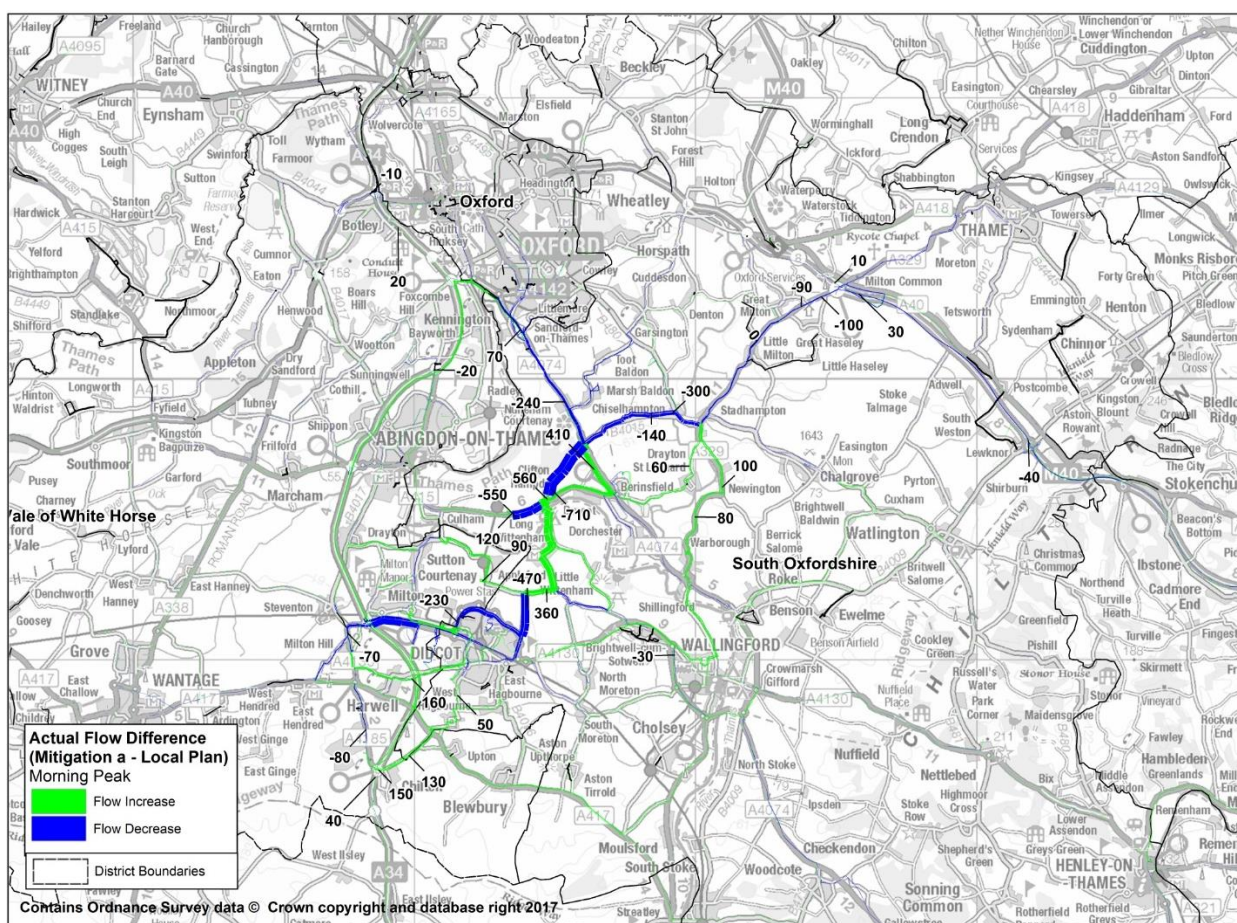
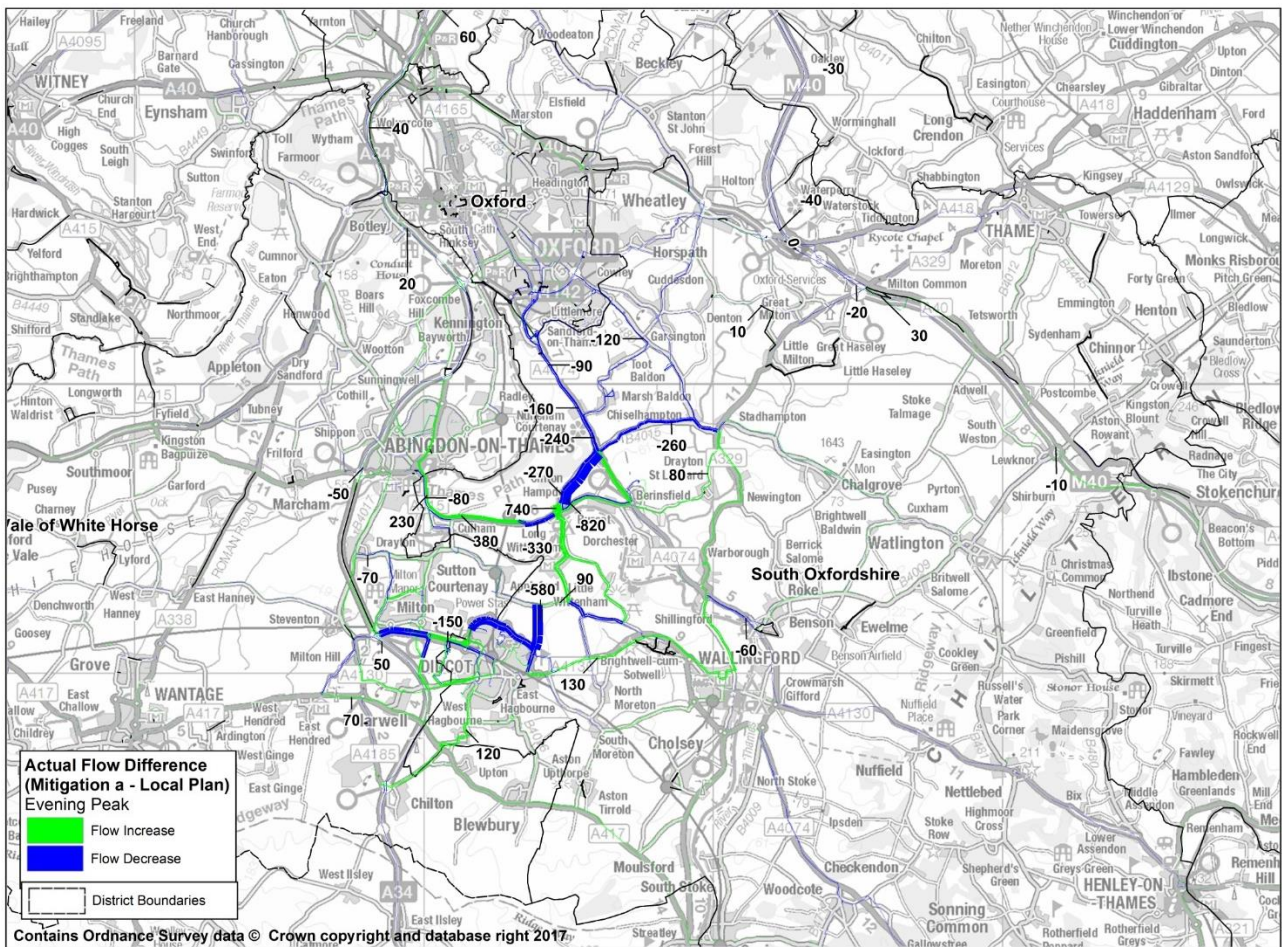


Figure 12 South Oxfordshire flow difference (Mitigation (a) – Local Plan) (PCU/hr) – 2031 PM peak hour



6.2.3. Capacity impacts

The forecast volume to capacity plots for Mitigation (a) across the District are shown in Figure 13 and Figure 14.

In Mitigation (a), the B480 is forecast to remain below capacity in both morning and evening peak hours.

The A415 is forecast to exceed capacity at the following links and junctions:

- In the morning peak, the A415 westbound between Tollgate Road and Thame Lane and eastbound between A415 / High Street and junction of A415/ High Street and junction of A415/ Oxford Road are forecast to be operating at or above capacity.
- In the morning and evening peak, the A415 eastbound between A415 / High Street and Berinsfield roundabout is forecast to be operating above capacity.

The model forecasts suggest that the A4074 exceeds capacity at the following approaches:

- In the morning peak hour, A4074 northbound between Berinsfield and Henley Road / A4074 junction, southbound between Warborough Road/A4074 junction to Shillingford roundabout, south and northbound between A4074 / Church Road junction and A4074 / Benson Lane junction, southbound between Benson Lane / A4074 junction and Crowmarsh roundabout.
- The A4074 is above operational capacity in the evening peak hour in the between Benson and Crowmarsh and between Golden Balls roundabout and Baldon Lane and at or above operational capacity between Baldon Lane and Henley Road.
- A4074 / Church Road junction in the morning and evening peak hour, and Crowmarsh roundabout, Shillingford roundabout in the evening peak are forecast to be at or above operational capacity.

The A329 is forecast to exceed capacity at the following links and junctions:

- In the morning and evening peak hour, the A329 in a northbound direction between Stadhampton Road and the A329 / B480 junction and between Cratlands Close and Thame Road / Milton Road are forecast to be operating at or above capacity.
- In the evening peak hour, A329 southbound between Sinodun View and Shillingford roundabout is forecast to be operating at or above capacity.

The A40 is forecast to remain below capacity in both the morning and evening peak hours except:

- On the westbound approaches at Headington roundabout which are forecast to be operating above operational capacity and eastbound approaches are forecast to be at or above operational capacity.

The B4009 is forecast to remain below capacity in both morning and evening peak hours.

The A34 corridor is operating at or below capacity in both the morning and evening peak hours except at the following locations where it is forecast to operate at above capacity:

- In the morning peak, northbound off slip to A44 junction and on/off slip Westminster Way.
- In the morning peak, the link between Marcham Road and where it intersects the B4017, Hinksey Hill/ Southern By-Pass Road to Oxford Road and Westminster Way to Hinksey Hill.
- In the evening peak, the link between Marcham Road and where it intersects the B4017.

Figure 13 South Oxfordshire V/C for links and junctions – 2031 Mitigation (a) AM peak hour

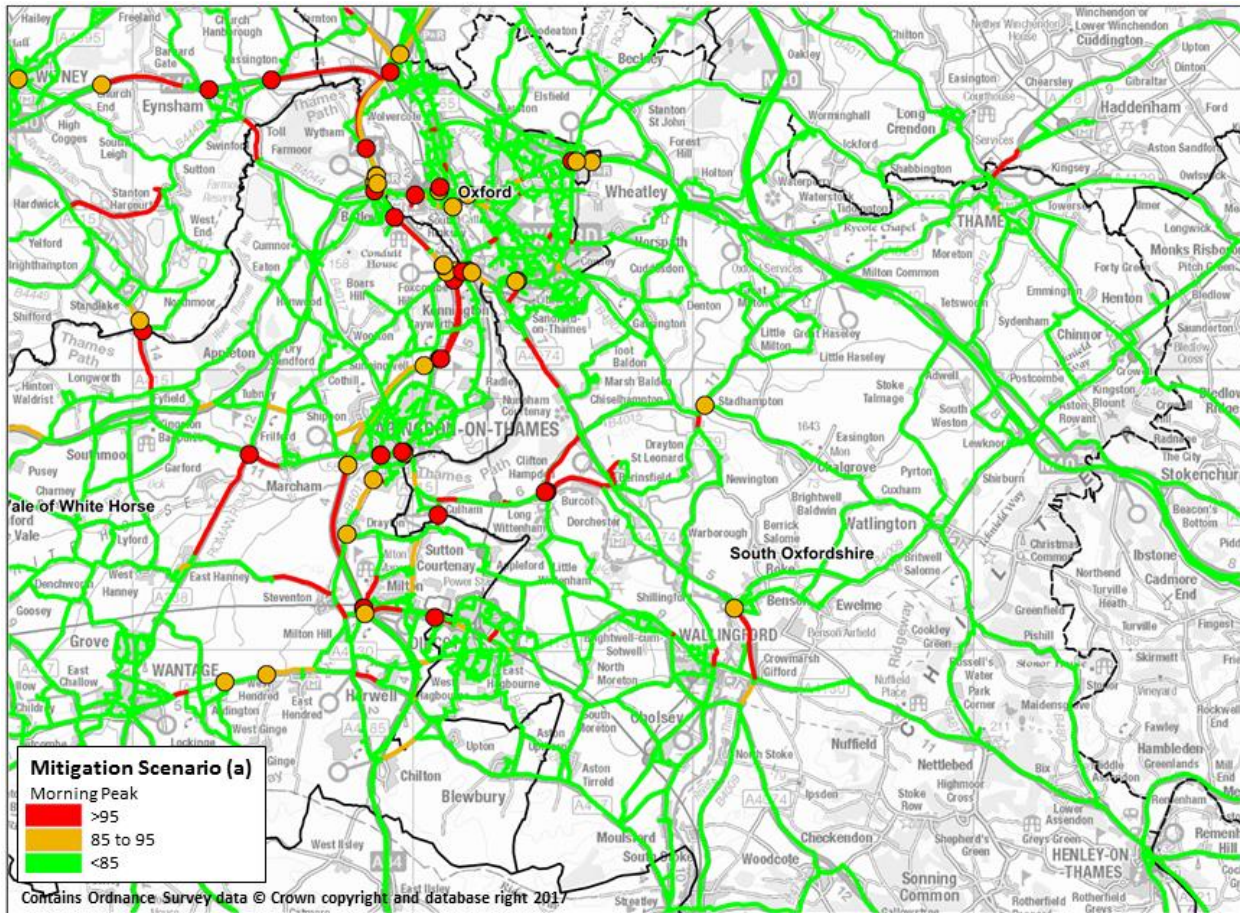
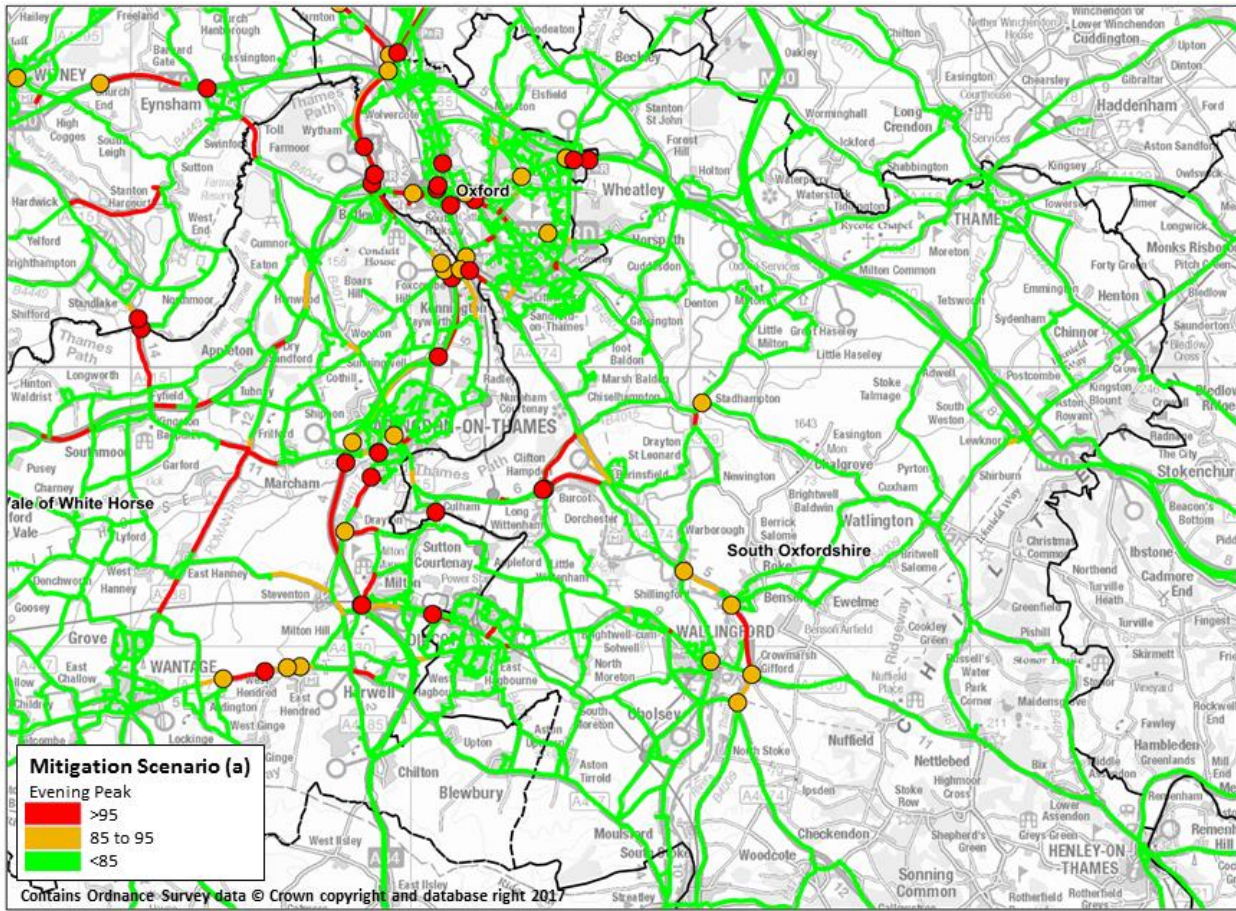


Figure 14 South Oxfordshire V/C for links and junctions – 2031 Mitigation (a) PM peak hour



6.2.4. Corridor Performance

6.2.4.1. A34 Corridor

The network performance for Mitigation (a) along the A34 corridor is shown in Table 33 and Table 34 for the morning and evening peak hours respectively.

In the morning peak hour, the model forecasts suggest an increase in delay, total time and the total distance and the average speed is forecast to decrease. In the evening peak hour, the model forecast suggests increase in delay, travel time, and travel distance, and reduction in average speed.

The forecast increase in average delay compared to Local Plan Scenario during the morning and evening peak would be around 4 seconds per vehicle and 15 seconds per vehicle respectively. It should be noted that around 200 pcus are forecast be added to this corridor during morning peak and around 100 pcus are modelled to be added to this corridor during evening peak indicating the vehicles are forecast to shift to the A34 corridor due to the changes in the network.

Table 33 A34 corridor performance in the morning peak hour in 2031

	A34		
	Local Plan (LP)	Mitigation (a) (Ma)	Difference (Ma – LP)
Delay (pcu-hr)	676	735	59
Total Time (pcu-hr)	3053	3329	276
Total Distance (pcu-km)	191968	202498	10530
Average Speed (km/hr)	62.9	60.8	-2.1

Table 34 A34 corridor performance in the evening peak hour in 2031

	A40		
	Local Plan (LP)	Mitigation (a) (Ma)	Difference (Ma – LP)
Delay (pcu-hr)	859	1034	175
Total Time (pcu-hr)	3214	3597	383
Total Distance (pcu-km)	192933	202671	9738
Average Speed (km/hr)	60	56.3	-3.7

6.2.4.2. A40 Corridor

The network performance for Mitigation (a) along the A40 corridor is shown in Table 35 and Table 36 for the morning and evening peak hours respectively.

The forecast changes to the network negligible impact during the morning and evening peak hour compared to the Local Plan Scenario, since the changes to the network lie near to the Culham and Didcot.

Table 35 A40 corridor performance in the morning peak hour in 2031

	A40		
	Local Plan (LP)	Mitigation (a) (Ma)	Difference (Ma – LP)
Delay (pcu-hr)	148	148	0
Total Time (pcu-hr)	519	519	0
Total Distance (pcu-km)	27133	27141	8
Average Speed (km/hr)	52.3	52.3	0.0

Table 36 A40 corridor performance in the evening peak hour in 2031

	A40		
	Local Plan (LP)	Mitigation (a) (Ma)	Difference (Ma – LP)
Delay (pcu-hr)	94	95	1
Total Time (pcu-hr)	530	531	1
Total Distance (pcu-km)	31570	31522	-48
Average Speed (km/hr)	59.5	59.4	-0.1

6.2.4.3. A415 Corridor

The modelled network performance for Mitigation (a) along the A415 corridor is shown in Table 37 and Table 38 for the morning and evening peak hours respectively.

In the morning peak, the delay and travel time is forecast to decrease along the corridor whereas the total distance and average speed are modelled to increase. In the evening peak, the forecasts suggest increased delays, travel distance and total travel times while the average speed is forecast to decrease. The new developments at Culham, along the A415 corridor, are forecast to increase traffic flow on the corridor which is likely to result in an increase in delay during the evening peak.

The decrease in delay during the morning peak can be attributed to the traffic choosing the alternative routes.

The forecast average delay per vehicle compared to Local Plan Scenario during the morning peak would decrease by around 2 seconds per vehicle. In the evening peak, it is forecast to increase by an average of around one minute and 30 seconds per vehicle. It should be noted that a reduction in vehicle flow of around 550 pcus and 350 pcus is forecast along this corridor during the morning peak and evening peak respectively indicating that vehicles may shift to alternative routes due to the changes in the network.

Table 37 A415 corridor performance in the morning peak hour in 2031

	A415		
	Local Plan (LP)	Mitigation (a) (Ma)	Difference (Ma – LP)
Delay (pcu-hr)	344	295	-49
Total Time (pcu-hr)	497	491	-6
Total Distance (pcu-km)	9718	12164	2446
Average Speed (km/hr)	19.6	24.8	5.2

Table 38 A415 corridor performance in the evening peak hour in 2031

	A415		
	Local Plan (LP)	Mitigation (a) (Ma)	Difference (Ma – LP)
Delay (pcu-hr)	188	263	75
Total Time (pcu-hr)	344	477	133
Total Distance (pcu-km)	9762	13168	3406
Average Speed (km/hr)	28.4	27.6	-0.8

6.2.4.4. A329 Corridor

The network performance for Mitigation (a) along the A329 corridor is shown in Table 39 and Table 40 for the morning and evening peak hours respectively.

In the morning peak hour, the model forecasts suggest a decrease in delay, total travel time and total distance, while the average speed is forecast to increase. In the evening peak hour, the model forecasts suggest a decrease in delay and total travel time, and increase in total distance and average speed.

The forecast decrease in average delay during the morning and evening peak would be 3 seconds per vehicle and 12 seconds per vehicle respectively, compared to Local Plan Scenario.

Table 39 A329 corridor performance in the morning peak hour in 2031

	A329		
	Local Plan (LP)	Mitigation (a) (Ma)	Difference (Ma – LP)
Delay (pcu-hr)	41	35	-6
Total Time (pcu-hr)	382	371	-11
Total Distance (pcu-km)	23906	23791	-115
Average Speed (km/hr)	62.5	64.1	1.6

Table 40 A329 corridor performance in the evening peak hour in 2031

	A329		
	Local Plan (LP)	Mitigation (a) (Ma)	Difference (Ma – LP)
Delay (pcu-hr)	106	76	-30
Total Time (pcu-hr)	434	413	-21
Total Distance (pcu-km)	23279	23832	553
Average Speed (km/hr)	53.6	57.7	4.1

6.2.4.5. A4074 Corridor

The modelled network performance for Mitigation (a) along the A4074 corridor is shown in Table 41 and Table 42 for the morning and evening peak hours respectively.

In the morning peak, the delay increases whereas travel time, total distance and average speed decreases along the corridor. In the evening peak, the forecast suggests no changes to delays but decrease in total time and total distance, and increase in average speed.

The forecast increases in average delay per vehicle compared to Local Plan Scenario during the morning and evening peak would be around 20 seconds per vehicle and 11 seconds per vehicle respectively.

Table 41 A4074 corridor performance in the morning peak hour in 2031

	A4074		
	Local Plan (LP)	Mitigation (a) (Ma)	Difference (Ma – LP)
Delay (pcu-hr)	121	122	1
Total Time (pcu-hr)	551	537	-14
Total Distance (pcu-km)	26723	25803	-920
Average Speed (km/hr)	48.5	48	-0.5

Table 42 A4074 corridor performance in the evening peak hour in 2031

	A4074		
	Local Plan (LP)	Mitigation (a) (Ma)	Difference (Ma – LP)
Delay (pcu-hr)	69	69	0
Total Time (pcu-hr)	528	495	-33
Total Distance (pcu-km)	28147	26906	-1241
Average Speed (km/hr)	53.3	54.4	1.1

6.2.4.6. B480 Corridor

The modelled network performance for Mitigation (a) along the B480 corridor is shown in Table 43 and Table 44 for the morning and evening peak hours respectively.

In the morning peak, the forecast delay and travel time reduces whereas the total distance and speed increases. In the evening peak, no change in delay is forecast, whereas the travel time and distance increase and average speed is predicted to decrease.

The forecast delay per vehicle during the morning peak reduces by around 5 seconds per vehicle but during the evening peak there is likely to be no change to the delay per vehicle compared to the Local Plan scenario.

Table 43 B480 corridor performance in the morning peak hour in 2031

	B480		
	Local Plan (LP)	Mitigation (a) (Ma)	Difference (Ma – LP)
Delay (pcu-hr)	57	50	-7
Total Time (pcu-hr)	237	232	-5
Total Distance (pcu-km)	11830	11890	60
Average Speed (km/hr)	49.8	51.4	1.6

Table 44 B480 corridor performance in the evening peak hour in 2031

	B480		
	Local Plan (LP)	Mitigation (a) (Ma)	Difference (Ma – LP)
Delay (pcu-hr)	6	6	0
Total Time (pcu-hr)	192	195	3
Total Distance (pcu-km)	12256	12424	168
Average Speed (km/hr)	63.8	63.7	-0.1

6.2.4.7. B4009 Corridor

The modelled network performance for Mitigation (a) along the B4009 corridor is shown in Table 45 and Table 46 for the morning and evening peak hours respectively.

During the morning and evening peak hours, changes to network performance are forecast to be negligible compared to the Local Plan Scenario.

Table 45 B4009 corridor performance in the morning peak hour in 2031

	B4009		
	Local Plan (LP)	Mitigation (a)(Ma)	Difference (Ma – LP)
Delay (pcu-hr)	6	6	0
Total Time (pcu-hr)	306	312	6
Total Distance (pcu-km)	18458	18805	347
Average Speed (km/hr)	60.3	60.4	0.1

Table 46 B4009 corridor performance in the evening peak hour in 2031

	B4009		
	Local Plan (LP)	Mitigation (a) (Ma)	Difference (Ma – LP)
Delay (pcu-hr)	68	70	2
Total Time (pcu-hr)	404	410	6
Total Distance (pcu-km)	19854	20095	241
Average Speed (km/hr)	49.1	49	-0.1

6.3. Mitigation (b1)

Mitigation (b1) includes the land use assumptions as considered under the Local Plan Scenario and network mitigation being non-funded schemes included (as identified under Mitigation (a)) and the addition of the following Highway Mitigation Schemes:

- Stadhampton Bypass
- Watlington Bypass
- Roundabout improvement at Golden Balls roundabout – includes provision of left turn filter lane at Oxford Road (B4015) approach for northbound vehicles accessing the A4074.

6.3.1. Network Performance

The modelled highway network performance within the District for the Local Plan and the Mitigation (b1) are shown in the Table 47 and Table 48.

These statistics give a high-level summary of how the model has responded to the changes in land use assumptions and network changes.

The changes in highway network are forecast to reduce the delays, travel times and travel distances with minimal decrease in speed within the District during the morning peak hour and decrease in delay and travel times, and increase in travel distances and speed during the evening peak hour.

This improvement in network performance parameters can be attributed to the additional mitigation schemes added within the District.

The reduction in average delay is forecast to be around 2 seconds per vehicle and 6 seconds per vehicle during morning peak and evening peak hours respectively, in the South Oxfordshire District, compared to Local Plan Scenario.

Table 47 South Oxfordshire District modelled network performance - morning peak 2031

	South Oxfordshire		
	Local Plan (LP)	Mitigation (b1) (Mb1)	Difference (Mb1 - LP)
Delay (pcu-hr)	961	936	-25
Total Time (pcu-hr)	6815	6795.6	-19
Total Distance (pcu-km)	393554	391964	-1590
Average Speed (km/hr)	57.8	57.7	-0.1

Table 48 South Oxfordshire District modelled network performance - evening peak 2031

	South Oxfordshire		
	Local Plan (LP)	Mitigation (b1) (Mb1)	Difference (Mb1 - LP)
Delay (pcu-hr)	951	844	-107
Total Time (pcu-hr)	7398	7368	-30
Total Distance (pcu-km)	426439	427628	1189
Average Speed (km/hr)	57.6	58	0.4

6.3.2. Flow Impacts

The forecast flow difference between Mitigation (b1) and Local Plan modelled across the District is shown in Figure 15 and Figure 16. For the purposes of the report, we focus on changes along the A34, A40, A415, A329, A4074, B480 and B4009 corridors and where relevant will provide commentary on forecast impacts on other links.

The model forecasts show minor changes along the A40 in both the morning and evening peak hours. In the morning peak hour along the M40/A40 corridor, the modelling suggests a slight increase in trips. In the evening peak hour along the M40/A40 corridor, the model suggests a slight reduction in trips along the M40/A40 corridor. This is likely to be related to the incorporation of the Stadhampton and Watlington bypasses on the B480, with a certain percentage of traffic potentially diverted from the M40.

The Stadhampton and Watlington bypasses show significant reduction in volume of through traffic in the Stadhampton and Watlington residential area.

In the morning peak hour, the model forecasts suggest decreases in flows along A415 eastbound between the A415 / Clifton Hampden Bypass junction and the A A415 / A4074 junction. In the evening peak, the model forecasts suggest a decrease in flows along A415 between A415/Tollgate Road junction and the A A415 / A4074 junction. There is likely to be an increase in flow along Clifton Hampden bypass and through Golden Balls roundabout in the morning and evening peak hours.

In the evening peak hour, the flow is forecast to increase along the A329 northbound and southbound section between the Shillingford roundabout and the A329 / M40 roundabout.

In the morning peak hour, the flow is forecast to decrease along the A4074, southbound and northbound between Golden Balls roundabout and the Shillingford roundabout.

Actual flow along B4009 is forecast to decrease in morning and evening peak hour between Elm Bridge Roundabout to B4009/M40 junction.

Figure 15 South Oxfordshire flow difference (Mitigation b1 – Local Plan) (PCU/hr) – 2031 AM peak hour

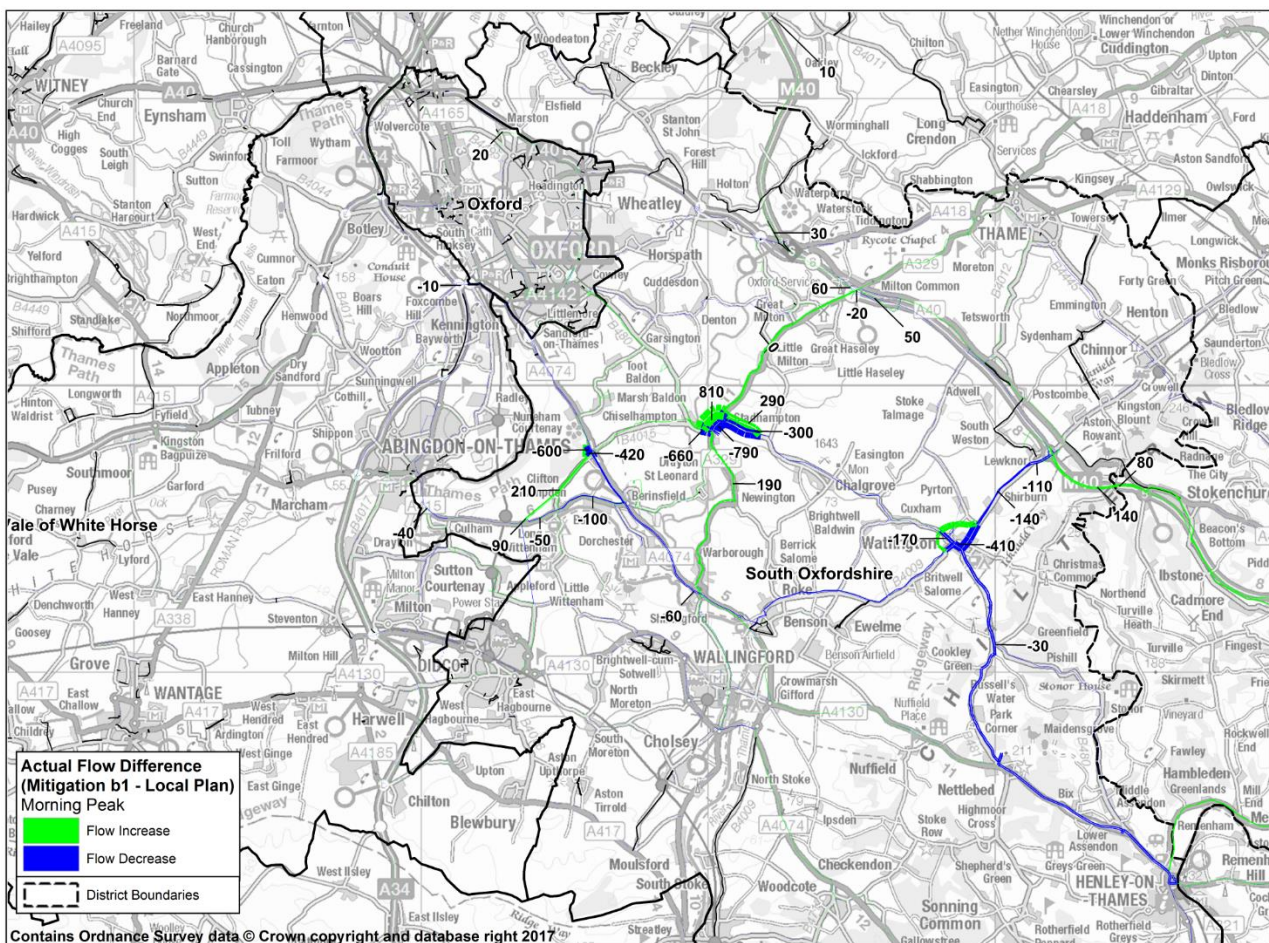
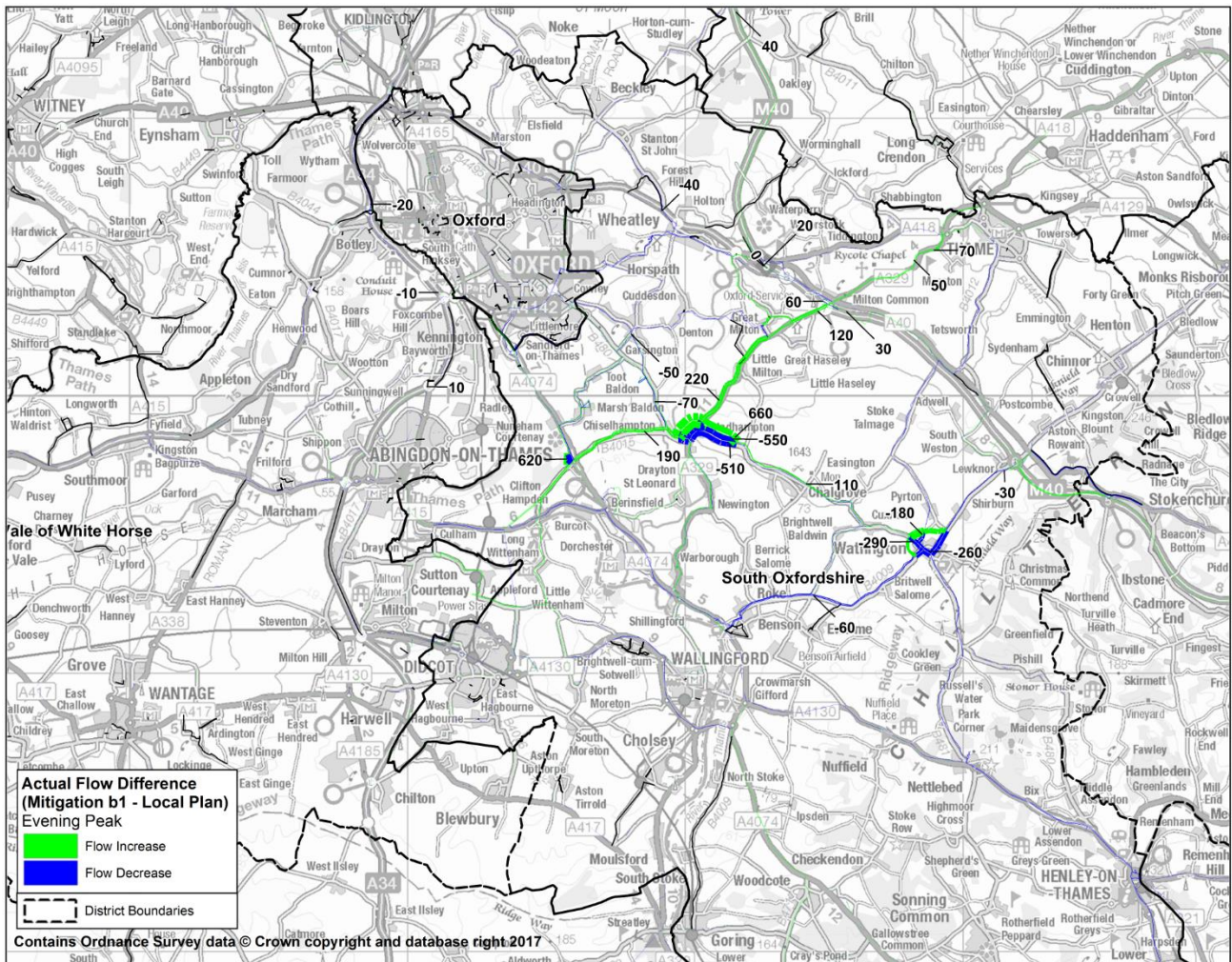


Figure 16 South Oxfordshire flow difference (Mitigation b1 – Local Plan) (PCU/hr) – 2031 PM peak hour



6.3.3. Capacity impacts

The forecast volume to capacity plots for Mitigation (b1) across the District are shown in Figure 17 and Figure 18.

In Mitigation (b1), the forecast suggests the following links along the B480 are likely to be over capacity:

- In the morning peak, northbound link between proposed Stadhampton bypass/B480 junction to Clifton Hampden Road/B480 junction.
- In the evening peak, southbound link between proposed Stadhampton bypass/B480 junction to Clifton Hampden Road/B480 junction.

The A415 is forecast to exceed capacity at the following links:

- In both the morning and evening peaks, the A415 westbound link between Tollgate Rd and A415 / High Street junctions and link between junction of A415/ High Street and junction of A415/ Oxford Road respectively.

The model forecasts suggest that the A4074 exceeds capacity at the following approaches:

- In the morning peak hour, A4074 northbound between Berinsfield and Baldon Lane / A4074 junction, northbound between A4074 / Church Road junction and A4074 / Benson Lane junction, southbound between A4074 / Church Road junction and Crowmarsh roundabout are forecast to exceed capacity.
- The A4074 is above operational capacity in the evening peak hour in both directions on the A4074 between Berinsfield and Baldon Lane / A4074 junction, northbound between A4074 / Church Road junction and A4074 / Benson Lane junction, southbound between A4074 / Church Road junction and Crowmarsh roundabout are forecast to exceed capacity. The A4074 / Church Road junction in the morning and evening peak hour, and Crowmarsh roundabout, Shillingford roundabout in the evening peak are forecast to be at or above operational capacity.

The A329 is forecast to exceed capacity at the following links:

- In the morning peaks, the A329 northbound between Stadhampton Road and A329 / B480 junction.
- A329 is forecast to remain below capacity in evening peak hours except southbound between Sinodun View and Shillingford roundabout.

The A40 is forecast to remain below capacity in both the morning and evening peak hours except:

- The eastbound and westbound approaches at Headington roundabout are forecast to be operating above operational capacity.

The B4009 is forecast to remain below capacity in both morning and evening peak hours.

Figure 17 South Oxfordshire V/C for links and junctions – 2031 Mitigation (b1) AM peak hour

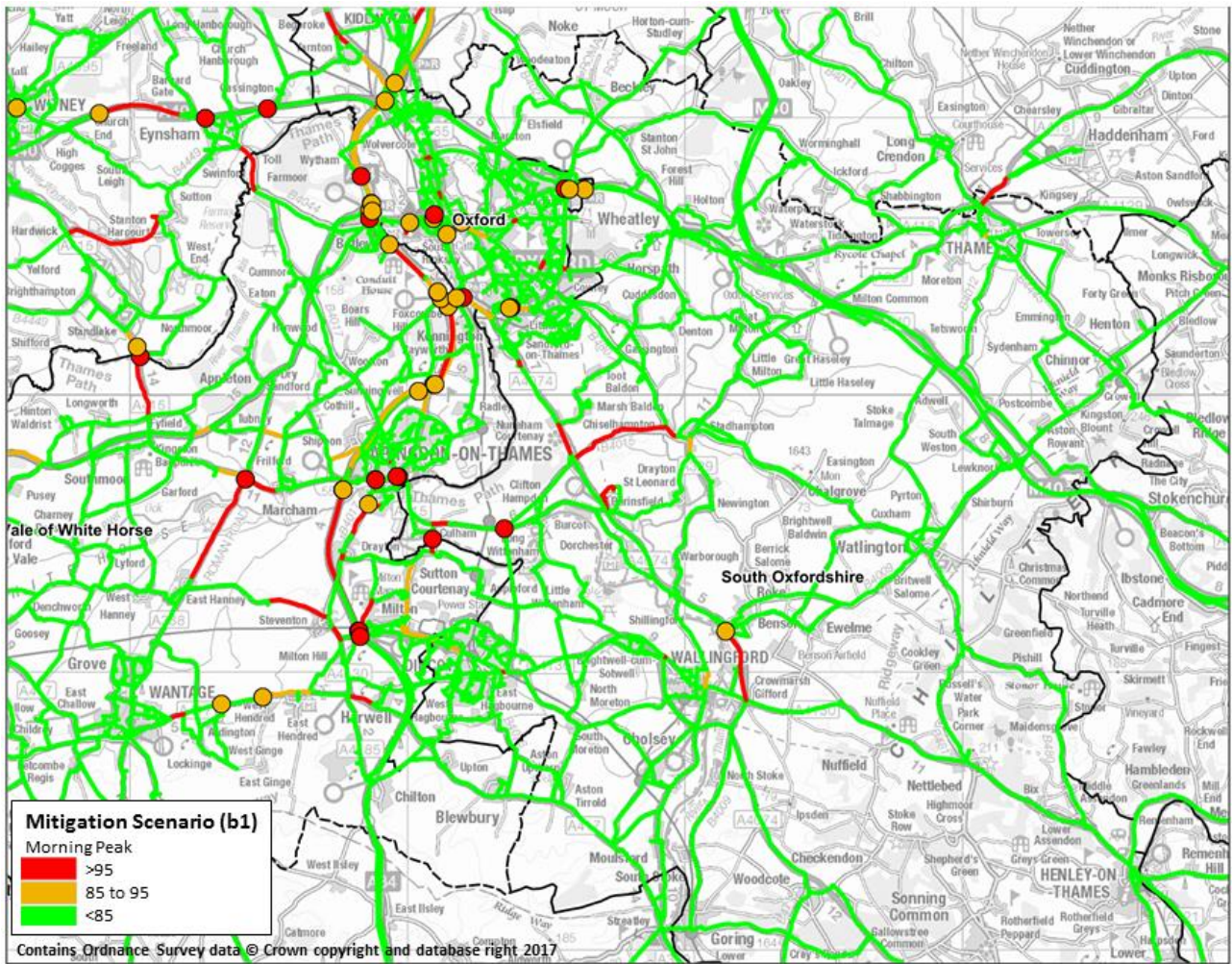
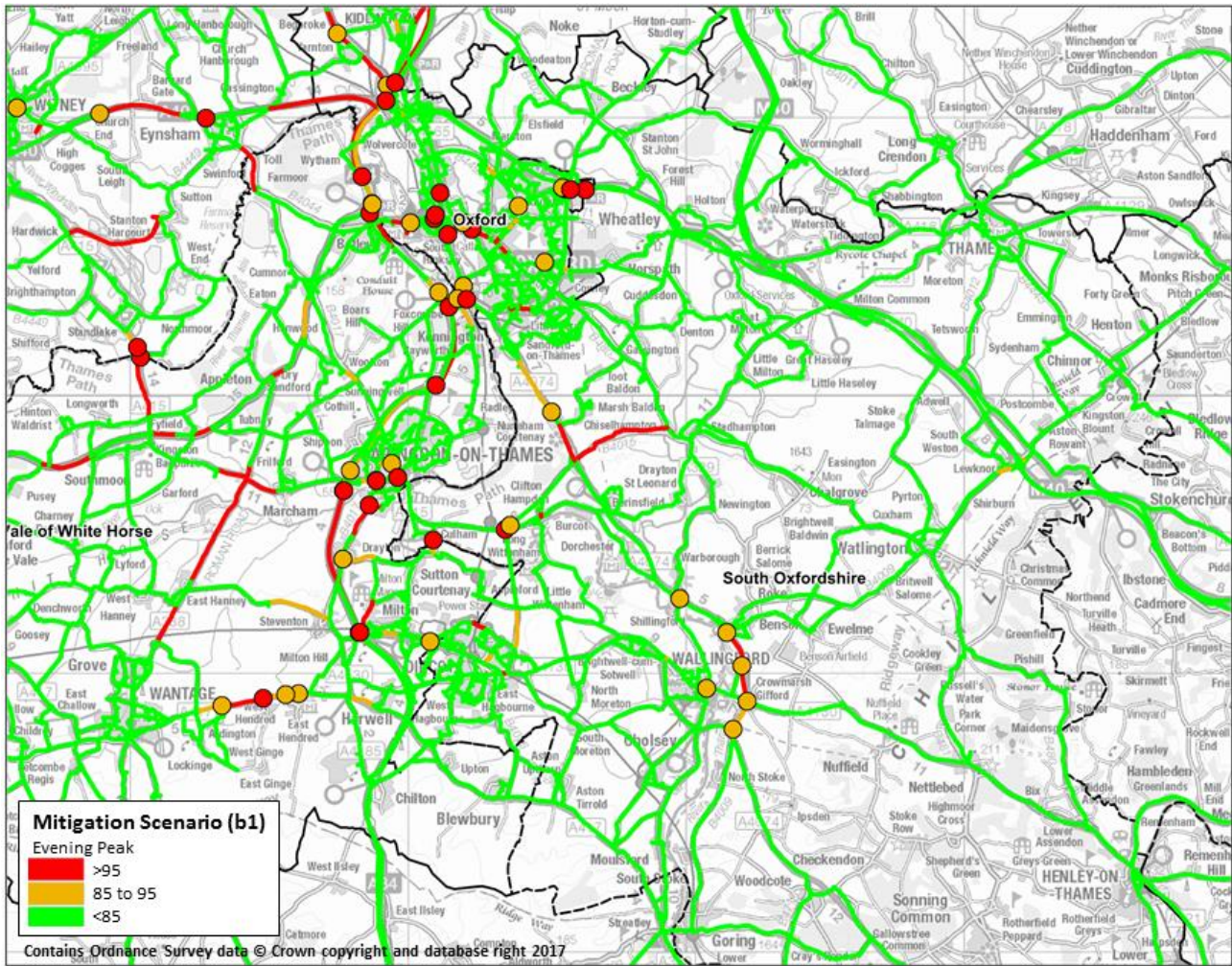


Figure 18 South Oxfordshire V/C for links and junctions – 2031 Mitigation (b1) PM peak hour



6.3.4. Corridor Performance

6.3.4.1. A34 Corridor

The network performance for Mitigation (b1) along the A34 corridor is shown in Table 49 and Table 50 for the morning and evening peak hours respectively.

In the morning peak hour, the model forecasts suggest decrease in delay, total time and the total distance and a negligible increase in average speed. In the evening peak hour, the model forecast suggests increase in delay and travel time, and reduction in travel distance and average speed.

The forecast decrease in average delay compared to Local Plan Scenario during the morning peak would be around 2 seconds per vehicle and the forecast increase in average delay compared to Local Plan Scenario during evening peak would be 1 second per vehicle.

Table 49 A34 corridor performance in the morning peak hour in 2031

	A34		
	Local Plan(LP)	Mitigation (b1) (Mb1)	Difference (Mb1 - LP)
Delay (pcu-hr)	676	665	-11
Total Time (pcu-hr)	3053	3039	-14
Total Distance (pcu-km)	191968	191808	-160
Average Speed (km/hr)	62.9	63.1	0.2

Table 50 A34 corridor performance in the evening peak hour in 2031

	A34		
	Local Plan(LP)	Mitigation (b1) (Mb1)	Difference (Mb1 - LP)
Delay (pcu-hr)	859	867	8
Total Time (pcu-hr)	3214	3220	6
Total Distance (pcu-km)	192933	192879	-54
Average Speed (km/hr)	60	59.9	-0.1

6.3.4.2. A40 Corridor

The network performance for Mitigation (b1) along the A40 corridor is shown in Table 51 and Table 52 for the morning and evening peak hours respectively.

The forecast changes to the network are likely to be negligible during the morning and evening peak hour compared to the Local Plan Scenario, since the network changes are proposed in the Stadhampton, Watlington and Nuneham Courtenay area.

Table 51 A40 corridor performance in the morning peak hour in 2031

	A40		
	Local Plan(LP)	Mitigation (b1) (Mb1)	Difference (Mb1 - LP)
Delay (pcu-hr)	148	148	0
Total Time (pcu-hr)	519	520	1
Total Distance (pcu-km)	27133	27206	73
Average Speed (km/hr)	52.3	52.3	0.0

Table 52 A40 corridor performance in the evening peak hour in 2031

	A40		
	Local Plan(LP)	Mitigation (b1) (Mb1)	Difference (Mb1 - LP)
Delay (pcu-hr)	94	93	-1
Total Time (pcu-hr)	530	522	-8
Total Distance (pcu-km)	31570	31011	-559
Average Speed (km/hr)	59.5	59.4	-0.1

6.3.4.3. A415 Corridor

The modelled network performance for Mitigation (b1) along the A415 corridor is shown in Table 53 and Table 54 for the morning and evening peak hours respectively.

In both morning and evening peaks, the increased level of demand generated by the new sites is forecast to result in increased delays, travel distance and total travel times while the average speed is forecast to decrease.

In the morning peak, the delay and travel time is forecast to increase along the corridor whereas the total distance and average speed decreases. In the evening peak, the forecasts suggest a reduction in delays, total travel times, travel distance and average speed. The mitigation scheme at the Golden Balls junction is forecast to add additional demand along the corridor, which may mean that additional mitigation is required along this corridor in the future, or that the scheme proposals need to be further refined through more detailed junction assessments.

The forecast increase in average delay per vehicle compared to Local Plan Scenario during the morning peak would be around 7 seconds per vehicle and during evening peak decrease by 3 seconds per vehicle.

Table 53 A415 corridor performance in the morning peak hour in 2031

	A415		
	Local Plan(LP)	Mitigation (b1) (Mb1)	Difference (Mb1 - LP)
Delay (pcu-hr)	344	358	14
Total Time (pcu-hr)	497	506	9
Total Distance (pcu-km)	9718	9400	-318
Average Speed (km/hr)	19.6	18.6	-1.0

Table 54 A415 corridor performance in the evening peak hour in 2031

	A415		
	Local Plan(LP)	Mitigation (b1) (Mb1)	Difference (Mb1 - LP)
Delay (pcu-hr)	188	187	-1
Total Time (pcu-hr)	344	337	-7
Total Distance (pcu-km)	9762	9443	-319
Average Speed (km/hr)	28.4	28	-0.4

6.3.4.4. A329 Corridor

The network performance for Mitigation (b1) along the A329 corridor is shown in Table 55 and Table 56 for the morning and evening peak hours respectively.

In both the morning and evening peaks, the forecast suggests a decrease in delays and increase in travel distance, total travel times and average speed. The differences presented are higher in the evening peak in comparison to the morning peak.

The modelled decrease in delay can be attributed to the Stadhampton Bypass which would provide access to B480 corridor and potentially remove congestion at the B480 / A329 roundabout at Stadhampton.

The forecast decrease in average delay per vehicle compared to Local Plan Scenario during the morning peak would be around 16 seconds per vehicle and during evening peak decrease by 37 seconds per vehicle.

Table 55 A329 corridor performance in the morning peak hour in 2031

	A329		
	Local Plan(LP)	Mitigation (b1) (Mb1)	Difference (Mb1 - LP)
Delay (pcu-hr)	41	19	-22
Total Time (pcu-hr)	382	429	47
Total Distance (pcu-km)	23906	27726	3820
Average Speed (km/hr)	62.5	64.6	2.1

Table 56 A329 corridor performance in the evening peak hour in 2031

	A329		
	Local Plan(LP)	Mitigation (b1) (Mb1)	Difference (Mb1 - LP)
Delay (pcu-hr)	106	17	-89
Total Time (pcu-hr)	434	437	3
Total Distance (pcu-km)	23279	27545	4266
Average Speed (km/hr)	53.6	63.1	9.5

6.3.4.5. A4074 Corridor

The network performance for Mitigation (b1) along the A4074 corridor is shown in Table 57 and Table 58 for the morning and evening peak hours respectively.

In both the morning and the evening peak hours, the delay and total time are forecast to increase, while the total distance and average speed is forecast to decrease. The delay along the A4074 is forecast to increase at the A4074 and Baldon Lane junction (Nuneham Courtenay) and at Shillingford roundabout which may be associated with improvements at the Golden Balls roundabout and the Stadhampton Bypass attracting demand.

The differences presented look comparatively higher in the morning peak than in the evening peak.

The forecast increase in average delay per vehicle compared to Local Plan Scenario during the morning peak would be around 24 seconds per vehicle and during evening peak increase by 9 seconds per vehicle.

Table 57 A4074 corridor performance in the morning peak hour in 2031

	A4074		
	Local Plan(LP)	Mitigation (b1) (Mb1)	Difference (Mb1 - LP)
Delay (pcu-hr)	121	148	27
Total Time (pcu-hr)	551	559	8
Total Distance (pcu-km)	26723	25494	-1229
Average Speed (km/hr)	48.5	45.6	-2.9

Table 58 A4074 corridor performance in the evening peak hour in 2031

	A4074		
	Local Plan(LP)	Mitigation (b1) (Mb1)	Difference (Mb1 - LP)
Delay (pcu-hr)	69	76	7
Total Time (pcu-hr)	528	534	6
Total Distance (pcu-km)	28147	27818	-329
Average Speed (km/hr)	53.3	52.1	-1.2

6.3.4.6. B480 Corridor

The modelled network performance for Mitigation (b1) along the B480 corridor is shown in Table 59 and Table 60 for the morning and evening peak hours respectively.

In both morning and evening peaks, the B480 corridor is forecast to experience decreases in delays, travel distance, total travel times and average speed.

The forecast decrease in average delay per vehicle compared to Local Plan Scenario during the morning peak and evening peak would be around 6 seconds per vehicle and 2 seconds per vehicle, respectively. The delay decrease and speed reduction compared to the local plan scenario, is related to a reduction of the speed limit through Stadhampton.

Table 59 B480 corridor performance in the morning peak hour in 2031

	B480		
	Local Plan(LP)	Mitigation (b1) (Mb1)	Difference (Mb1 - LP)
Delay (pcu-hr)	57	49	-8
Total Time (pcu-hr)	237	182	-55
Total Distance (pcu-km)	11830	8672	-3158
Average Speed (km/hr)	49.8	47.8	-2.0

Table 60 B480 corridor performance in the evening peak hour in 2031

	B480		
	Local Plan(LP)	Mitigation (b1) (Mb1)	Difference (Mb1 - LP)
Delay (pcu-hr)	6	4	-2
Total Time (pcu-hr)	192	163	-29
Total Distance (pcu-km)	12256	10195	-2061
Average Speed (km/hr)	63.8	62.5	-1.3

6.3.4.7. B4009 Corridor

The network performance for Mitigation (b1) along the B4009 corridor is shown in Table 61 and Table 62 for the morning and evening peak hours respectively.

In the morning peak, the forecasts suggest no change to the delay, whereas the total time and total distance are forecast to decrease, while the average speed is fore

cast to increase. In the evening peak hour, the average speed, total time and total distance are forecast to decrease while the average speed is forecast to increase.

The forecast average delay per vehicle compared to Local Plan Scenario during the morning peak would be same as the Local Plan Scenario and during evening peak decrease by 6 seconds per vehicle.

Table 61 B4009 corridor performance in the morning peak hour in 2031

	B4009		
	Local Plan(LP)	Mitigation (b1) (Mb1)	Difference (Mb1 - LP)
Delay (pcu-hr)	6	6	0
Total Time (pcu-hr)	306	252	-54
Total Distance (pcu-km)	18458	15366	-3092
Average Speed (km/hr)	60.3	61	0.7

Table 62 B4009 corridor performance in the evening peak hour in 2031

	B4009		
	Local Plan(LP)	Mitigation (b1) (Mb1)	Difference (Mb1 - LP)
Delay (pcu-hr)	68	49	-19
Total Time (pcu-hr)	404	349	-55
Total Distance (pcu-km)	19854	17371	-2483
Average Speed (km/hr)	49.1	49.8	0.7

6.4. Mitigation (b2)

Mitigation (b2) includes the land use assumptions as considered under the Local Plan Scenario and the changes being the addition of highway mitigation schemes to Mitigation Scenario (b1). The additional highway network changes include addition of following schemes:

- Benson Bypass
- Nuneham Courtenay Bypass

6.4.1. Network Performance

The modelled highway network performance within the District for the Do Minimum and Mitigation (b2) are shown in the Table 63 and Table 64.

These statistics give a high-level summary of how the model has responded to the network changes.

Changes in highway network are forecast to reduce the delays, travel times and travel distances with negligible decrease in speed within the District during the morning peak hours and decrease in delay and travel times, and increase in travel distances and speed during evening peak hours.

This change in network performance parameters is likely to be related to the additional mitigation schemes modelled within the District.

The forecast reduction in average delay would be 5 seconds per vehicle and 8 seconds per vehicle during morning peak and evening peak hours in the South Oxfordshire District, compared to Local Plan Scenario.

Table 63 South Oxfordshire District modelled network performance - morning peak 2031

	South Oxfordshire		
	Local Plan (LP)	Mitigation (b2) (Mb2)	Difference (Mb2-LP)
Delay (pcu-hr)	961	904	-57
Total Time (pcu-hr)	6815	6786	-29
Total Distance (pcu-km)	393554	391073	-2481
Average Speed (km/hr)	57.8	57.6	-0.2

Table 64 South Oxfordshire District modelled network performance - evening peak 2031

	South Oxfordshire		
	Local Plan (LP)	Mitigation (b2) (Mb2)	Difference (Mb2-LP)
Delay (pcu-hr)	951	809	-142
Total Time (pcu-hr)	7398	7352	-46
Total Distance (pcu-km)	426439	426596	157
Average Speed (km/hr)	57.6	58	0.4

6.4.2. Flow Impacts

The forecast flow difference between Mitigation (b2) and Local Plan modelled across the District is shown in Figure 19 and Figure 20. For the purposes of the report, we focus on changes along the A34, A40, A415, A329, A4074, B480 and B4009 corridors and where relevant will provide commentary on forecast impacts on other links.

The model forecasts suggest minor changes along the A40 in both the morning and evening peak hours. This is likely to be related to the Stadhampton and Watlington bypass on B480 and some trips being diverted from A40 to B480.

The Stadhampton and Watlington bypass show significant reduction in volume of through traffic in the Stadhampton and Watlington residential area.

In the morning and evening peak hour, the model forecasts suggest decrease in flows along A415 westbound between the A415 / A4074 junction and the A415 / A4074 junction. There are forecast increases in flow along Clifton Hampden bypass and Golden Balls roundabout.

In the evening peak hour, the flow is forecast to increase along the A329 northbound and southbound section between the Shillingford roundabout and the A329 / M40 roundabout.

In the morning peak hours, the flow is forecast to decrease along the A4074, southbound and northbound between Golden Balls roundabout and the Shillingford roundabout. The forecasts suggest that the proposed Nuneham Courtenay Bypass is likely to lead to a reduction in flow through the A4074 in both the directions between the junctions of the A4074 with the proposed bypass in morning and evening peak hour.

Flow along B4009 is forecast to decrease in the morning and evening peak hours between Elm Bridge Roundabout to B4009/M40 junction. The forecasts suggest that the proposed Benson bypass is likely to have the impact of reducing in flow in both directions of the B4009 in morning and evening peak hour between Elm Bridge Roundabout to the junction of B4009/ Proposed bypass.

Figure 19 South Oxfordshire flow difference (Mitigation b2 – Local Plan) (PCU/hr) – 2031 AM peak hour

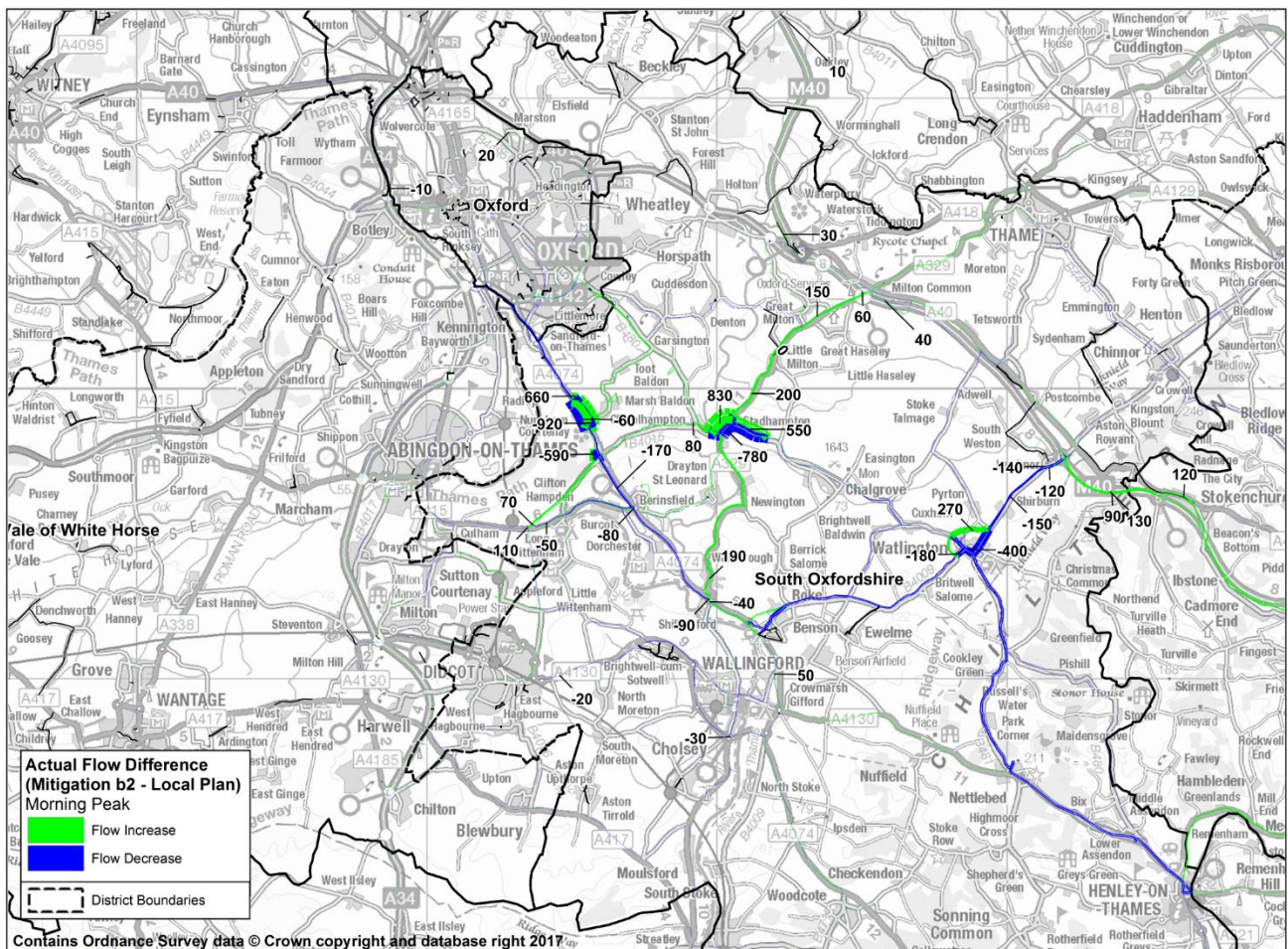
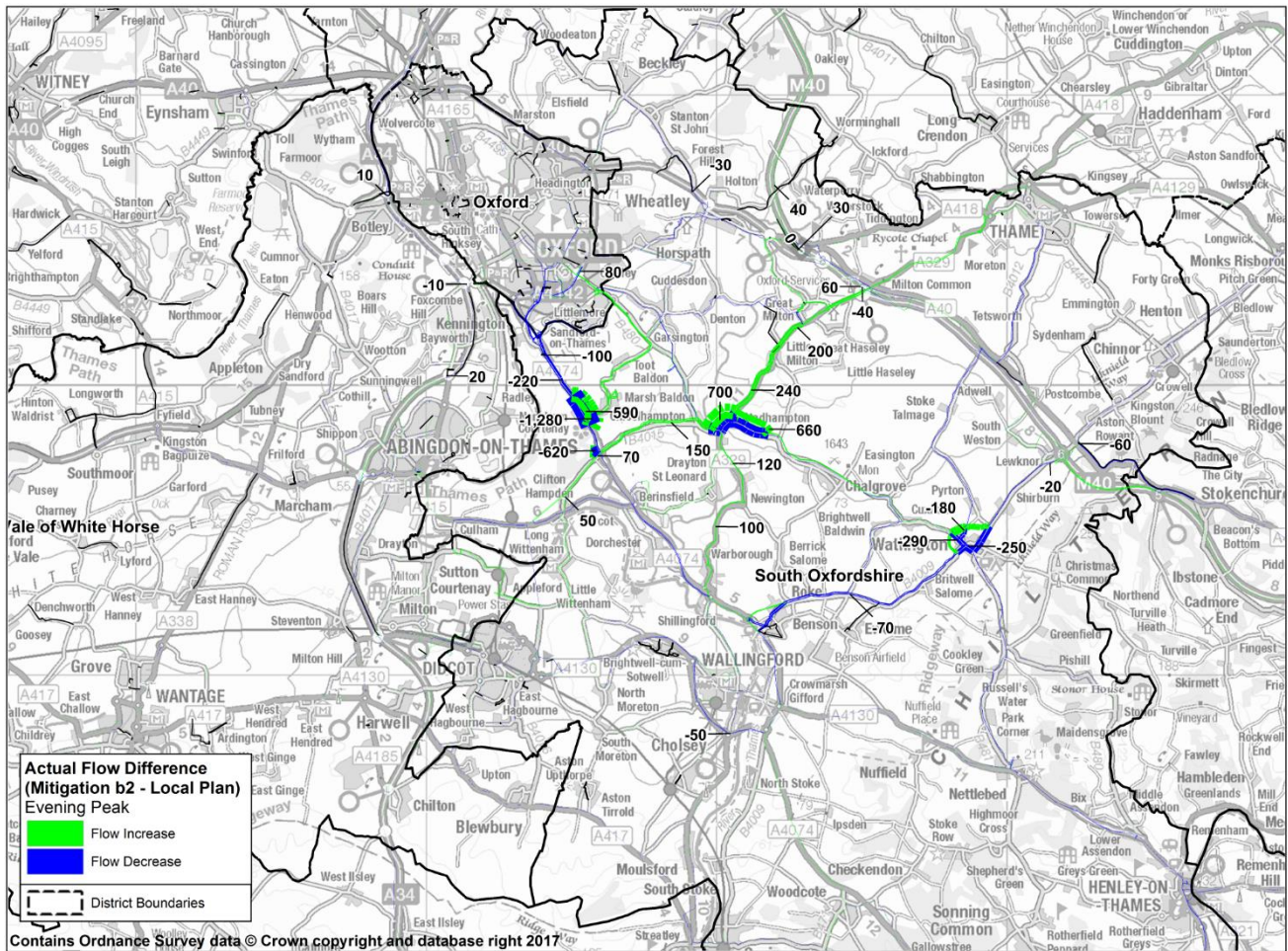


Figure 20 South Oxfordshire flow difference (Mitigation b2 – Local Plan) (PCU/hr) – 2031 PM peak hour



6.4.3. Capacity impacts

The forecast volume to capacity plots for Mitigation (b2) across the District are shown in Figure 21 and Figure 22.

In Mitigation (b2), the forecast shows the following links along the B480 are likely to experience capacity issues:

- In the morning, northbound between proposed Stadhampton bypass/B480 junction to Clifton Hampden Road/B480 junction is forecast to be operating at or above capacity.
- In the evening, southbound between proposed Stadhampton bypass/B480 junction to Clifton Hampden Road/B480 junction is forecast to be operating at or above capacity.

The A415 is forecast to exceed capacity at the following links and junctions:

- In both the morning and evening peaks, the A415 westbound between Tollgate Rd and A415 / High Street junctions.
- In the morning and evening peak, the proposed junction of A415/ Culham Didcot Thames river crossing

The model forecasts suggest that the A4074 exceeds capacity at the following approaches:

- In the morning peak hour, northbound on the A4074 between Golden Balls roundabout and Henley Road / A4074 junction, northbound between A4074 / Church Road junction and A4074 / Benson Lane junction, southbound between A4074 / Church Road junction and Crowmarsh roundabout.
- In the evening peak hour, northbound on the A4074 between Berinsfield roundabout and Baldon Lane / A4074 Roundabout, northbound between Elm Bridge roundabout and Shillingford roundabout. Southbound between Church Road / A4074 junction and Crowmarsh roundabout and northbound between Church Road / A4074 and Church Road / A4074 junction.
- A4074 / Church Road junction in the morning and evening peak hour, and Crowmarsh roundabout, Shillingford roundabout in the evening peak.
- Fane Drive/ Wimblestraw Road link at A4074 is forecast to operate at above capacity, due to the access for the Berinsfield development. The impacts of growth and mitigation needed in Berinsfield will be assessed as part of Transport Assessment for strategic Berinsfield development site.

The A329 is forecast to exceed capacity at the following link:

- In the morning peaks, the A329 northbound direction between Stadhampton Road and A329 / B480 junction.

The A40 is forecast to remain below capacity in both the morning and evening peak hours except:

- The eastbound and westbound approaches at Headington roundabout are forecast to be operating above operational capacity.

The B4009 is forecast to remain below capacity in both morning and evening peak hours.

Figure 21 South Oxfordshire V/C for links and junctions – 2031 Mitigation (b2) AM peak hour

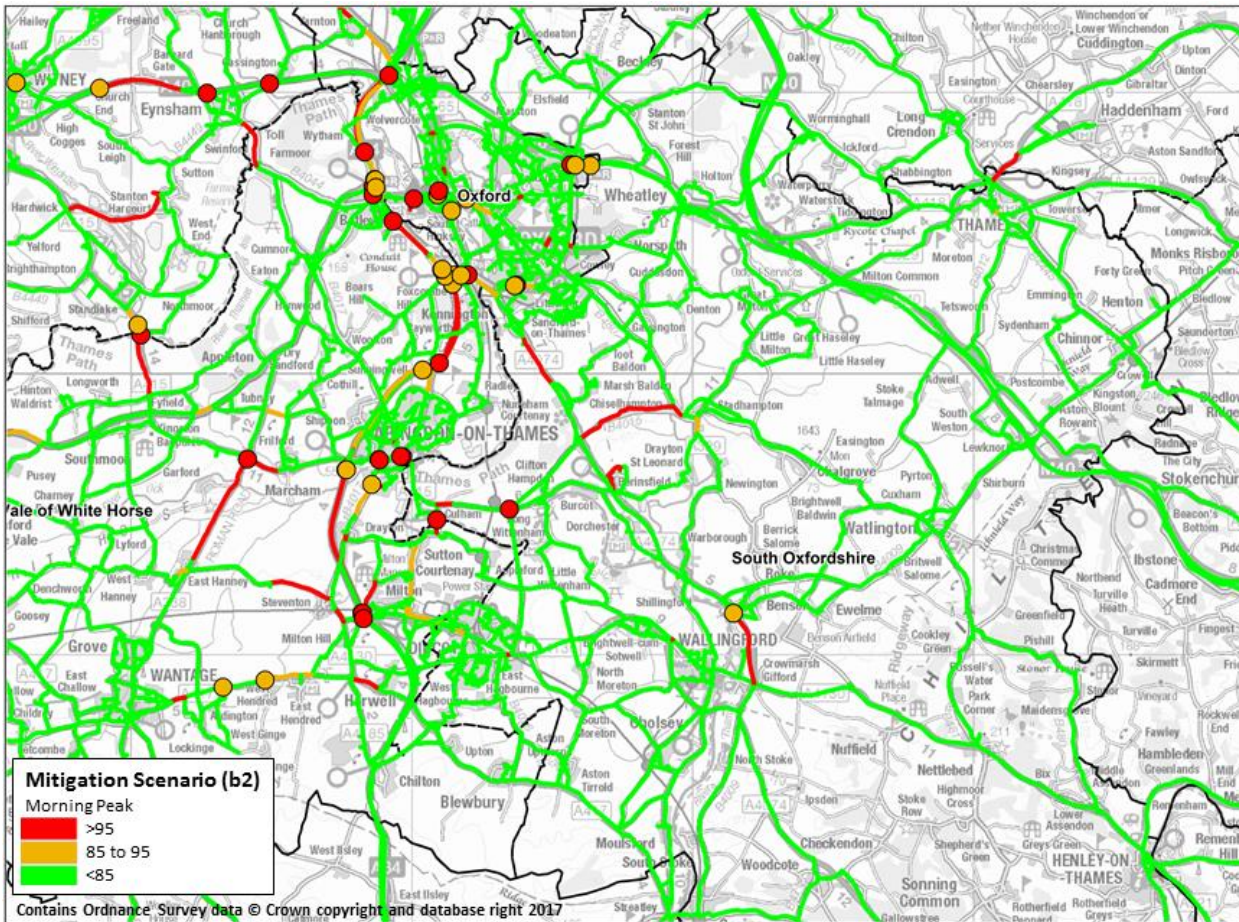
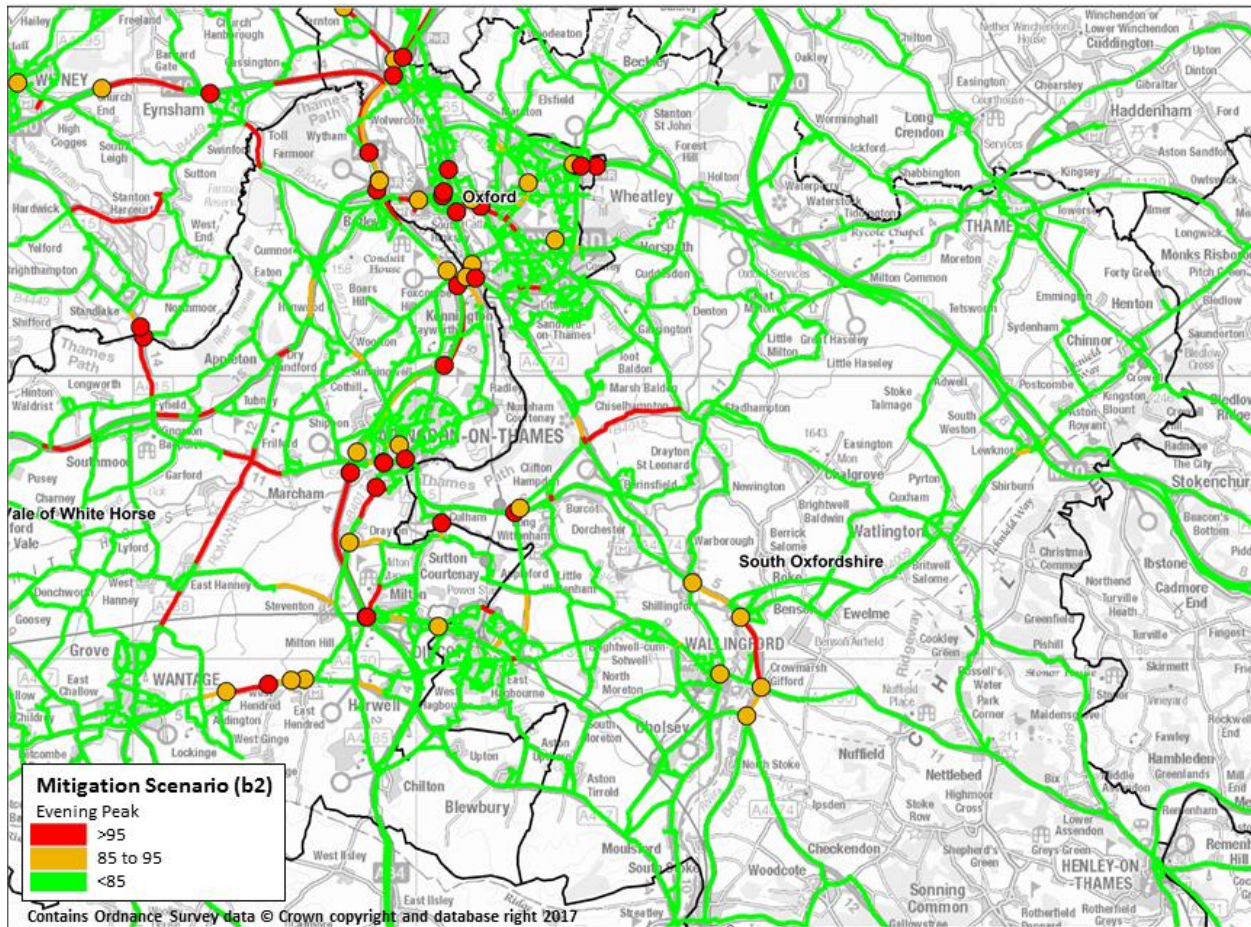


Figure 22 South Oxfordshire V/C for links and junctions – 2031 Mitigation (b2) PM peak hour



6.4.4. Corridor Performance

6.4.4.1. A34 Corridor

The network performance for Mitigation (b2) along the A34 corridor is shown in Table 65 and Table 66 for the morning and evening peak hours respectively.

In the morning peak hour, the model forecasts suggest a decrease in delay, total time and the total distance and a negligible increase in average speed. In the evening peak hour, the model forecast suggests increase in delay, travel time, and travel distance, and a negligible reduction in average speed.

The forecast decrease in average delay compared to Local Plan Scenario during the morning peak would be around 2 seconds per vehicle and the forecast increase in average delay compared to Local Plan Scenario during evening peak would be 5 seconds per vehicle.

Table 65 A34 corridor performance in the morning peak hour in 2031

	A34		
	Local Plan(LP)	Mitigation (b2) (Mb2)	Difference (Mb2-LP)
Delay (pcu-hr)	676	663	-13
Total Time (pcu-hr)	3053	3040	-13
Total Distance (pcu-km)	191968	191920	-48
Average Speed (km/hr)	62.9	63.1	0.2

Table 66 A34 corridor performance in the evening peak hour in 2031

	A34		
	Local Plan(LP)	Mitigation (b2) (Mb2)	Difference (Mb2-LP)
Delay (pcu-hr)	859	888	29
Total Time (pcu-hr)	3214	3247	33
Total Distance (pcu-km)	192933	193318	385
Average Speed (km/hr)	60	59.5	-0.5

6.4.4.2. A40 Corridor

The network performance for Mitigation (b2) along the A40 corridor is shown in Table 67 and Table 68 for the morning and evening peak hours respectively.

The forecast changes to the network are low during the morning and evening peak hour compared to the Local Plan Scenario, since the changes were proposed at Benson and Nuneham Courtenay area.

Table 67 A40 corridor performance in the morning peak hour in 2031

	A40		
	Local Plan (LP)	Mitigation (b2) (Mb2)	Difference (Mb2-LP)
Delay (pcu-hr)	148	148	0
Total Time (pcu-hr)	519	520	1
Total Distance (pcu-km)	27133	27198	65
Average Speed (km/hr)	52.3	52.3	0.0

Table 68 A40 corridor performance in the evening peak hour in 2031

	A40		
	Local Plan (LP)	Mitigation (b2) (Mb2)	Difference (Mb2-LP)
Delay (pcu-hr)	94	95	1
Total Time (pcu-hr)	530	525	-5
Total Distance (pcu-km)	31570	31058	-512
Average Speed (km/hr)	59.5	59.2	-0.3

6.4.4.3. A415 Corridor

The modelled network performance for Mitigation (b2) along the A415 corridor is shown in Table 69 and Table 70 for the morning and evening peak hours respectively.

In the morning peak, the delay and travel time increase along the corridor whereas the total distance and average speed decrease. In the evening peak, the forecasts suggest a decrease in delays, total travel time, travel distance and average speed.

The forecast increase in average delay per vehicle compared to Local Plan Scenario during the morning peak would be around 4 seconds per vehicle and during evening peak decrease by 2 seconds per vehicle.

Table 69 A415 corridor performance in the morning peak hour in 2031

	A415		
	Local Plan (LP)	Mitigation (b2) (Mb2)	Difference (Mb2-LP)
Delay (pcu-hr)	344	355	11
Total Time (pcu-hr)	497	504	7
Total Distance (pcu-km)	9718	9440	-278
Average Speed (km/hr)	19.6	18.7	-0.9

Table 70 A415 corridor performance in the evening peak hour in 2031

	A415		
	Local Plan (LP)	Mitigation (b2) (Mb2)	Difference (Mb2-LP)
Delay (pcu-hr)	188	187	-1
Total Time (pcu-hr)	344	336	-8
Total Distance (pcu-km)	9762	9394	-368
Average Speed (km/hr)	28.4	28	-0.4

6.4.4.4. A329 Corridor

The network performance for Mitigation (b2) along the A329 corridor is shown in Table 71 and Table 72 for the morning and evening peak hours.

In both the morning and evening peaks, a reduction in delay is forecast and increase in travel distance, total travel times and average speed. The difference presented are higher in the evening peak in comparison to the morning peak.

The decrease in delay can be attributed to the Stadhampton Bypass which would provide access to B480 corridor removing the congestion at the B480 / A329 roundabout at Stadhampton.

The forecast decrease in average delay per vehicle compared to Local Plan Scenario during the morning peak would be around 16 seconds per vehicle and during evening peak decrease by 37 seconds per vehicle.

Table 71 A329 corridor performance in the morning peak hour in 2031

	A329		
	Local Plan (LP)	Mitigation (b2) (Mb2)	Difference (Mb2-LP)
Delay (pcu-hr)	41	9	-32
Total Time (pcu-hr)	382	438	56
Total Distance (pcu-km)	23906	28186	4280
Average Speed (km/hr)	62.5	64.4	1.9

Table 72 A329 corridor performance in the evening peak hour in 2031

	A329		
	Local Plan (LP)	Mitigation (b2) (Mb2)	Difference (Mb2-LP)
Delay (pcu-hr)	106	18	-88
Total Time (pcu-hr)	434	440	6
Total Distance (pcu-km)	23279	27738	4459
Average Speed (km/hr)	53.6	63.0	9.4

6.4.4.5. A4074 Corridor

The network performance for Mitigation (b2) along the A4074 corridor is shown in Table 73 and Table 74 for the morning and evening peak hours.

In both the morning and evening peak hours the network performance parameters are forecast to decrease, except for the average speed in evening peak which is forecast to increase.

The forecast average delay per vehicle compared to Local Plan Scenario during the morning peak is forecast to have negligible change in delay and during evening peak to decrease by 7 seconds per vehicle.

Table 73 A4074 corridor performance in the morning peak hour in 2031

	A4074		
	Local Plan (LP)	Mitigation (b2) (Mb2)	Difference (Mb2-LP)
Delay (pcu-hr)	121	119	-2
Total Time (pcu-hr)	551	438	-113
Total Distance (pcu-km)	26723	20430	-6292
Average Speed (km/hr)	48.5	46.6	-1.9

Table 74 A4074 corridor performance in the evening peak hour in 2031

	A4074		
	Local Plan (LP)	Mitigation (b2) (Mb2)	Difference (Mb2-LP)
Delay (pcu-hr)	69	51	-18
Total Time (pcu-hr)	528	389	-139
Total Distance (pcu-km)	28147	21613	-6534
Average Speed (km/hr)	53.3	55.5	2.2

6.4.4.6. B480 Corridor

The modelled network performance for Mitigation (b2) along the B480 corridor is shown in Table 75 and Table 76.

In both morning and evening peaks, the mitigation is forecast to result in a decrease in delays, travel distance, total travel time and average speed.

The forecast decrease in average delay per vehicle compared to Local Plan Scenario during the morning peak and evening peak would be around 8 seconds per vehicle and 2 seconds per vehicle, respectively.

Table 75 B480 corridor performance in the morning peak hour in 2031

	B480		
	Local Plan (LP)	Mitigation (b2) (Mb2)	Difference (Mb2-LP)
Delay (pcu-hr)	57	46	-11
Total Time (pcu-hr)	237	180	-57
Total Distance (pcu-km)	11830	8774	-3056
Average Speed (km/hr)	49.8	48.8	-1.0

Table 76 B480 corridor performance in the evening peak hour in 2031

	B480		
	Local Plan (LP)	Mitigation (b2) (Mb2)	Difference (Mb2-LP)
Delay (pcu-hr)	6	4	-2
Total Time (pcu-hr)	192	164	-28
Total Distance (pcu-km)	12256	10229	-2027
Average Speed (km/hr)	63.8	62.4	-1.4

6.4.4.7. B4009 Corridor

The network performance for Mitigation (b2) along the B4009 corridor is shown in Table 77 and Table 78 for the morning and evening peak hours.

In the morning peak hour, there is no change to the delay whereas the total time, total distance and average speed are forecast to decrease. In the evening peak hour the delay, average speed, total time and total distance are forecast to decrease.

The forecast increase in average delay per vehicle compared to Local Plan Scenario during the morning peak would be same as the Local Plan Scenario and during evening peak would decrease by 5 seconds per vehicle.

Table 77 B4009 corridor performance in the morning peak hour in 2031

	B4009		
	Local Plan (LP)	Mitigation (b2) (Mb2)	Difference (Mb2-LP)
Delay (pcu-hr)	6	6	0
Total Time (pcu-hr)	306	250	-56
Total Distance (pcu-km)	18458	14601	-3857
Average Speed (km/hr)	60.3	58.4	-1.9

Table 78 B4009 corridor performance in the evening peak hour in 2031

	B4009		
	Local Plan (LP)	Mitigation (b2) (Mb2)	Difference (Mb2-LP)
Delay (pcu-hr)	68	49	-19
Total Time (pcu-hr)	404	351	-53
Total Distance (pcu-km)	19854	16934	-2920
Average Speed (km/hr)	49.1	48.2	-0.9

7. Summary

One of the main purposes of the ETI is to inform the selection of strategic development sites to be allocated in the Local Plan 2031 and to help identify a package of highway mitigation measures that ensures that the plan contributes towards the delivery of sustainable development. The ETI forms part of the evidence base to inform the Local Plan 2031 alongside other evidence, including Landscape Capacity Study, Strategic Flood Risk Assessment, Sustainability Appraisal, Green Belt Review, and others.

This is the second stage of work associated with the ETI commission using the Oxfordshire Strategy Model (OSM). This technical note reports on the results of OSM model testing related to the transport impacts of five Local Plan scenarios.

The assessed Local Plan and mitigation scenarios each contain same number of housing allocations. The scenarios and its variation and the number of houses is shown in Table 79.

Table 79 Summary of Scenario housing allocation and network variation

Number	Dwellings	Description
Do Minimum	11079	Do Minimum scenario which has 2013 as Base Year and 2031 as Future Year. The updated Do Minimum scenario used for this assessment includes homes delivered since 2013, current commitments (homes with planning approval) and 2012 Core Strategy sites.
Local Plan	22380	Local Plan allocation 2031 which includes Do Minimum housing scenario and numbers of dwellings from the proposed new Local Plan sites (Table 6) based on the latest committed development for the south as per the monitoring exercise of April/May 2017.
Mitigation (a)	22380	As Local Plan, with variation of removal of non-funded mitigation schemes namely Clifton Hampden Bypass, Culham to Didcot River Crossing, A4130 dualling and Science Bridge.
Mitigation (b1)	22380	Including non-funded schemes and addition of mitigation measures in Stadhampton, Watlington and at Golden Balls roundabout.
Mitigation (b2)	22380	As Mitigation (b1), with addition of mitigation measures in Benson and Nuneham Courtenay area.

The forecast impact of each development scenario by corridor is summarised in Table 80.

Table 80 Summary of highway capacity impacts

Scenario	Time	Corridor					
		A40	A415	A329	A4074	B480	B4009
Do Min	Morning peak	The A40 is forecast to be operating below operational capacity in the northbound and southbound directions between Wheatley and the M40 Junction for both the morning and evening peak hours. The eastbound and westbound approaches at Headington roundabout are forecast to be operating above operational capacity.	The A415 is forecast to be above capacity in the morning and evening peak hours westbound between Tollgate Road and Thame Lane and eastbound between A415 / High St and Thame Lane / A415 junctions.	The A329 eastbound is forecast to be at or above operational capacity at Stadhampton between School Lane and Milton Road / Thame Road roundabout and above capacity northbound between Stadhampton Road / A439 and Thame Road / Newington Road junctions and southbound on Milton Road, east of the Thame Road / Milton Road roundabout.	The A4074 is operating at or above operational capacity in the morning peak hour in the between Benson and Crowmarsh and above capacity in the between Golden Balls roundabout and Henley Road.	The B480 is forecast to be below operational capacity in both morning and evening peak hours.	The B4009 is forecast to be below operational capacity in both the morning and evening peak hours.
	Evening peak	The A40 is forecast to be operating below operational capacity in the northbound and southbound directions between Wheatley and the M40 Junction for both the morning and evening peak hours. The eastbound and westbound approaches at Headington roundabout are forecast to be operating above operational capacity.	The A415 is forecast to be above capacity in the morning and evening peak hours westbound between Tollgate Road and Thame Lane and eastbound between A415 / High St and Thame Lane / A415 junctions.	The A329 eastbound is forecast to be at or above operational capacity southbound on Milton Road, east of the Thame Road / Milton Road roundabout and above capacity eastbound between School Lane and Milton Road / Thame Road roundabout and northbound between Stadhampton Road / A439 and Thame Road / Newington Road junctions and westbound between Sinodun View and Shillingford roundabout.	The A4074 is operating at or above operational capacity in the both direction between Henley Road and Baldon Lane and above capacity between the Golden Balls roundabout and Baldon Lane in both directions and southbound between Benson and Crowmarsh roundabout.	The B480 is forecast to be below operational capacity in both morning and evening peak hours.	
Local Plan	Morning peak	A40 is forecast to remain below capacity in both morning and evening peak hours. The westbound approaches at Headington roundabout are forecaster to be operating above operational capacity and eastbound approaches are forecast to be at or	The A415 is forecast to be above capacity in the morning and evening peak hours, the A415 westbound between Tollgate Road and Thame Lane and eastbound between A415 / High Street and Thame Lane / A415 junctions.	The A329 northbound direction between Stadhampton Road and A329 / B480 junction and between Cratlands Close and Thame Road / Milton Road are forecast to be operating at or above capacity.	The A4074 is operating above operational capacity in the morning peak hour in the between Benson and Crowmarsh and above capacity in the in the northbound direction between Berinsfield roundabout and Henley Road.	In the morning and evening peak hours, the B480 is forecast to exceed capacity at the B480 / A329 roundabout at Stadhampton and northbound link between B480/Monument Road and B480 / A329 roundabout and between B480/Newington Road	B4009 is forecast to remain below capacity in both morning and evening peak hours.

Scenario	Time	Corridor					
		A40	A415	A329	A4074	B480	B4009
		above operational capacity.				junction to B480/ Clifton Hampden Road.	
	Evening peak	A40 is forecast to remain below capacity in both morning and evening peak hours. The eastbound and westbound approaches at Headington roundabout are forecaster to be operating above operational capacity.	The A415 is forecast to be above capacity in the morning and evening peak hours, the A415 westbound between Tollgate Road and Thame Lane and eastbound between A415 / High Street and Thame Lane / A415 junctions.	The northbound direction between Newington Road / B480 Thame Road junction and Milton Road / Thame Road junction are forecast to be operating at or above capacity. The westbound direction between Sinodun View and Shillingford roundabout are forecast to be operating above capacity.	The A4074 is operating above operational capacity in the evening peak hour in the between Benson and Crowmarsh and between Golden Balls roundabout and Baldon Lane and at or above operational capacity between Baldon Lane and Henley Road.	The B480 is forecast to be below operational capacity in evening peak hours.	B4009 is forecast to remain below capacity in both morning and evening peak hours.
Mitigation (a)	Morning peak	A40 is forecast to remain below capacity in both morning and evening peak hours. The westbound approaches at Headington roundabout are forecaster to be operating above operational capacity and eastbound approaches are forecast to be at or above operational capacity.	The A415 westbound between Tollgate Road and Thame Lane and eastbound between A415 / High Street and Berinsfield roundabout are forecast to be operating at or above capacity.	The A329 in a northbound direction between Stadhampton Road and the A329 / B480 junction and between Cratlands Close and Thame Road / Milton Road are forecast to be operating at or above capacity.	The A4074 northbound between Berinsfield and Henley Road / A4074 junction, northbound between southbound between Church Road / A4074 junction and Crowmarsh roundabout are forecast to be operating above capacity. And Northbound between Benson Lane / A4074 junction and Church Road / A4074 junction are forecast to be operating at or above capacity.	B480 is forecast to remain below capacity in both morning and evening peak hours	B4009 is forecast to remain below capacity in both morning and evening peak hours.
	Evening peak	A40 is forecast to remain below capacity in both morning and evening peak hours. The westbound approaches at Headington roundabout are forecaster to be operating above operational capacity and eastbound approaches are forecast to be at or above operational capacity.	The A415 eastbound between A415 / High Street and Berinsfield roundabout are forecast to be operating above capacity.	The A329 in a northbound direction between Stadhampton Road and A329 / B480 junction and between Cratlands Close and Thame Road / Milton Road and southbound between Sinodun View and Shillingford roundabout are forecast to be operating at or above capacity.	Northbound on the A4074 between Berinsfield roundabout and Baldon Lane / A4074 Roundabout, northbound between Elm Bridge roundabout and Shillingford roundabout are forecast to be operating at or above capacity. southbound between Church Road / A4074 junction and Crowmarsh roundabout and Northbound between Church Road / A4074 and	B480 is forecast to remain below capacity in both morning and evening peak hours.	B4009 is forecast to remain below capacity in both morning and evening peak hours.

Scenario	Time	Corridor					
		A40	A415	A329	A4074	B480	B4009
					Church Road / A4074 junction are forecast to be operating above capacity.		
Mitigation (b1)	Morning peak	A40 is forecast to remain below capacity in both morning and evening peak hours. The westbound approaches at Headington roundabout are forecaster to be operating above operational capacity and eastbound approaches are forecast to be at or above operational capacity.	In both the morning and evening peaks, the A415 westbound between Tollgate Rd and A415 / High Street junctions are forecast to exceed capacity.	In the morning peaks, the A329 northbound direction between Stadhampton Road and A329 / B480 junction are forecast to be at or above operational capacity.	A4074 northbound between Berinsfield and Baldon Lane / A4074 junction, northbound between A4074 / Church Road junction and A4074 / Benson Lane junction, southbound between A4074 / Church Road junction and Crowmarsh roundabout are forecast to exceed capacity.	B480 is forecast to remain below capacity in both morning and evening peak hours except northbound between proposed Stadhampton bypass/B480 junction to Clifton Hampden Road/B480 junction is forecast to be operating at or above capacity.	B4009 is forecast to remain below capacity in both morning and evening peak hours.
	Evening peak	A40 is forecast to remain below capacity in both morning and evening peak hours. The eastbound and westbound approaches at Headington roundabout are forecaster to be operating above operational capacity.	In both the morning and evening peaks, the A415 westbound between Tollgate Rd and A415 / High Street junctions are forecast to exceed capacity.	A329 is forecast to remain below capacity in evening peak hours except southbound between Sinodun View and Shillingford roundabout are forecast to be operating at or above capacity.	Both directions on the A4074 between Berinsfield and Baldon Lane / A4074 junction, northbound between A4074 / Church Road junction and A4074 / Benson Lane junction, southbound between A4074 / Church Road junction and Crowmarsh roundabout are forecast to exceed capacity.	B480 is forecast to remain below capacity in both morning and evening peak hours except southbound between proposed Stadhampton bypass/B480 junction to Clifton Hampden Road/B480 junction is forecast to be operating at or above capacity.	B4009 is forecast to remain below capacity in both morning and evening peak hours.
Mitigation (b2)	Morning peak	A40 is forecast to remain below capacity in both morning and evening peak hours. The westbound approaches at Headington roundabout are forecaster to be operating above operational capacity and eastbound approaches are forecast to be at or above operational capacity.	In both the morning and evening peaks, the A415 westbound between Tollgate Rd and A415 / High Street junctions are forecast to exceed capacity.	In the morning peaks, the A329 northbound direction between Stadhampton Road and A329 / B480 junction are forecast to be at or above operational capacity.	Northbound on the A4074 between Golden Balls roundabout and Henley Road / A4074 junction, northbound between A4074 / Church Road junction and A4074 / Benson Lane junction, southbound between A4074 / Church Road junction and Crowmarsh roundabout are forecast to exceed capacity.	B480 is forecast to remain below capacity in both morning and evening peak hours except northbound between proposed Stadhampton bypass/B480 junction to Clifton Hampden Road/B480 junction is forecast to be operating at or above capacity.	B4009 is forecast to remain below capacity in both morning and evening peak hours.
	Evening peak	A40 is forecast to remain below capacity in both morning and evening peak hours. The eastbound and	In both the morning and evening peaks, the A415 westbound between Tollgate Rd and A415 / High Street junctions are	A329 is forecast to remain below capacity in evening peak hours	Northbound on the A4074 between Berinsfield roundabout and Baldon Lane / A4074 Roundabout, northbound	B480 is forecast to remain below capacity in both morning and evening peak hours except southbound between	B4009 is forecast to remain below capacity in both morning and evening peak hours.

Scenario	Time	Corridor					
		A40	A415	A329	A4074	B480	B4009
		westbound approaches at Headington roundabout are forecast to be operating above operational capacity.	forecast to exceed capacity.		between Elm Bridge roundabout and Shillingford roundabout are forecast to be operating at or above capacity. southbound between Church Road / A4074 junction and Crowmarsh roundabout and Northbound between Church Road / A4074 and Church Road / A4074 junction are forecast to be operating above capacity	proposed Stadhampton bypass/B480 junction to Clifton Hampden Road/B480 junction is forecast to be operating at or above capacity.	

To ascertain the extent to which the proposed dwellings impact on different scenarios, Table 81 and Table 82 below show the impact of each scenario on delay in the corridor. At the District wide level, delay is forecast to be greater for Local Plan compared to the Do Minimum Scenario. The level of forecast delay is also much greater along the B480 corridor followed by A415 corridor for Local Plan scenario and this is likely to be associated with the development growth at the Chalgrove site and Culham site. This would suggest that transport infrastructure mitigation needs to be developed in more detail at these locations, building on those schemes already tested in the model. This is likely to require additional junction upgrades associated with the strategic mitigation tested, including along the B480 corridor in the vicinity of Chiselhampton. This will, in particular, need to be assessed as part of the transport assessment work associated with the strategic sites.

Table 81 Forecast changes in delay by corridor and scenario compared with the Local Plan Scenario - morning peak

Corridor	Local Plan*	Mitigation (a) **	Mitigation (b1) **	Mitigation (b2) **
South	85%	-6%	-3%	-6%
A34	7%	9%	-2%	-1%
A40	5%	0%	0%	0%
A415	407%	-14%	4%	3%
A329	61%	-14%	-78%	-77%
A4074	64%	1%	22%	-2%
B480	3061%	-12%	-14%	-20%
B4009	13%	2%	-2%	2%

*The Local Plan scenario has been compared with the Do Minimum

** The Mitigation (a), Mitigation (b1), Mitigation (b2) scenarios have been compared with the Local Plan

Table 82 Forecast changes in delay by corridor and scenario compared with the Local Plan Scenario - evening peak

Corridor	Local Plan*	Mitigation (a) **	Mitigation (b1) **	Mitigation (b2) **
South	54%	10%	-11%	-15%
A34	12%	20%	1%	2%
A40	-2%	1%	0%	2%
A415	61%	39%	-1%	0%
A329	192%	-28%	-84%	-83%
A4074	35%	0%	10%	-27%
B480	222%	-5%	-26%	-26%
B4009	50%	3%	-28%	-28%

*The Local Plan scenario has been compared with the Do Minimum

** The Mitigation (a), Mitigation (b1), Mitigation (b2) scenarios have been compared with the Local Plan

A comprehensive assessment of forecast development growth scenarios and associated transport impacts has been undertaken. The analysis summarised in this report will be used as an evidence base to support the Local Plan, helping to determine a final package of mitigation measure requirements. There will also need to be further more detailed work to help refine the package of highway and sustainable transport mitigation measures to support future housing and employment growth in the area to ensure the plan contributes towards the delivery of sustainable development. The further work will also include analysis of the cumulative impacts of the proposed growth in both South and Vale districts and identification of further mitigation measures if necessary. This will include on-going partnership work between the County Council, District Council and other partners including south Oxfordshire communities and developers of the proposed strategic sites.

Appendix



Appendix A.

A.1. Volume to Capacity summary tables

This document contains supplementary information. The supplementary information provided should be considered in parallel with information provided in the report South Oxfordshire District Council Local Plan Evaluation of Transport Impacts: Stage 2 - Development Scenarios (SODC_ETI Stage2_Report_V2.0_4.pdf).

This information illustrates traffic flow volume to capacity percentage forecasts for 2031 modelled scenarios along each corridor considered within the South Oxfordshire District for the Do Minimum (DM), Local Plan (LP) and Mitigation Option b2 with Mitigation scenarios. In all tables, sections of corridors are identified at specific junctions and roundabouts (RAB).

To aid interpretation of model forecasts, the volume to capacity model results have been categorised into three levels:

V/C percentage range	Description
>95%	Route at capacity (higher figures indicate journey delays)
>85% and <95%	Route close to capacity
<85%	Route within capacity

The presented traffic flow volume to capacity percentage forecasts for 2031 in the below tables are the weighted average of traffic flow volume to capacity percentages of a set of modelled links by their modelled distance. The information represents a volume to capacity percentage along each identified section.

A40 corridor volume to capacity percentage forecasts for 2031 modelled scenarios - morning and evening peak

A40	Direction	Morning Peak			Evening Peak		
		DM	LP	Mitigation Option b2	DM	LP	Mitigation Option b2
East of Headington RAB (A420/Bayswater Rd - Merewood Ave)	East	78	77	77	84	84	84
	West	84	84	84	80	80	80
South of Forest Hill (Merewood Ave - M40)	East	36	36	36	49	49	49
	West	42	42	42	37	37	38
Wheatley (M40 - Back St)	East	38	40	40	56	59	57
	West	7	8	8	13	13	13
Intersection with A329(Back St - Chinnor Rd/ B4009)	East	21	21	22	20	19	19
	West	13	13	13	5	6	6
Intersection with B4009 (B4009 - George Rd)	East	1	1	1	1	1	1
	West	11	10	12	38	56	43

A329 corridor volume to capacity percentage forecasts for 2031 modelled scenarios - morning and evening peak

A329	Direction	Morning Peak			Evening Peak		
		DM	LP	Mitigation Option b2	DM	LP	Mitigation Option b2
South of Thame (Moreton Rd - A40)	South	41	41	42	21	19	24
	North	29	28	33	35	33	36
Intersection with A40 (A40 - Gold St)	South	59	56	60	54	51	61
	North	51	54	65	59	52	64
Little Milton (Gold St- B480)	South	67	63	58	62	64	74
	North	55	59	71	60	53	67
Stadhampton (B480 - The Lydes)	South	37	35	32	47	43	40
	North	55	53	52	53	52	46
Newington (The Lydes - Sinodum View)	South	28	25	26	40	39	38
	North	33	29	41	30	28	34

A415 corridor volume to capacity percentage forecasts for 2031 modelled scenarios - morning and evening peak

A415	Direction	Morning Peak			Evening Peak		
		DM	LP	Mitigation Option b2	DM	LP	Mitigation Option b2
Abingdon (The Burycroft - Toilgate Rd)	East	73	70	68	77	65	67
	West	44	48	47	54	54	55
Culham (Toilgate Rd - Culham Science Centre)	East	92	93	92	92	92	91
	West	58	56	57	65	55	51
Culham Rail Station (Culham Science Centre - Oxford Rd/B4015)	East	35	34	33	36	30	30
	West	42	51	56	43	73	67
Clifton Hampden (Oxford Rd/B4015 - Abington Rd)	East	15	15	11	12	17	16
	West	37	54	57	26	43	41

A4074 corridor volume to capacity percentage forecasts for 2031 modelled scenarios - morning and evening peak

A4074	Direction	Morning Peak			Evening Peak		
		DM	LP	Mitigation Option b2	DM	LP	Mitigation Option b2
Heyford Hill RAB (Brick Klin Ln - Baldon Ln)	South	57	56	35	71	76	48
	North	80	81	69	75	74	60
Sandford-on-Thames (Baldon Ln - Oxford Rd/B4015)	South	77	79	69	101	102	100
	North	104	106	64	97	94	75
South of Little Baldon (Oxford Rd/B4015 - New Rd/ A329)	South	44	50	45	52	60	58
	North	69	75	68	60	68	66
Shillingford (New Rd/ A329 - Oxford Rd/B4009)	South	68	65	64	76	72	72
	North	76	71	80	78	83	86

B480corridor volume to capacity percentage forecasts for 2031 modelled scenarios - morning and evening peak

B480	Direction	Morning Peak			Evening Peak		
		DM	LP	Mitigation Option b2	DM	LP	Mitigation Option b2
Stadhampton (Milton Rd - Pryton Ln)	East	13	26	23	16	38	35
	West	36	73	29	34	67	35
Chalgrove (Pryton Ln - B481/Red Ln)	East	23	28	24	17	20	23
	West	30	29	16	16	22	20

B4009 corridor volume to capacity percentage forecasts for 2031 modelled scenarios - morning and evening peak

B4009	Direction	Morning Peak			Evening Peak		
		DM	LP	Mitigation Option b2	DM	LP	Mitigation Option b2
Chinnor (High St - A40/ London Rd)	South	24	24	23	33	34	33
	North	17	17	16	37	39	37
Intersection with A40 (A40/ London Rd - Brook St)	South	51	50	37	47	54	46
	North	58	63	55	46	51	48
Watlington (Brook St - Firebrass Hill)	South	18	19	13	22	26	18
	North	24	26	16	19	21	14
Britwell Salome (Firebrass Hill - Chapel Ln)	South	12	19	15	12	17	13
	North	14	19	15	11	18	15

Appendix B.

B.1. Summary of Demand Model results for the entire model

B.1.1. Local Plan (LP) Scenario

Morning peak period (07:00-10:00)

Entire model	Base Year (BY)	Do Minimum (DM)	DM-BY	Local Plan (LP)	LP-DM
Reg car (veh.)	239,449	328,481	89,032	335,653	7,172
P&R (veh.)	2,221	3,086	865	3,106	20
Bus only (pax)	27,925	33,996	6,071	34,642	646
Rail (pax)	9,302	15,112	5,810	16,400	1,288
TOTAL (persons)	338,981	470,159	131,178	481,223	11,064

Inter Peak period (10:00 – 16:00)

Entire model	Base Year (BY)	Do Minimum (DM)	DM-BY	Local Plan (LP)	LP-DM
Reg car (veh.)	418,193	616,727	198,534	630,183	13,456
P&R (veh.)	2,235	2,448	213	2,464	16
Bus only (pax)	46,839	67,859	21,020	68,222	363
Rail (pax)	9,824	22,491	12,667	23,013	522
TOTAL (persons)	581,864	898,026	316,162	916,589	18,563

Evening peak period (16:00 - 19:00)

Entire model	Base Year (BY)	Do Minimum (DM)	DM-BY	Local Plan (LP)	LP-DM
Reg car (veh.)	316,831	412,712	95,881	421,691	8,979
P&R (veh.)	2,021	2,609	588	2,625	16
Bus only (pax)	27,885	33,700	5,815	34,183	484
Rail (pax)	11,112	16,981	5,869	17,897	916
TOTAL (persons)	437,259	573,102	135,843	585,898	12,796

B.1.2. Mitigation Scenario (a)

Morning peak period (07:00-10:00)

Entire model	Do Minimum (DM)	Local Plan (LP)	LP-DM	Mitigation (a) (Ma)	Ma – LP
Reg car (veh.)	328,481	335,653	7,172	336,217	564
P&R (veh.)	3,086	3,106	20	3,107	1
Bus only (pax)	33,996	34,642	646	34,066	-576
Rail (pax)	15,112	16,400	1,288	16,128	-272
TOTAL (persons)	470,159	481,223	11,064	481,064	-159

Inter Peak period (10:00 – 16:00)

Entire model	Do Minimum (DM)	Local Plan (LP)	LP-DM	Mitigation (a) (Ma)	Ma – LP
Reg car (veh.)	616,727	630,183	13,456	631,172	989
P&R (veh.)	2,448	2,464	16	2,473	9
Bus only (pax)	67,859	68,222	363	68,041	-181
Rail (pax)	22,491	23,013	522	23,023	10
TOTAL (persons)	898,026	916,589	18,563	917,734	1,145

Evening peak period (16:00 - 19:00)

Entire model	Do Minimum (DM)	Local Plan (LP)	LP-DM	Mitigation (a) (Ma)	Ma – LP
Reg car (veh.)	412,712	421,691	8,979	421,670	-21
P&R (veh.)	2,609	2,625	16	2,633	8
Bus only (pax)	33,700	34,183	483	33,871	-312
Rail (pax)	16,981	17,897	916	17,639	-258
TOTAL (persons)	573,102	585,898	12,796	585,221	-677

B.1.3. Mitigation Scenario (b1)

Morning peak period (07:00-10:00)

Entire model	Do Minimum (DM)	Local Plan (LP)	LP-DM	Mitigation (b1) (Mb1)	Mb1 – LP
Reg car (veh.)	328,481	335,653	7,172	335,729	76
P&R (veh.)	3,086	3,106	20	3,108	2
Bus only (pax)	33,996	34,642	646	34,621	-21
Rail (pax)	15,112	16,400	1,288	16,413	13
TOTAL (persons)	470,159	481,223	11,064	481,318	95

Inter Peak period (10:00 – 16:00)

Entire model	Do Minimum (DM)	Local Plan (LP)	LP-DM	Mitigation (b1) (Mb1)	Mb1 – LP
Reg car (veh.)	616,727	630,183	13,456	630,063	-120
P&R (veh.)	2,448	2,464	16	2,463	-1
Bus only (pax)	67,859	68,222	363	68,168	-54
Rail (pax)	22,491	23,013	522	23,019	6
TOTAL (persons)	898,026	916,589	18,563	916,385	-204

Evening peak period (16:00 - 19:00)

Entire model	Do Minimum (DM)	Local Plan (LP)	LP-DM	Mitigation (b1) (Mb1)	Mb1 – LP
Reg car (veh.)	412,712	421,691	8,979	421,744	53
P&R (veh.)	2,609	2,625	16	2,625	0
Bus only (pax)	33,700	34,183	483	34,154	-29
Rail (pax)	16,981	17,897	916	17,912	15
TOTAL (persons)	573,102	585,898	12,796	585,965	67

B.1.4. Mitigation Scenario (b2)

Morning peak period (07:00-10:00)

Entire model	Do Minimum (DM)	Local Plan (LP)	LP-DM	Mitigation (b2) (Mb2)	Mb2 – LP
Reg car (veh.)	328,481	335,653	7,172	335,759	106
P&R (veh.)	3,086	3,106	20	3,109	3
Bus only (pax)	33,996	34,642	646	34,611	-31
Rail (pax)	15,112	16,400	1,288	16,435	35
TOTAL (persons)	470,159	481,223	11,064	481,373	150

Inter Peak period (10:00 – 16:00)

Entire model	Do Minimum (DM)	Local Plan (LP)	LP-DM	Mitigation (b2) (Mb2)	Mb2 – LP
Reg car (veh.)	616,727	630,183	13,456	629,997	-186
P&R (veh.)	2,448	2,464	16	2,464	0
Bus only (pax)	67,859	68,222	363	68,174	-48
Rail (pax)	22,491	23,013	522	23,036	23
TOTAL (persons)	898,026	916,589	18,563	916,320	-269

Evening peak period (16:00 - 19:00)

Entire model	Do Minimum (DM)	Local Plan (LP)	LP-DM	Mitigation (b2) (Mb2)	Mb2 – LP
Reg car (veh.)	412,712	421,691	8,979	421,817	126
P&R (veh.)	2,609	2,625	16	2,626	1
Bus only (pax)	33,700	34,183	483	34,151	-32
Rail (pax)	16,981	17,897	916	17,936	39
TOTAL (persons)	573,102	585,898	12,796	586,081	183

B.2. Summary of Demand Model results for South Oxfordshire

B.2.1. Local Plan (LP) Scenario

Morning peak period (07:00-10:00)

SODC	Base Year (BY)		Do Minimum (DM)		DM-BY		Local Plan (LP)		LP-DM	
	Orig.	Dest.	Orig.	Dest.	Orig.	Dest.	Orig.	Dest.	Orig.	Dest.
Reg car (veh.)	38,092	32,002	48,061	37,766	9,969	5,764	55,714	41,592	7,653	3,826
P&R (veh.)	224	24	343	19	119	-5	392	20	49	1
Bus only (pax)	1,442	1,012	1,969	1,126	527	114	2,546	1,196	577	70
Rail (pax)	1,784	644	2,454	795	670	151	3,537	924	1,083	129
TOTAL (persons)	51,088	41,686	66,117	49,941	15,029	8,255	77,583	55,037	11,466	5,096

Inter Peak period (10:00 – 16:00)

SODC	Base Year (BY)		Do Minimum (DM)		DM-BY		Local Plan (LP)		LP-DM	
	Orig.	Dest.	Orig.	Dest.	Orig.	Orig.	Orig.	Dest.	Orig.	Dest.
Reg car (veh.)	62,891	63,302	76,688	77,539	13,797	14,237	89,105	90,179	12,417	12,640
P&R (veh.)	129	133	111	144	-18	11	129	159	18	15
Bus only (pax)	1,883	1,458	2,128	1,806	245	348	2,357	2,144	229	338
Rail (pax)	1,124	997	1,421	1,395	297	398	1,732	1,831	311	436
TOTAL (persons)	81,762	81,730	103,938	104,702	22,176	22,972	120,776	122,081	16,838	17,379

Evening peak period (16:00 - 19:00)

SODC	Base Year (BY)		Do Minimum (DM)		DM-BY		Local Plan (LP)		LP-DM	
	Orig.	Dest.	Orig.	Dest.	Orig.	Orig.	Orig.	Dest.	Orig.	Dest.
Reg car (veh.)	58,470	62,129	63,823	70,703	5,353	8,574	70,169	79,680	6,346	8,977
P&R (veh.)	32	144	26	217	-6	73	29	251	3	34
Bus only (pax)	860	1,055	912	1,497	52	442	968	1,948	56	451
Rail (pax)	893	1,967	1,127	2,672	234	705	1,265	3,493	138	821
TOTAL (persons)	74,876	80,842	82,318	93,621	7,442	12,779	90,593	106,303	8,275	12,682

12 hour-period (07:00 - 19:00)

SODC	Base Year (BY)		Do Minimum (DM)		DM-BY		Local Plan (LP)		LP-DM	
	Orig.	Dest.	Orig.	Dest.	Orig.	Orig.	Orig.	Dest.	Orig.	Dest.
Reg car (veh.)	159,453	157,434	188,572	186,008	29,119	28,574	214,988	211,450	26,416	25,442
P&R (veh.)	385	300	480	381	95	81	550	430	70	49
Bus only (pax)	4,185	3,526	5,009	4,429	824	903	5,870	5,287	861	858
Rail (pax)	3,801	3,608	5,003	4,862	1202	1254	6,533	6,248	1530	1386
TOTAL (persons)	207,726	204,257	252,373	248,263	44,647	44,006	288,952	283,420	36,579	35,157

B.2.2. Mitigation Scenario (a)

Morning peak period (07:00-10:00)

SODC	Do Minimum (DM)		Local Plan (LP)		LP-DM		Mitigation (a) (Ma)		Ma – LP	
	Orig.	Dest.	Orig.	Dest.	Orig.	Dest.	Orig.	Dest.	Orig.	Dest.
Reg car (veh.)	48,061	37,766	55,714	41,592	7,653	3,826	56,080	41,357	366	-235
P&R (veh.)	343	19	392	20	49	1	390	21	-2	1
Bus only (pax)	1,969	1,126	2,546	1,196	577	70	2,272	1,135	-274	-61
Rail (pax)	2,454	795	3,537	924	1,083	129	3,552	951	15	27
TOTAL (persons)	66,117	49,941	77,583	55,037	11,466	5,096	77,783	54,669	200	-368

Inter Peak period (10:00 – 16:00)

SODC	Do Minimum (DM)		Local Plan (LP)		LP-DM		Mitigation (a) (Ma)		Ma – LP	
	Orig.	Dest.	Orig.	Dest.	Orig.	Orig.	Orig.	Dest.	Orig.	Dest.
Reg car (veh.)	76,688	77,539	89,105	90,179	12,417	12,640	88,884	89,481	-221	-698
P&R (veh.)	111	144	129	159	18	15	130	158	1	-1
Bus only (pax)	2,128	1,806	2,357	2,144	229	338	2,227	2,033	-130	-111
Rail (pax)	1,421	1,395	1,732	1,831	311	436	1,801	1,849	69	18
TOTAL (persons)	103,938	104,702	120,776	122,081	16,838	17,379	120,408	121,042	-368	-1,039

Evening peak period (16:00 - 19:00)

SODC	Do Minimum (DM)		Local Plan (LP)		LP-DM		Mitigation (a) (Ma)		Ma – LP	
	Orig.	Dest.	Orig.	Dest.	Orig.	Orig.	Orig.	Dest.	Orig.	Dest.
Reg car (veh.)	63,823	70,703	70,169	79,680	6,346	8,977	69,582	79,340	-587	-340
P&R (veh.)	26	217	29	251	3	34	28	251	-1	0
Bus only (pax)	912	1,497	968	1,948	56	451	970	1,805	2	-143
Rail (pax)	1,127	2,672	1,265	3,493	138	821	1,286	3,515	21	22
TOTAL (persons)	82,318	93,621	90,593	106,303	8,275	12,682	89,799	105,644	-794	-659

12 hour-period (07:00 - 19:00)

SODC	Do Minimum (DM)		Local Plan (LP)		LP-DM		Mitigation (a) (Ma)		Ma – LP	
	Orig.	Dest.	Orig.	Dest.	Orig.	Orig.	Orig.	Dest.	Orig.	Dest.
Reg car (veh.)	188,572	186,008	214,988	211,450	26,416	25,442	214,546	210,177	-442	-1273
P&R (veh.)	480	381	550	430	70	49	549	430	-1	0
Bus only (pax)	5,009	4,429	5,870	5,287	861	858	5,469	4,973	-401	-314
Rail (pax)	5,003	4,862	6,533	6,248	1,530	1,386	6,639	6,315	106	67
TOTAL (persons)	252,373	248,263	288,952	283,420	36,579	35,157	287,989	281,355	-963	-2,065

B.2.3. Mitigation Scenario (b1)

Morning peak period (07:00-10:00)

SODC	Do Minimum (DM)		Local Plan (LP)		LP-DM		Mitigation (b1) (Mb1)		Mb1 – LP	
	Orig.	Dest.	Orig.	Dest.	Orig.	Dest.	Orig.	Dest.	Orig.	Dest.
Reg car (veh.)	48,061	37,766	55,714	41,592	7,653	3,826	55,756	41,538	42	-54
P&R (veh.)	343	19	392	20	49	1	392	20	2	-1
Bus only (pax)	1,969	1,126	2,546	1,196	577	70	2,523	1,191	251	56
Rail (pax)	2,454	795	3,537	924	1,083	129	3,547	925	-5	-26
TOTAL (persons)	66,117	49,941	77,583	55,037	11,466	5,096	77,626	54,957	-157	288

Inter Peak period (10:00 – 16:00)

SODC	Do Minimum (DM)		Local Plan (LP)		LP-DM		Mitigation (b1) (Mb1)		Mb1 – LP	
	Orig.	Dest.	Orig.	Dest.	Orig.	Orig.	Orig.	Dest.	Orig.	Dest.
Reg car (veh.)	76,688	77,539	89,105	90,179	12,417	12,640	88,985	90,100	-120	-79
P&R (veh.)	111	144	129	159	18	15	128	159	-2	1
Bus only (pax)	2,128	1,806	2,357	2,144	229	338	2,317	2,103	90	70
Rail (pax)	1,421	1,395	1,732	1,831	311	436	1,733	1,828	-68	-21
TOTAL (persons)	103,938	104,702	120,776	122,081	16,838	17,379	120,578	121,932	170	890

Evening peak period (16:00 - 19:00)

SODC	Do Minimum (DM)		Local Plan (LP)		LP-DM		Mitigation (b1) (Mb1)		Mb1 – LP	
	Orig.	Dest.	Orig.	Dest.	Orig.	Orig.	Orig.	Dest.	Orig.	Dest.
Reg car (veh.)	63,823	70,703	70,169	79,680	6,346	8,977	70,251	79,788	82	108
P&R (veh.)	26	217	29	251	3	34	28	251	0	0
Bus only (pax)	912	1,497	968	1,948	56	451	961	1,917	-9	112
Rail (pax)	1,127	2,672	1,265	3,493	138	821	1,268	3,499	-18	-16
TOTAL (persons)	82,318	93,621	90,593	106,303	8,275	12,682	90,704	106,432	905	788

12 hour-period (07:00 - 19:00)

SODC	Do Minimum (DM)		Local Plan (LP)		LP-DM		Mitigation (b1) (Mb1)		Mb1 – LP	
	Orig.	Dest.	Orig.	Dest.	Orig.	Orig.	Orig.	Dest.	Orig.	Dest.
Reg car (veh.)	188,572	186,008	214,988	211,450	26,416	25,442	214,992	211,426	4	-24
P&R (veh.)	480	381	550	430	70	49	549	430	0	0
Bus only (pax)	5,009	4,429	5,870	5,287	861	858	5,802	5,212	333	239
Rail (pax)	5,003	4,862	6,533	6,248	1530	1386	6,548	6,252	-91	-63
TOTAL (persons)	252,373	248,263	288,952	283,420	36,579	35,157	288,908	283,320	919	1,965

B.2.4. Mitigation Scenario (b2)

Morning peak period (07:00-10:00)

SODC	Do Minimum (DM)		Local Plan (LP)		LP-DM		Mitigation (b2) (Mb2)		Mb2 – LP	
	Orig.	Dest.	Orig.	Dest.	Orig.	Dest.	Orig.	Dest.	Orig.	Dest.
Reg car (veh.)	48,061	37,766	55,714	41,592	7,653	3,826	55,799	41,479	85	-113
P&R (veh.)	343	19	392	20	49	1	392	20	0	0
Bus only (pax)	1,969	1,126	2,546	1,196	577	70	2,505	1,191	-41	-5
Rail (pax)	2,454	795	3,537	924	1083	129	3,561	926	24	2
TOTAL (persons)	66,117	49,941	77,583	55,037	11,466	5,096	77,677	54,877	94	-160

Inter Peak period (10:00 – 16:00)

SODC	Do Minimum (DM)		Local Plan (LP)		LP-DM		Mitigation (b2) (Mb2)		Mb2 – LP	
	Orig.	Dest.	Orig.	Dest.	Orig.	Orig.	Orig.	Dest.	Orig.	Dest.
Reg car (veh.)	76,688	77,539	89,105	90,179	12,417	12,640	88,932	90,018	-173	-161
P&R (veh.)	111	144	129	159	18	15	127	157	-2	-2
Bus only (pax)	2,128	1,806	2,357	2,144	229	338	2,308	2,088	-49	-56
Rail (pax)	1,421	1,395	1,732	1,831	311	436	1,736	1,831	4	0
TOTAL (persons)	103,938	104,702	120,776	122,081	16,838	17,379	120,499	121,806	-277	-275

Evening peak period (16:00 - 19:00)

SODC	Do Minimum (DM)		Local Plan (LP)		LP-DM		Mitigation (b2) (Mb2)		Mb2 – LP	
	Orig.	Dest.	Orig.	Dest.	Orig.	Orig.	Orig.	Dest.	Orig.	Dest.
Reg car (veh.)	63,823	70,703	70,169	79,680	6,346	8,977	70,269	79,836	100	156
P&R (veh.)	26	217	29	251	3	34	28	250	-1	-1
Bus only (pax)	912	1,497	968	1,948	56	451	961	1,901	-7	-47
Rail (pax)	1,127	2,672	1,265	3,493	138	821	1,271	3,506	6	13
TOTAL (persons)	82,318	93,621	90,593	106,303	8,275	12,682	90,728	106,477	135	174

12 hour-period (07:00 - 19:00)

SODC	Do Minimum (DM)		Local Plan (LP)		LP-DM		Mitigation (b2) (Mb2)		Mb2 – LP	
	Orig.	Dest.	Orig.	Dest.	Orig.	Orig.	Orig.	Dest.	Orig.	Dest.
Reg car (veh.)	188,572	186,008	214,988	211,450	26,416	25,442	215,000	211,333	12	-117
P&R (veh.)	480	381	550	430	70	49	547	428	-3	-2
Bus only (pax)	5,009	4,429	5,870	5,287	861	858	5,774	5,179	-96	-108
Rail (pax)	5,003	4,862	6,533	6,248	1530	1386	6,567	6,262	34	14
TOTAL (persons)	252,373	248,263	288,952	283,420	36,579	35,157	288,904	283,160	-48	-260

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