# South Oxfordshire District Council Local Plan

## Evaluation of Transport Impacts: Stage 3 Development Scenarios and Mitigation Testing - Addendum (updated Do-Minimum and Scenario 5c)

Oxfordshire County Council

**22 July 2020**

# Notice

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## Document history

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| Rev 1.1 | Addressed comments on v1.0. | CB | MA | JL | MA | 25/03/2019 |
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| Rev 1.4 | Addressed comments on v1.3. | AM | ATM | AEA | AEA | 22/07/2020 |
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## Client signoff

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# Table of contents



## Tables



## Figures

# 1. Introduction

*This document is an update to the 'SODC_ETI_Stage3_5c_Addendum_v1.2' to correct the text describing the number of additional dwellings assumed for scenario 5c in section 3.1 (Land Use Assumptions) and section 4 (Summary). In consistency with Table 3-1, the text has been changed from 17,494 to 15,931. The number of additional dwellings incorporated in the modelling for Scenario 5c remain unchanged and are reflective of the data provided by South Oxfordshire District Council in January 2019.*

Atkins has been commissioned by Oxfordshire County Council (OCC) and South Oxfordshire District Council (SODC) to undertake transport modelling to test an additional land use and transport mitigation scenario in relation to the Evaluation of Transport Impacts (ETI) for the emerging SODC Local Plan. The scenario is referenced as 5c and reflects the housing numbers proposed within the SODC Local Plan 2011-2034, Final Publication Version 2 published in January 2019.

This addendum report documents the modelling work undertaken by Atkins using the Oxfordshire Strategic Model (OSM) to assess Scenario 5c and is supplementary to the previous report issued by Atkins (SODC_ETI Stage3_Report_v1) documenting scenarios 1-5b.

This note also documents the development of a revised Do-Minimum (DM) scenario which incorporates the latest updates to South Oxfordshire known housing growth assumptions

The same analysis presented in the Stage 3 report for the other scenarios is presented here for Scenario 5c, drawing comparisons against the new Revised DM scenario.

# 2. Revised 2031 Do-Minimum

A revised South Oxfordshire ETI 2031 DM model has been developed to take account of the latest housing growth assumptions in South Oxfordshire. The modelling methodology remains unchanged to that documented in the Stage 3 report.

The only difference to the Revised DM model concerns housing growth assumptions, with an additional 3,158 dwellings assumed to be in South Oxfordshire by 2031. This is based on planning commitments known as of Autumn 2018, incorporating development sites with permission and those within made neighbourhood plans. Housing growth for surrounding Oxfordshire districts remain consistent with the previous version of the DM as presented in the Stage 3 report. Employment and transport network assumptions are also unchanged from the previous DM across all districts

The planning data assumptions included in the last two versions of the South Oxfordshire ETI 2031 DM are presented below in Table 2-1.

**Table 2-1 - South Oxfordshire ETI 2031 DM Planning Data Totals**

| OSM | Dwellings | Jobs |
|---|---|---|
| Previous DM | 11,079 | 4,282 |
| Revised DM | 14,237 | 4,282 |

The main locations where there has been a change in additional housing between the two DM models as a result of new planning permissions and neighbourhood plan commitments are; Chalgrove, Chinnor, Crowmarsh Gifford, Didcot, Thame, Wallingford and Watlington.

## 2.1. Highway Network Performance

This section summarises the performance of the Revised DM scenario on key corridors for the AM and PM peak hours based on the volume to capacity ratios on the highway network. Volume to capacity (V/C) plots are presented for the Revised DM in Figure 2-1 and Figure 2-2.

The V/C ratio represents the level of congestion on the network and is represented by the ratio of traffic volume to the maximum capacity available at a given point on the highway network. It is given as a percentage, with volume to capacity between 0% - 85% indicating that the network is performing within operational capacity, between 85% - 95% indicating that the network is performing at or near operational capacity, and at 95% and above indicating that the network is performing above operational capacity. The V/C plots remain largely unchanged from the previous DM scenario. This means that while exact traffic volumes may have changed, the V/C ratio of many links is in the same band as in the previous DM, and thus similar performance levels are expected.

The colour of a link or node does not represent the length of a queue at a point in the network, although a higher V/C ratio does suggest a higher likelihood of queues developing at that point.

**A40**

- The A40 is predicted to be operating below operational capacity in the eastbound and westbound 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.
- Figure 2-1 shows a reduction in V/C on the A40 (EB) between Headington roundabout and Thornhill P&R in the revised 2031 DM model. This section of road has a V/C ratio of 96% in the previous DM, whilst the ratio has dropped to just under the 95% threshold in the Revised DM.

**A4074**

- The Revised DM predicts that the A4074 is operating at or above operational capacity in the AM peak hour in the northbound direction between Berinsfield roundabout and the Golden Balls roundabout and above capacity in the northbound direction between High View and Lower Farm Lane, Benson Lane and Church Road, Golden Balls roundabout and Baldon Lane.
- In the PM peak hour, the model predicts 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 southbound between Church Road and Crowmarsh roundabout.

**B480**

- The Revised DM predicts that the B480 is forecast to be below operational capacity in both the AM and PM peak hours.

**A34**

- The Revised DM predicts that the A34 is forecast to be above operational capacity in some areas, in both the AM and PM peak hours, most notably north and south of Abingdon, and around Oxford between Hinksey Hill and Kidlington Junctions.

**Figure 2-1 - South Oxfordshire ETI 2031 Revised DM: Volume over Capacity (V/C) Ratio (AM Peak Hour)**

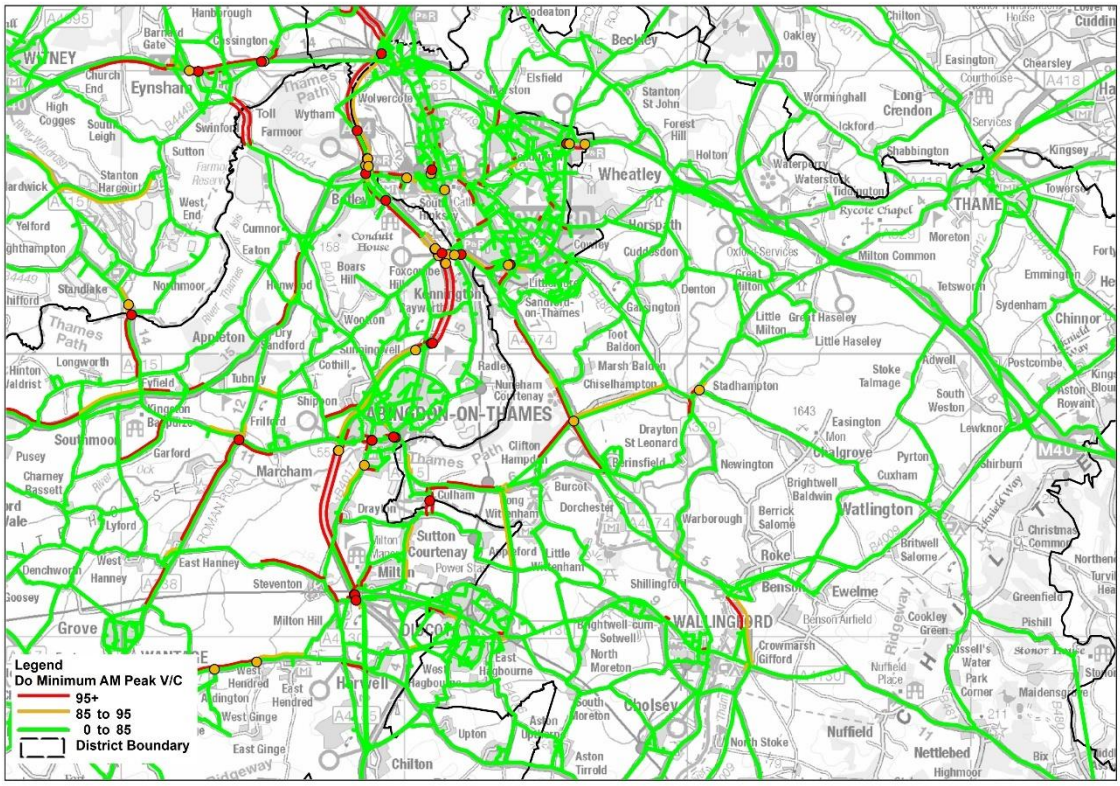
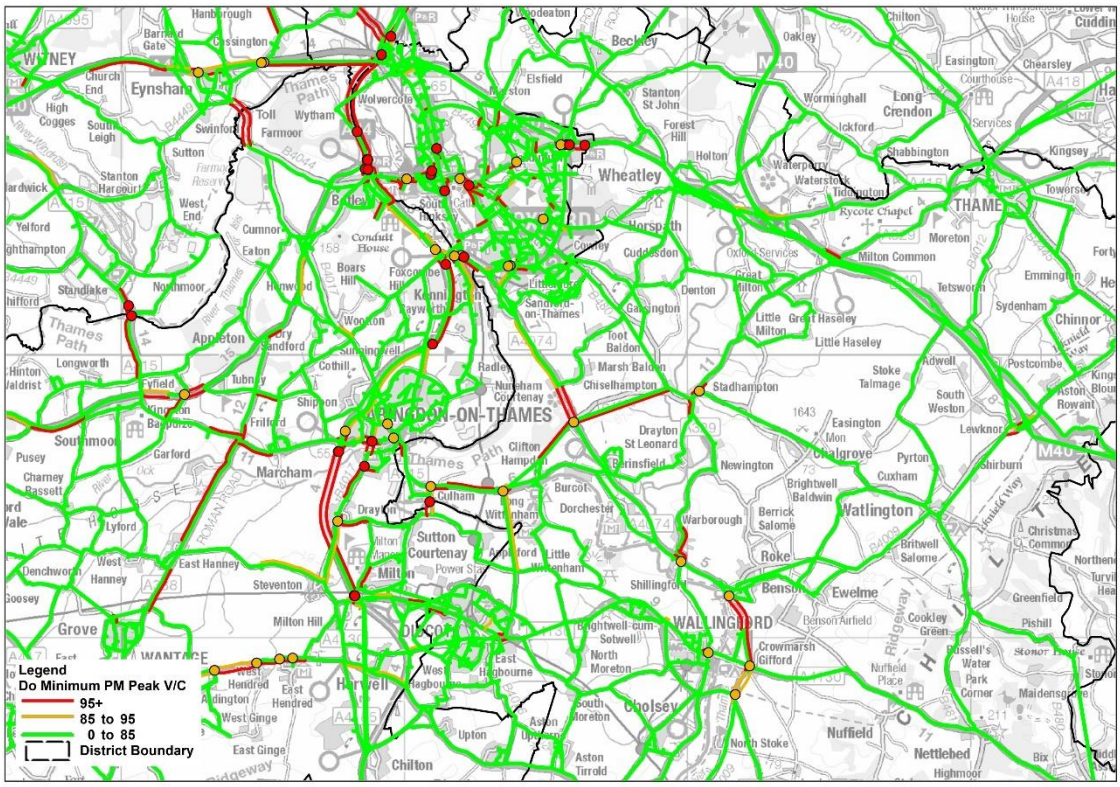



**Figure 2-2 - South Oxfordshire ETI 2031 Revised DM: Volume over Capacity (V/C) Ratio (PM Peak Hour)**



# 3. 2031 Scenario 5c

This section details the land use and transport mitigation assumptions for Scenario 5c, which builds on Scenario 5b, including new schemes to provide additional capacity and help address the congestion issues predicted by the Revised DM and previous Scenario 5 model runs at the Golden Balls and Headington roundabouts.

## 3.1. Land Use Assumptions

Table 3-1 summarises the 2031 planning data assumptions for South Oxfordshire in the Revised DM and Scenario 5c. An additional 15,931 dwellings are assumed for Scenario 5c. Jobs remains unchanged from the Revised DM.

Table 3-2 lists the local plan developments and proposed transport mitigation (above that included in the Revised DM).

**Table 3-1 - Planning Data Assumptions Included in the Revised DM and Scenario 5c**

| | Revised DM | 5c |
|---|---|---|
| Dwellings | 14,237 | 30,168 |
| Jobs | 4,282 | 4,282 |

**Table 3-2 - 2031 South Oxfordshire ETI Scenario 5c Developments and Transport Mitigations**

| Scenario | Proposed Developments | Mitigation Included |
|---|---|---|
| 5c | Northfield (1,800), Grenoble Road (3,000), Chalgrove (3,000), Culham (3,500), North of Bayswater Brook (formally called Wick Farm/ Lower Elsfield (1,100), Berinsfield (1,700), Wheatley (300), NE Didcot (additional 150) and Neighbourhood Plan commitments and targets. | Benson Bypass, Chiselhampton Bypass, Stadhampton Bypass, Watlington Bypass, Culham Site Access Links, Culham Didcot Thames River Crossing Western Alignment, Berinsfield northern access, Speed reductions to Dorchester/Stadhampton Road to 20mph, six additional bus routes, the grade separation of Golden Balls roundabout and the grade separation of the A40 at Headington roundabout. |

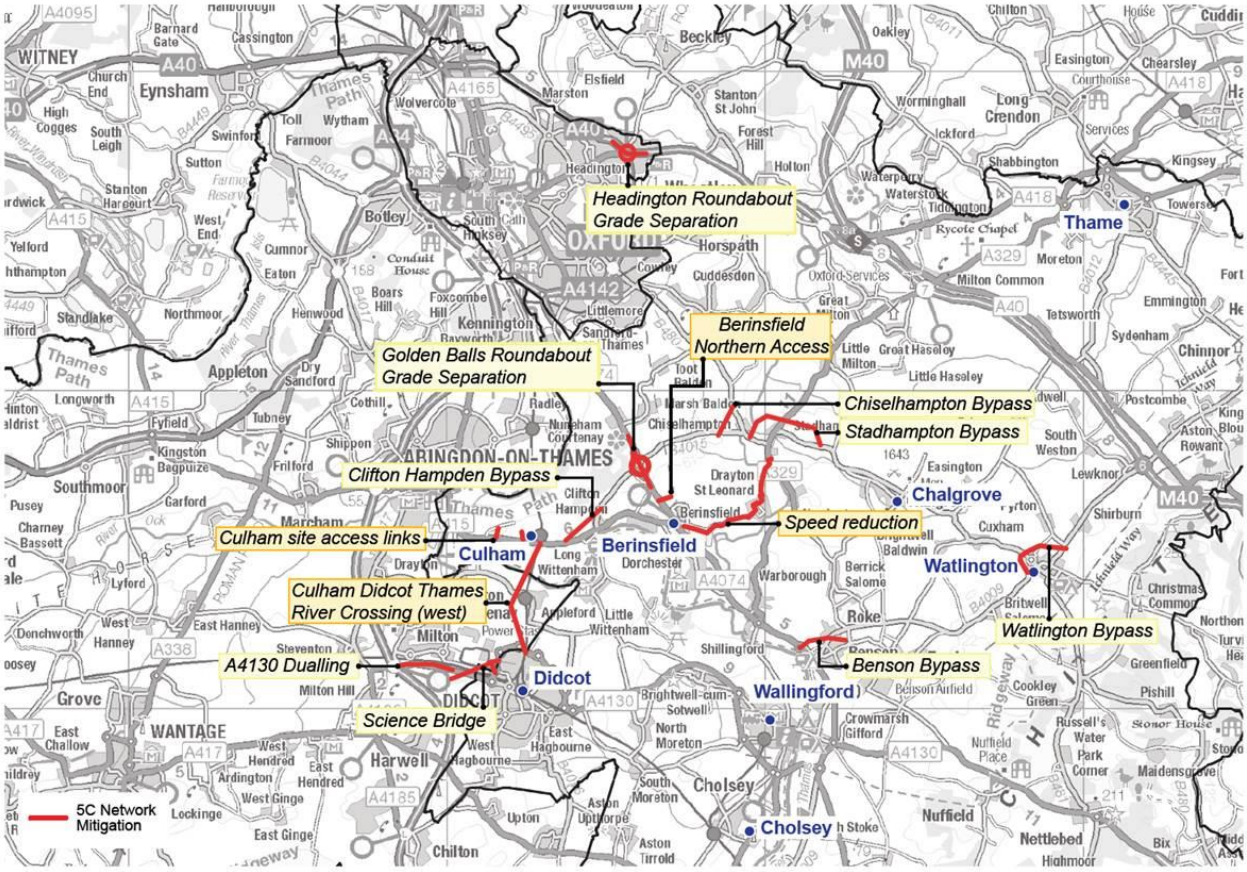
## 3.2. Transport Network Assumptions

Scenario 5c includes two new highway schemes in addition to those that were included in Scenario 5b.

- The Golden Balls A4074/B4015 roundabout has been grade separated to remove the junction for the A4074 in both directions. The scheme comprises of a single lane in each direction on the overpass for the A4074 with single lane on and off-slips linking to the B4015.
- The Headington A40/A420 (London Road) roundabout has also been grade separated for the A40 in both directions. The scheme comprises of two lanes in each direction on the overpass for the A40. The ground level roundabout remains under signal control as this was found to operate at a higher capacity. The Bayswater Road arm of the roundabout also remains in its current state as unsignalised. Signal timings at the junction were optimised using SATURN. With this scheme in place the A40 link road scheme included in Scenario 5b is not required and is therefore not included in Scenario 5c.

Figure 3-1 provides an overview of the proposed/ planned highway schemes included in Scenario 5c.
In addition to the major transport schemes identified, some minor access arrangement changes have been made to the Scenario 5c development sites.

**Figure 3-1 – Proposed Highway Scheme Locations for Scenario 5c**




## 3.3. Public Transport

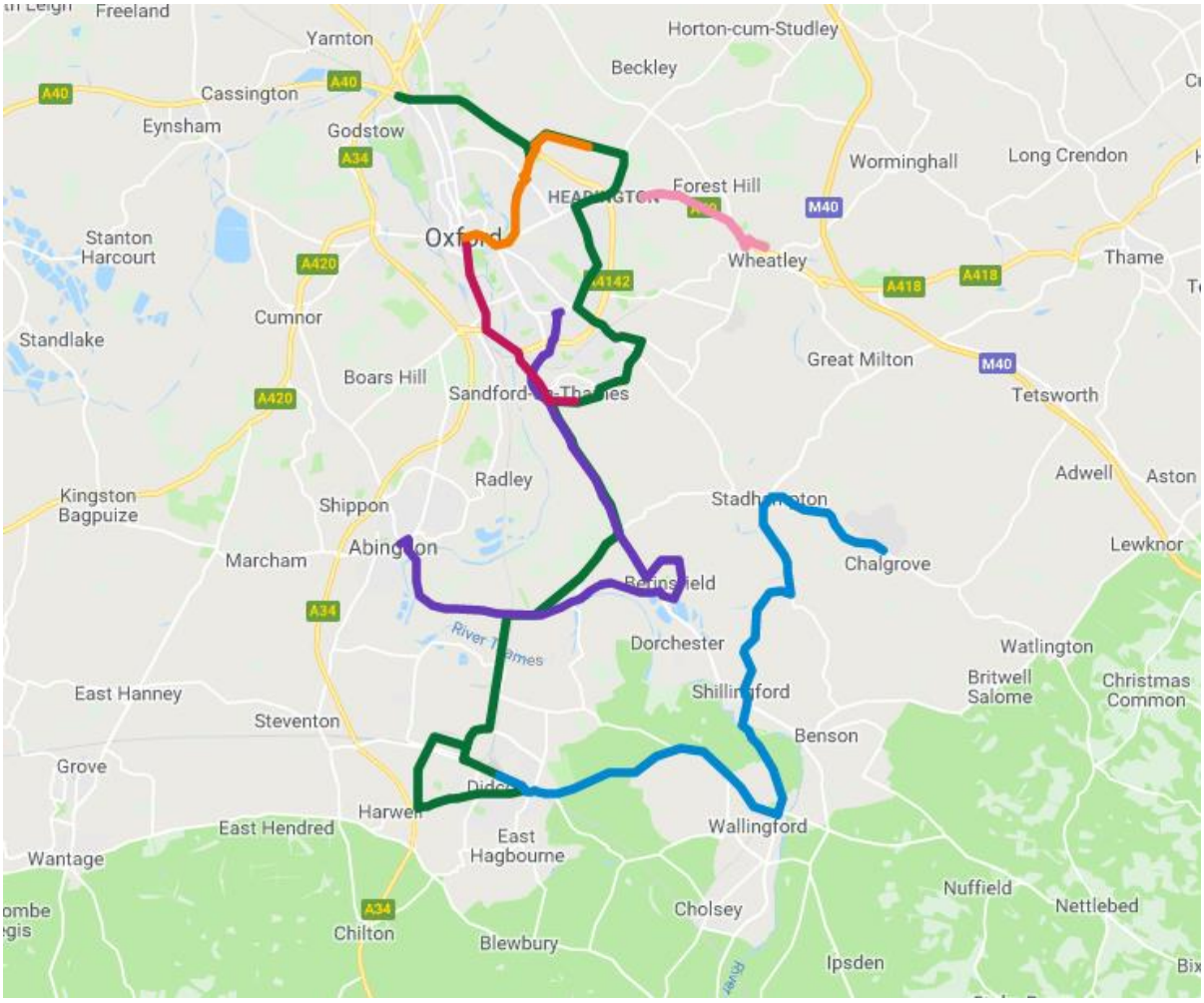
Six new bus routes to serve South Oxfordshire and the proposed new developments are included in Scenario 5c as shown in Figure 3-2 below as provided by OCC. Table 3-3 presents the assumed frequencies for each route.

The frequency of the existing route T1 between Oxford and Chalgrove has also been revised to four buses per hour in each modelled time period.

**Table 3-3 - Scenario 5c New Bus Services and Frequencies**

| Route ID | Route Name | Frequency (per hour) |
|---|---|---|
| 1 (Green) | Didcot Parkway to Northern Gateway | 4 |
| 2 (Purple) | Abingdon to Cowley Centre | 2 |
| 3 (Blue) | Chalgrove to Didcot | 2 |
| 4 (Red) | Grenoble Road to Oxford City Centre | 6 |
| 5 (Orange) | Bayswater to Oxford City Centre | 3 |
| 6 (Pink) | Wheatley to Thornhill | 2 |

**Figure 3-2 – Scenario 5c New South Oxfordshire Bus Services**




## 3.4. Variable Demand Model Results

This section compares variable demand model results between the Base, Revised DM and Scenario 5c. It also provides corresponding data taken from the Stage 3 report of the Original DM and Scenario 5b. This is provided to allow comparison between scenarios 5b and 5c, however it is important to note that the different DM's on which the two scenarios are based means direct comparisons cannot be drawn.

### 3.4.1. Model Convergence

The convergence of the Demand Model is checked for all scenarios before preparing the results/outputs, and WebTAG guidance suggests a convergence %GAP of 0.2%. The Revised DM met these criteria by converging with a level of 0.2% after 28 iterations, and the 2031 South Oxfordshire ETI Scenario 5c model ran for 30 iterations reaching a %GAP of 0.21%.

### 3.4.2. Travel Demand

Table 3-4 presents total trips by mode across the full modelled area. An increase in trips is reported across all modes in Scenario 5c, with a combined total of 60,655 additional trips over a 12-hour period compared with the Revised DM.

Table 3-6 presents the total trips by mode in South Oxfordshire only. A 3% increase in the share of trips made by public transport in scenario 5c compared to the revised Do Minimum is expected to occur as a result of the new bus services introduced in South Oxfordshire and destinations in Oxford city. Increased rail and Park & Ride patronage is also predicted as a result of congestion on the highway network causing the variable demand model response to assign a higher proportion of trips to public transport.

Table 3-7 and Table 3-8 present total 12-hour trip origins and destinations respectively for just the South Oxfordshire district.

**Table 3-4 - Summary of Demand Model Results (Full Network) - 12-hour period**

| Entire Model | Car (veh.) | P&R (veh.) | Bus only (pax) | Rail (pax) | TOTAL (persons) |
|---|---|---|---|---|---|
| Base Year | 974,474 | 6,477 | 102,649 | 30,238 | 1,431,020 |
| Original DM | 1,380,871 | 9,396 | 167,224 | 40,353 | 2,036,182 |
| Revised DM | 1,389,142 | 9,425 | 167,814 | 40,938 | 2,048,318 |
| Scenario 5b | 1,431,879 | 8,803 | 159,119 | 47,659 | 2,102,424 |
| Scenario 5c | 1,422,287 | 9,797 | 176,198 | 49,032 | 2,108,973 |

**Table 3-5 – Mode Share (Full Network) - 12-hour period**

| Entire Model | Car | Public Transport |
|---|---|---|
| Base Year | 90.7% | 9.3% |
| Original DM | 89.8% | 10.2% |
| Revised DM | 89.8% | 10.2% |
| Scenario 5b | 90.2% | 9.8% |
| Scenario 5c | 88.8% | 11.2% |

**Table 3-6 – Mode Share (South Oxfordshire) - 12-hour period**

| Table | Car | Public Transport |
|---|---|---|
| Base Year | 96.4% | 3.6% |
| Original DM | 95.2% | 4.8% |
| Revised DM | 95.1% | 4.9% |
| Scenario 5b | 94.6% | 5.4% |
| Scenario 5c | 92.1% | 7.9% |

**Table 3-7 - Trip Origins (South Oxfordshire) - 12-hour period**

| South Oxfordshire | Car (veh.) | P&R (veh.) | Bus only (pax) | Rail (pax) | TOTAL (persons) |
|---|---|---|---|---|---|
| Base Year | 159,453 | 385 | 4,185 | 3,801 | 219,867 |
| Original DM | 186,563 | 588 | 7,288 | 5,180 | 258,340 |
| Revised DM | 193,567 | 612 | 7,713 | 5,487 | 268,368 |
| Scenario 5b | 222,677 | 502 | 9,364 | 7,295 | 310,380 |
| Scenario 5c | 222,441 | 748 | 14,055 | 10,110 | 317,945 |

**Table 3-8 - Trip Destinations (South Oxfordshire) - 12-hour period**

| South Oxfordshire | Car (veh.) | P&R (veh.) | Bus only (pax) | Rail (pax) | TOTAL (persons) |
|---|---|---|---|---|---|
| Base Year | 157,434 | 300 | 3,526 | 3,608 | 216,098 |
| Original DM | 182,627 | 449 | 6,705 | 4,961 | 252,190 |
| Revised DM | 189,313 | 468 | 7,265 | 5,275 | 261,923 |
| Scenario 5b | 218,454 | 394 | 9,938 | 6,968 | 305,043 |
| Scenario 5c | 218,047 | 562 | 15,590 | 10,889 | 314,353 |

## 3.5. Network Performance

The modelled highway network performance within the District for Scenario 5c compared against the revised Do Minimum are shown in Table 3-9 and Table 3-10. These statistics give a high-level summary of how the model has responded to the changes in land use assumptions and network changes.

**Table 3-9 - South Oxfordshire District Modelled Network Performance - AM Peak Hour**

| | South Oxfordshire | | |
|---|---|---|---|
| | Revised Do Minimum | Scenario 5c | Difference (S5c-DM) |
| Delay (PCU-hr) | 532.1 | 646.1 | 114 |
| Total Time (PCU-hr) | 6,115.2 | 6,672.2 | 557 |
| Total Distance (PCU-km) | 380,531.3 | 394,748.6 | 14,217.3 |
| Average Speed (km/hr) | 62.2 | 59.2 | -3 |

**Table 3-10 - South Oxfordshire District Modelled Network Performance - PM Peak Hour**

| | South Oxfordshire | | |
|---|---|---|---|
| | Revised Do Minimum | Scenario 5c | Difference (S5c-DM) |
| Delay (PCU-hr) | 634.5 | 627.3 | -7.2 |
| Total Time (PCU-hr) | 6,798.2 | 7,346.3 | 548.1 |
| Total Distance (PCU-km) | 411,936.9 | 431,584.4 | 19,647.5 |
| Average Speed (km/hr) | 60.6 | 58.7 | -1.9 |

The forecast vehicle flow difference in South Oxfordshire between Scenario 5c and the Revised DM for the AM and PM peak hours are shown in Figure 3-3 and Figure 3-4. Volume to capacity plots for both hours are shown in Figure 3-5 and Figure 3-6. The key observations from comparison of these two scenarios are given below.

The impact of the two major schemes added in 5c:

- The grade separation scheme at the A40 Headington roundabout removes congestion on the A40 itself in both directions through the junction. This is predicted to result in an increase in average speeds along the A40 corridor during both morning and evening peaks compared to the Revised DM scenario. The ground level signal-control roundabout operates without any significant delays.
- The Golden Balls roundabout grade separation scheme is predicted to reduce delay at the junction itself, with the Oxford Road and B4015 arms experiencing journey time savings. Delay on the A4074 itself at the existing junction is removed as a result of the grade separation scheme, however the removal of this constraint causes increased traffic flow and delay at downstream junctions, particularly northbound in the AM peak hour. This will need review in more detail as the mitigation scheme is developed further.
- An amber node is present in Figure 3-6, just north of the village of Nuneham Courtenay on the A4074. Rather than representing a specific junction, this node is present to create a short link on which to restrict speed to represent the 30 mph speed limit through the village.

The following observations from the Stage 3 report with regards to the impact of the Scenario 5b schemes all also still apply when comparing Scenario 5c against the Revised DM.

- There is a reduction in traffic flow at Drayton-St Leonard related to speed reductions on this link. Lower flows are likely to relieve pressure on the A329 northbound at Stadhampton compared to the DM.
- Additional demand at Grenoble Road is likely to increase network stress along the A4074. Overall, development traffic is likely to be attracted to less congested corridors such as the B4015 and A329/Milton Road, and the B480 northbound link. These alternative routes may also potentially be used by traffic originating from the Culham, Berinsfield, and Chalgrove sites instead of more congested main corridors.

The below observation differs from the performance in the Stage 3 report.

- Scenario 5c includes a western alignment of the Thames River Crossing. This alignment allows for a more even distribution of demand along the proposed link. The Thames River Crossing is expected to attract volumes of traffic sufficient to cause its northern section to operate marginally above operational capacity in both directions in the PM peak hour, and in the southbound direction in the AM peak hour. However, dual access points to the development at Culham are also forecast to relieve congestion along the A415. Refinement of the detailed design of the Culham Crossing may be required to ensure the planned scheme operates as intended.

The following observation relates to performance on the A40.

- The V/C plot in the evening peak shows two locations south east of Oxford close to the M40 with links that are operating above capacity. These are on the A40 (EB) at the M40 Junction 8A and the A40 London Road (SB) at the junction with the A329, not the M40 itself.

**Figure 3-3 - Actual Flow difference (Scenario 5c – DM) (PCU/hr) – AM Peak Hour**

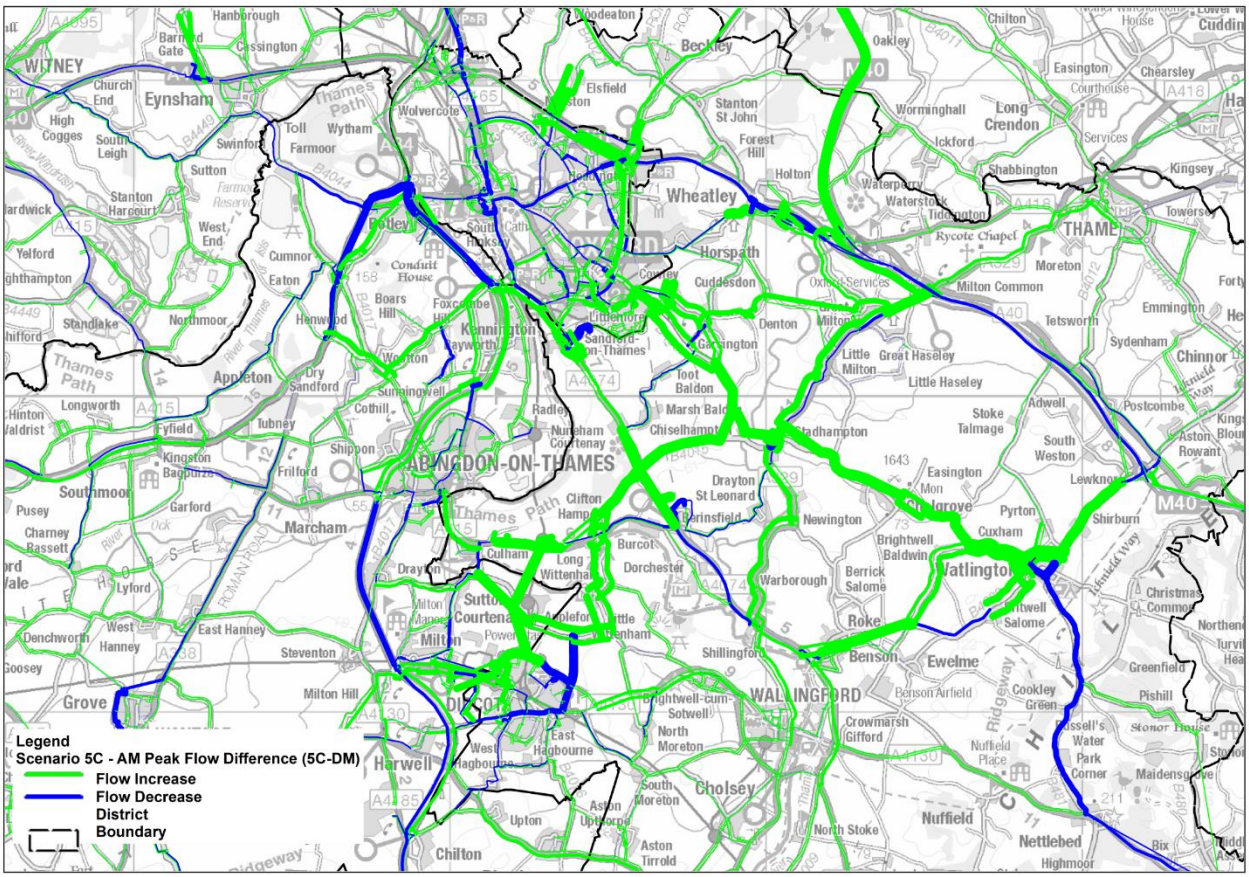



**Figure 3-4 - Actual Flow difference (Scenario 5c – DM) (PCU/hr) – PM Peak Hour**

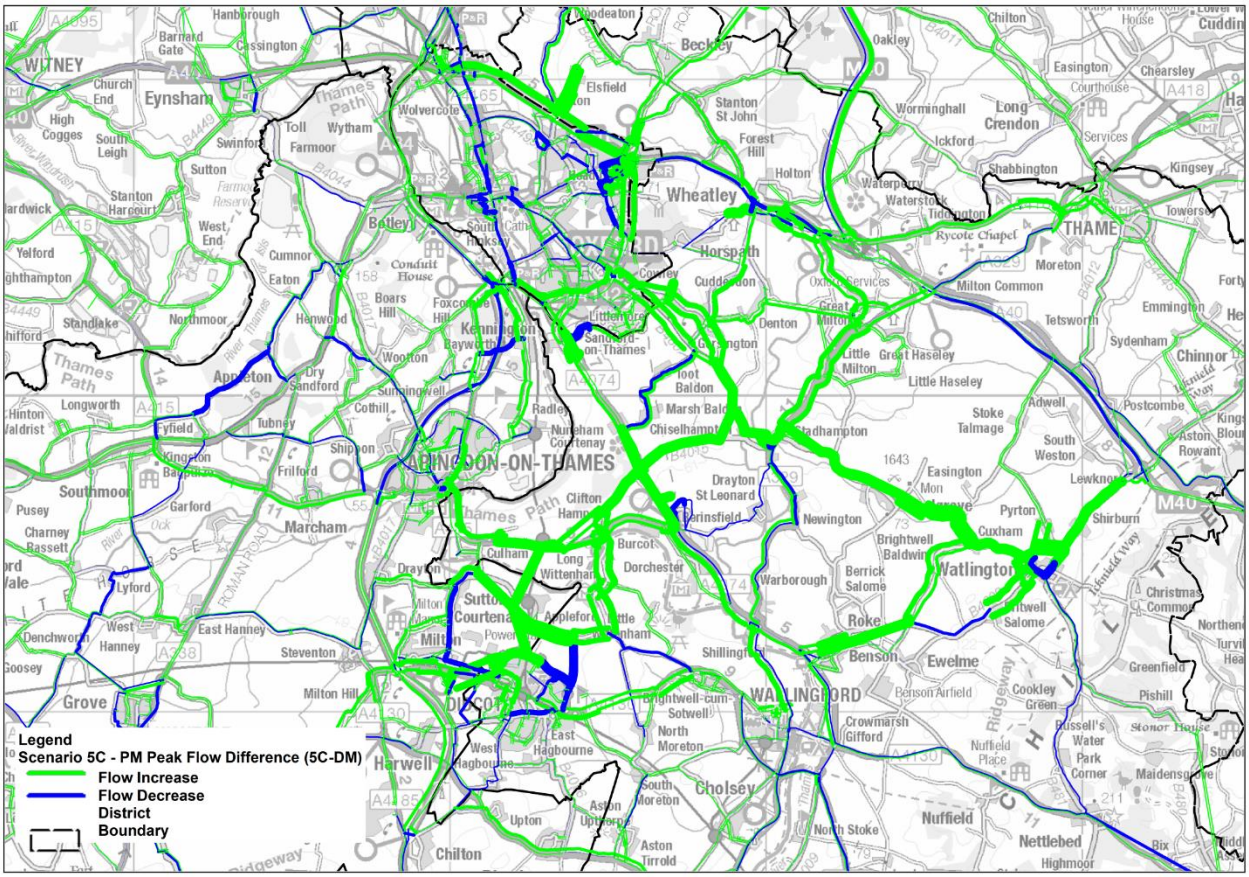


**Figure 3-5 – Link and Junction V/C (Scenario 5c) – AM Peak Hour**

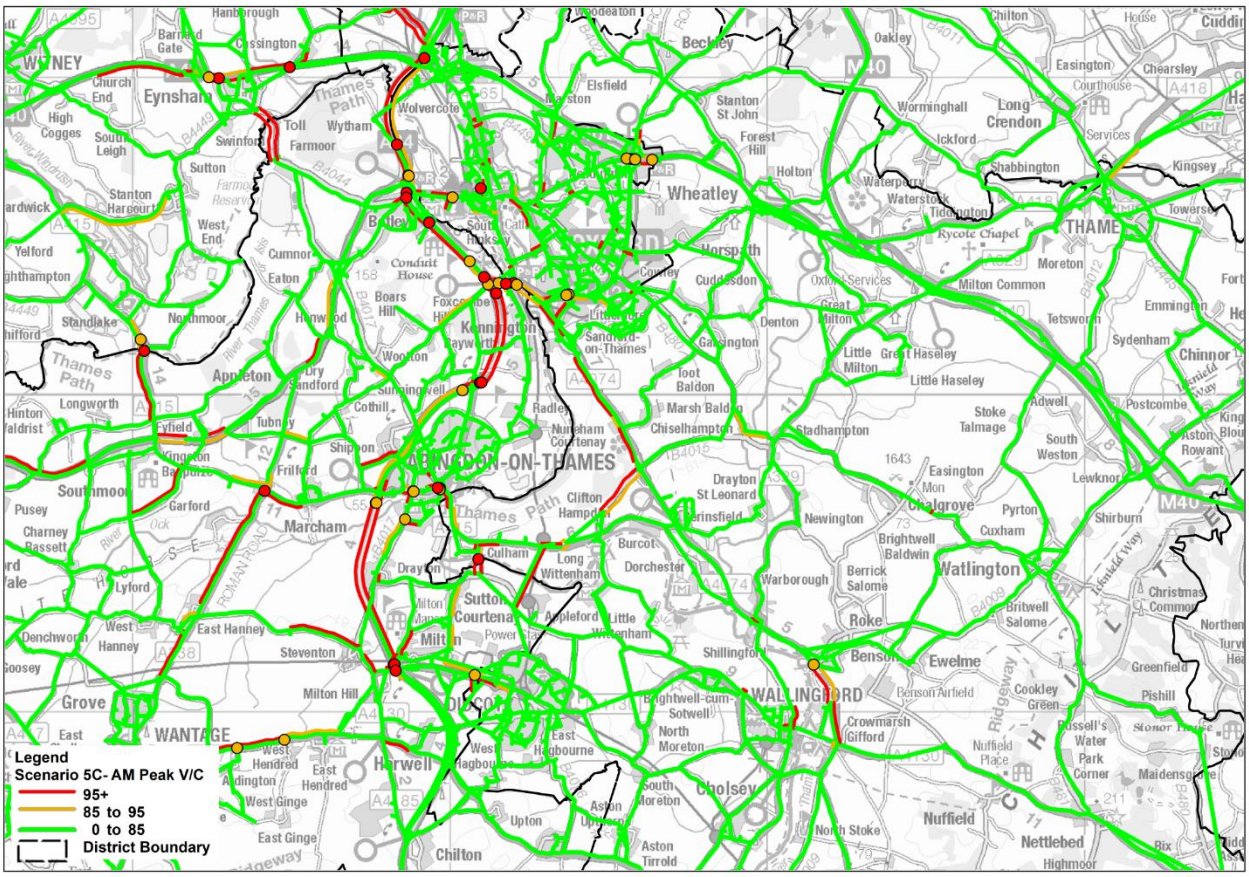
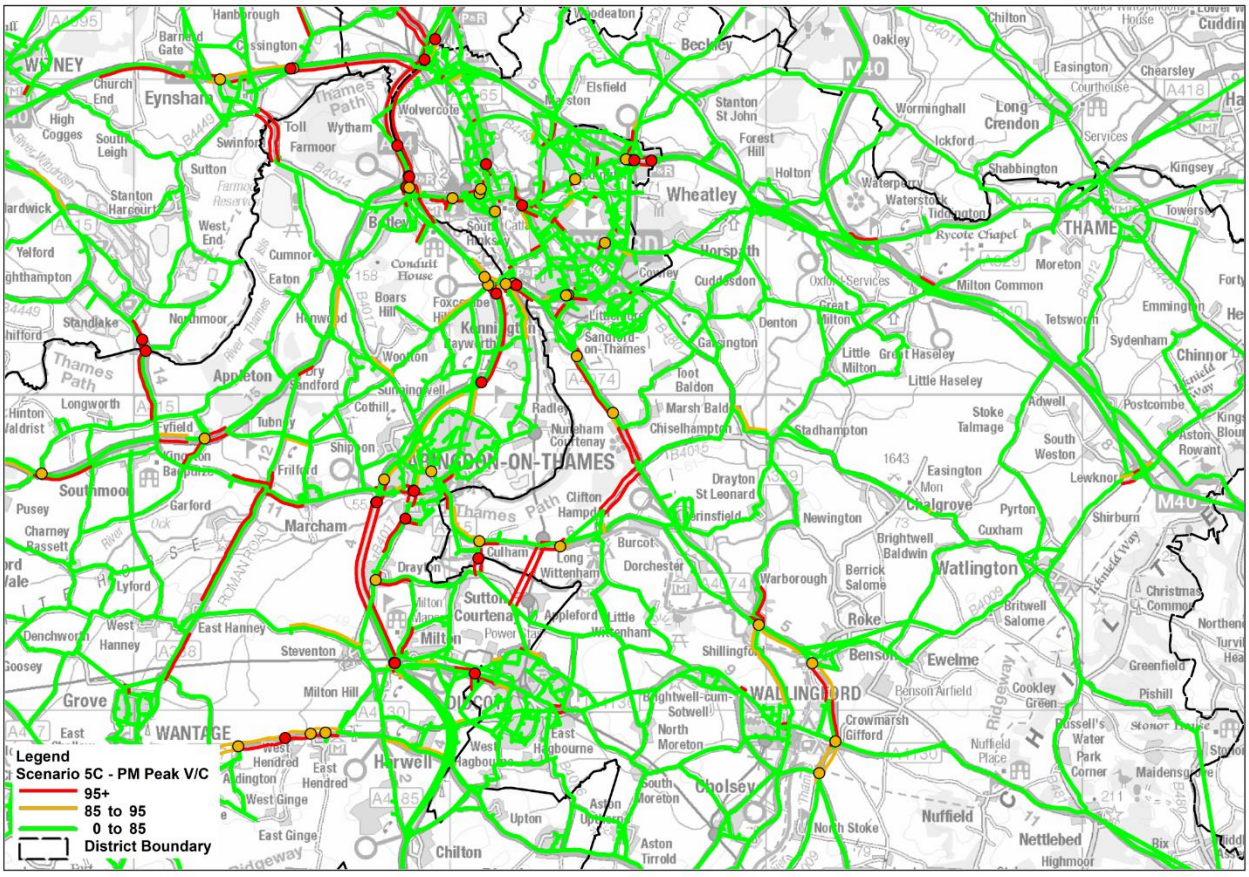



**Figure 3-6 - Link and Junction V/C (Scenario 5c) – PM Peak Hour**



# 4. Summary

This addendum report documents the modelling work undertaken by Atkins using the OSM to assess an additional land use and transport mitigation scenario in relation to the ETI for the emerging SODC Local Plan. Scenario 5c is based on a Revised DM 2031 scenario, updated from the DM used in previous mitigation scenarios to include an extra 3,158 dwellings based on planning commitments known as of Autumn 2018, incorporating development sites with permission and those within made neighbourhood plans.

Scenario 5c comprises further growth of 15,931 dwellings in South Oxfordshire and two new mitigation schemes above those included in Scenario 5b: grade separation of the Golden Balls roundabout; and grade separation of the Headington A40/A420 Roundabout (rather than the A40 link road included in Scenario 5b). It also includes the introduction of six new bus routes in South Oxfordshire.

The grade separation at Headington roundabout is predicted to remove congestion on the A40, increasing average speeds along the corridor in both peak hours. The Golden Balls grade separation is expected to reduce junction delay, but also increase flow on the A4074 to an extent which may cause congestion at junctions further north.

An increase in the share of trips made by public transport in scenario 5c compared to the revised Do Minimum is predicted as a result of the new bus services introduced and increased congestion on the highway network effecting mode choice.