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Cherwell DISTRICT COUNCIL NORTH OXFORDSHIRE

URGENT BUSINESS AND SUPPLEMENTARY INFORMATION

Council

20 October 2014

Agenda Item Number	Page	Title	Officer Responsible	Reason Not Included with Original Agenda
11.	(Pages 1 - 256)	Approval of Main Modifications of Cherwell Local Plan – Supplementary Information	Head of Strategic Planning and the Economy	Documents still in production

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OXFORDSHIRE COUNTY COUNCIL

Cherwell Local Plan Main Modifications – a summary of the transport technical notes

General comments

The proposed growth, without any mitigation measures, would result in significant increases in over capacity queuing and total travel time and a decrease in average speed across the highway network compared with the 2012 base.

Bicester Transport Modelling report

- The key aim of the Bicester modelling work was to provide evidence on whether the need for a new perimeter road was triggered within the Plan period with the proposed increase in growth. The consultants were also asked to re-run the earlier peripheral route options work to ensure there were no changes to the better performing options.

- The technical note reports that the North West Bicester proposed solutions mitigate their impact on the western side of town. However, there is the need for additional capacity for Boundary Way and the other peripheral routes to the north and east of the town.

- The two south-east perimeter road options perform better than one to the north-west. The more southerly route performs the best, but this is due to issues with the Vendee Drive junction which are currently being investigated and which once resolved are expected to redress this balance.

- The technical note recommends that further study is required into possible improvements to the northern, eastern and southern peripheral corridors. Initial feasibility engineering work has begun to look into these issues and is showing that there is scope to increase the junction and lane capacities along Southwold Lane, Skimmingdish Lane and Charbridge Lane.

- The design, consultation and approval processes for schemes on the existing peripheral routes will follow normal procedures. Work is also being carried out to test the phasing of these improvements alongside the introduction of sustainable transport measures within the town itself.

- The phasing work will help to inform the Infrastructure Delivery Plan and more information on the emerging package of measures will be provided for a statement of Common Ground with Cherwell District Council prior to the Examination.

Banbury Highway Model Forecasting Report

- The following infrastructure improvements to support Local Plan modifications were tested (Scenario 4):
    - Addition of a new link road between the A361 Bloxham Road and White Post Road;
    - Addition of measures for the promotion of Bankside including removal of traffic calming;
    - Traffic calming along the A361 South Bar Street/ Horsefair corridor;
    - Signalisation of the Hennef Way/Ermont Way junction, plus associated changes to the Middleton Road/Ermont Way roundabout.

- Assessment showed that problems would still exist on the network with the above mitigation, most notably at:
    - Junction 11 of the M40;
    - Hennef Way/Concord Avenue junction and to a lesser extent the Hennef Way/Ermont Way junction;
    - Bridge Street/Cherwell Street junction

- A new link road east of Junction 11, between Overthorpe Way and the A422 was tested. The results show that this would bring significant benefits to the highway network, particularly at M40 Junction 11. However, Hennef Way/ Concord Avenue junction is predicted to remain over capacity. A rough estimate of the value of time saving benefits compared to Scenario 4 in 2031 is approximately £5m per annum.

- A south east link road was also tested between Bankside and Ermont Way/Overthorpe Road. This also showed a significant benefit to the performance of Hennef Way junctions, and Swan Close Road/ Upper Windsor Street and Cherwell Street/ Bridge Street junctions. However, increased delays and queuing would occur at Junction 11, with A361 forecast to have significant delays (over 20 minutes). A rough estimate of the value of time saving benefits compared to Scenario 4, in 2031 is approximately £2.5m per annum.

- Further modelling work is ongoing to test:
    - an M40 junction to the south of Banbury
    - a combination of the link road to the east of the M40 + a south-east link road
    - 2021 testing and information on the phasing of infrastructure

Upper Heyford Technical Note

- The conclusion from this transport modelling technical note is that whilst the network surrounding the site is forecast to experience some stress which would deter car traffic from travelling, this could be offset by an increase in bus provision.

- The additional dwellings would have an impact on the highway network despite the public transport enhancements and a signals mitigation package has been tested which could reduce the impact on Middleton Stoney. Further work is required to test the performance of affected junctions in detailed local junction modelling software and to refine the strategy of traffic movements in the area.

- The modelling work to date has shown that increased public transport access to Upper Heyford would be essential. A feasibility study to investigate the appropriate level of improved service and viability is required and a travel behaviour package of measures will need to be developed to address the modal shift issue.

October 2014

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Technical note

Project:	Cherwell Local Plan Modifications	**To:**	Oxfordshire County Council
Subject:	Cherwell District Technical Note	**From:**	Graham Bown
Date:	20 October 2014	**cc:**	

1. Introduction

Cherwell District Council is consulting on modifications to the Submission Cherwell Local Plan including modified Policies Maps and an update to a Sustainability Appraisal. The documents are published for consultation from Friday 22 August 2014 to Friday 3 October 2014 prior to submission to the Secretary of State for Communities and Local Government.

The public Examination hearings into the Submission Local Plan were suspended on 4 June 2014 for six months. This was to enable the Council to put forward proposed modifications to the Plan involving increased new housing delivery over the plan period to meet the full, up to date, objectively assessed needs of the district, as required by the National Planning Policy Framework (NPPF) and based on the Oxfordshire Strategic Housing Market Assessment 2014 (SHMA).

These Main Modifications are now available for public comment for a period of six weeks before they are formally submitted to the Secretary of State and the public Examination of the Local Plan re-commences. A number of minor modifications are also being made available for viewing at the same time. Comments made must relate to proposed modifications only. Cherwell district council is not consulting on other aspects of the Plan.

Atkins have already provided transport modelling advice for OCC on this subject, but now the final figures for the modifications have been released and some scenarios need to be re-run and also some additional outputs are required. This brief commissions Atkins to undertake the transport modelling work required towards this task. The work will use the Oxfordshire Strategic Model in combination with understanding the trip distribution into and out of the Cherwell district/modelled area.

1.1. Model System

The work is based on the new Oxfordshire Strategic Model (OSM). The base model has recently been completed and early forecasts for 2031 have been finalised. The OSM covers the strategic links in Oxfordshire and has a detailed modelled area and fully modelled area shown in Figure 1-1.

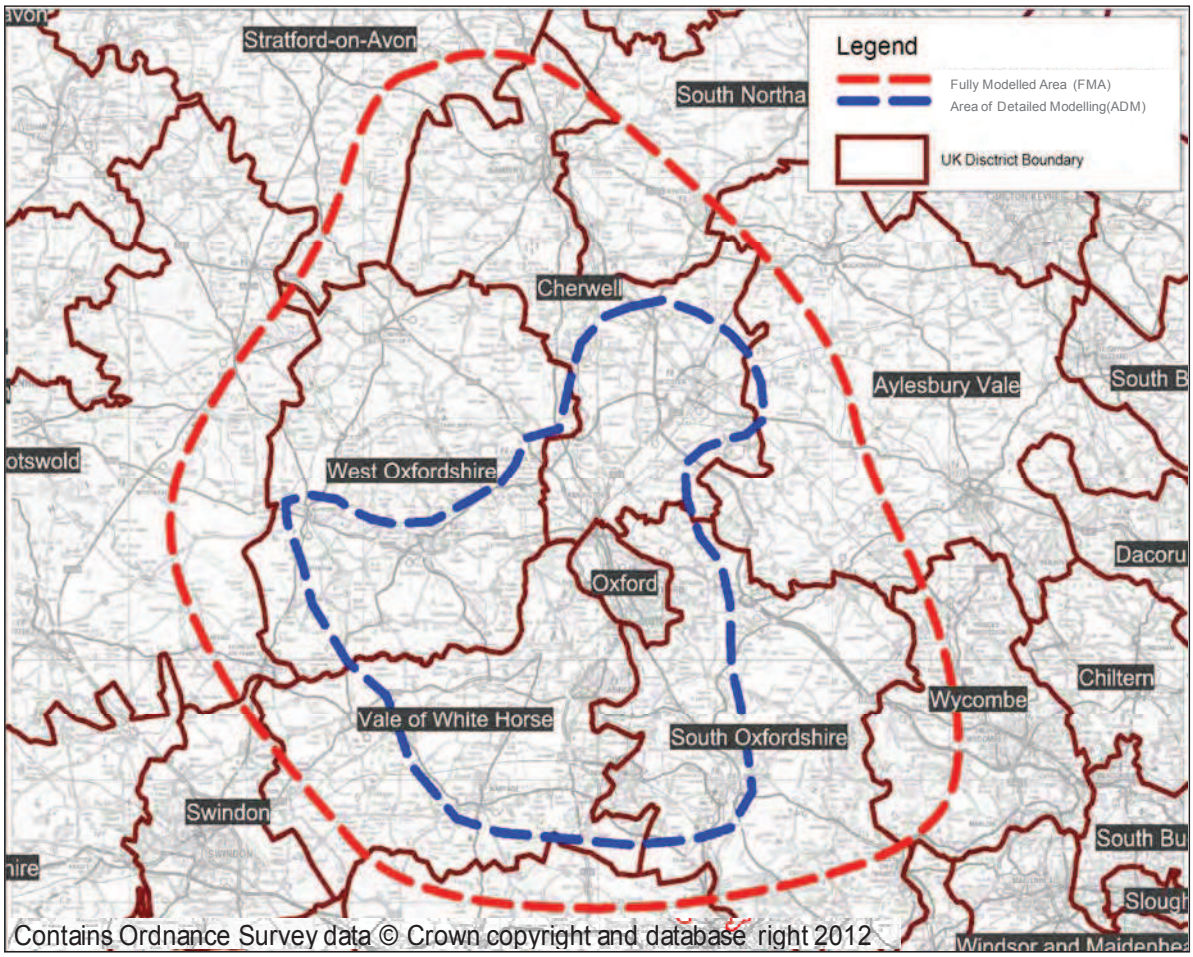
The detailed modelled area reflects the extent to which transport demand data has been collected and includes a representation of all movements to, from and within the county. Within the detailed modelled area all strategic highway links will be included although not all junctions will be simulated. The fully modelled area reflects the extent of calibration and validation data used in model development and therefore reflects the area in which the model's performance is known.

Cherwell straddles the detailed modelled area, with Bicester and Upper Heyford being within the detailed modelled area but Banbury outside it. This means that Banbury does not have the same level of model development as Bicester and as a result does not have the same level of certainty regarding traffic forecasts in the area. The impact of changes in transport demand in Banbury should only be considered as indicative. However, a stand-alone highway model for Banbury has been developed, and the impacts of changes in transport demand in Banbury are therefore reported in a separate Technical Report for Banbury.

Technical note

Testing of the highway mitigation options for Banbury are more progressed in the Banbury Highway Model [BHM], compared to OSM (which is an unvalidated model for the Banbury area). Therefore the Technical Report for the BHM should be considered more up-to-date when considering the highway network impacts in Banbury.

Figure 1-1 Detailed Modelled Area



The modelling work has been undertaken using a validated 2013 base year demand model and 2031 forecast year scenarios as follows and are described in more detail in following sections:

- Base Year 2013;
- 2031 Local Plan Modifications demand with no new mitigation measures (Scenario 2); and
- 2031 Local Plan Modifications demand with emerging mitigation measures (Scenario 5).

The two forecast scenarios described in this Technical Note are part of a series of scenarios run in the OSM looking at the impact of the Local Plan Modifications. Scenario 2 includes the Local Plan mitigation measures whilst Scenario 5 includes additional measure to mitigate the impact of the Local Plan Modifications. These are initial measures identified for testing in the scenario and are not the final set of measures.

A forecast year scenario has two elements: transport demand (trips by mode and time) and transport supply (the networks). Transport demand is formed from a reference case, known as a **Reference Forecast**. Transport supply reflects the existing networks and all certain changes up to the forecast year of 2031. A **Reference Forecast** is a term specific to setting up a forecast with a variable demand model and is an intermediate step to producing the Forecast Scenario. It uses the growth in trip ends over the forecasting period, but does not take into account changes in travel cost.

The **Forecast Scenario** reflects changes to the Reference Forecast brought about by the changes in network costs and is an iterative process within the demand model which can change trip frequency, time,

mode and destination. The iterations stop once a satisfactory level of convergence is reached (reflecting stability in the process) and the Forecast Scenario demand is created and its final assignment forms the model outputs.

An understanding of this process enables the results to be interpreted with more clarity. Any difference between the **Reference Forecast** and the **Forecast Scenario** will be a result of travel costs suppressing travel demand in cases where Reference Forecast > Forecast Scenario (or facilitating travel in the reverse). This is best viewed over a 12 hour period rather than specific modelled hours to account for changes in the time, mode and destination of the trip. Any final differences between the **Reference Forecast** and the **Forecast Scenario when time of day and mode are taken into account** are therefore due to trip frequency. Note that model output is vehicles for cars and people for public transport passengers.

To aid model convergence and reflect a general trend towards peak spreading (the process whereby the broadening of traffic flow profiles in peak periods in congested urban networks as traffic demand increases) the demand model assumes a flat peak period (7am to 10am and 4pm to 7pm), creating a rush-three hour rather than single rush-hour. The impact would be to slightly reduce demand between 8am and 9am and between 5pm and 6pm as more traffic would travel after the peak hour (analysis shows that flows before the 'peak hour' are similar in magnitude to the 'peak hour'). The benefit of this is improved model convergence.

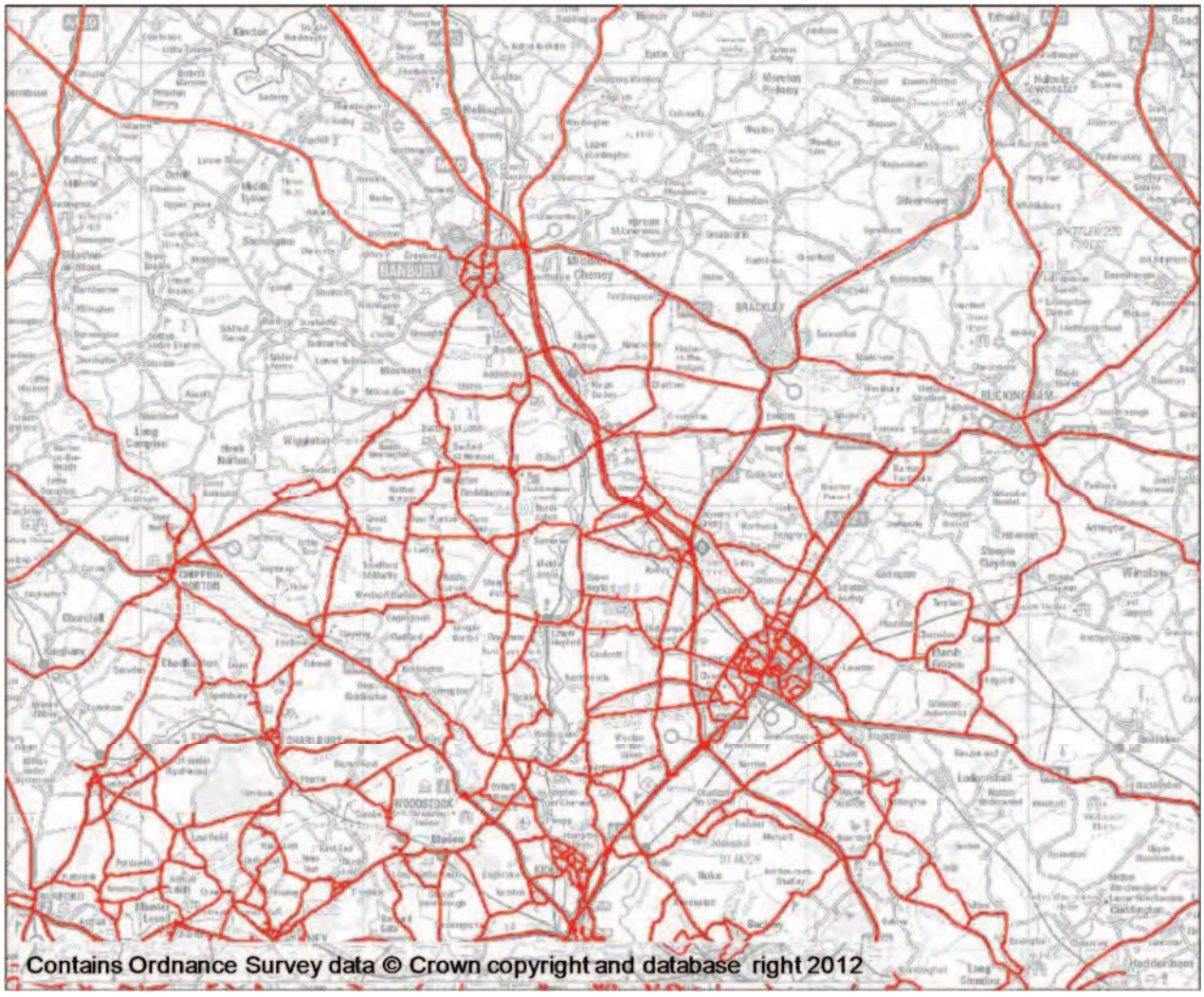
Technical note

2. Base Year 2013

Cherwell district's strategic transport network includes Bicester and Upper Heyford being within the detailed modelled area but Banbury located outside of it. As stated previously, the impact of changes in transport demand in Banbury, as assessed using the Banbury Local Highway Model, are reported in a separate Technical Report.

The strategic highway network coded in Cherwell area is presented in Figure 2-1 below.

Figure 2-1 Cherwell Highway Network



2.1. Base Year Demand

Table 2-1 to Table 2-4 summarise the aggregated demand for the Base Year for Cherwell District and for the full OSM model. In Cherwell approximately 223,000 person movements are made during the 12 hour period from 7am to 7pm, with approximately 5% of motorised journeys (excluding walking and cycling) taking place by public transport.

Table 2-1 Base Year demand for Cherwell (AM period)

Base Year AM	Cherwell District		Entire model
	Origin	Destination	Origin/Destination
Car (vehicles)	41382	40358	236631
Bus (people)	3565	1733	30406
Rail (people)	1884	763	9302
TOTAL (people)	57177	52944	335497
Public Transport Mode Share	9.5%	4.7%	11.8%

Table 2-2 Base Year demand for Cherwell (IP period)

Base Year IP	Cherwell District		Entire model
	Origin	Destination	Origin/Destination
Car (vehicles)	70922	71421	413268
Bus (people)	3503	3731	49298
Rail (people)	1461	1546	9824
TOTAL (people)	93617	94553	575707
Public Transport Mode Share	5.3%	5.6%	10.3%

Table 2-3 Base Year demand for Cherwell (PM period)

Base Year PM	Cherwell District		Entire model
	Origin	Destination	Origin/Destination
Car (vehicles)	55719	56382	316028
Bus (people)	1389	2868	30314
Rail (people)	1125	1917	11112
TOTAL (people)	72163	75263	436461
Public Transport Mode Share	3.5%	6.4%	9.5%

Table 2-4 Base Year demand for Cherwell (12 hour)

Base Year 12 hour	Cherwell District		Entire model
	Origin	Destination	Origin/Destination
Car (vehicles)	168023	168161	965928
Bus (people)	8456	8332	110019
Rail (people)	4471	4226	30238
TOTAL (people)	222956	222760	1347667
Public Transport Mode Share	5.8%	5.6%	10.4%

2.2. Highway Network

This section describes the highway network performance in the Cherwell District. The overall Cherwell District network statistics for the model simulation area are shown below in Table 2-5.

Table 2-5 Base Year Network Statistics – Cherwell District

Time	Metric	Results	Unit
Morning Peak Hour	Total Time	9555.5	Pcu Hr
	Delay	921	Pcu Hr

Time	Metric	Results	Unit
	Total distance	689783.0	Pcu KM
	Speed	72.2	KM/h
Inter Peak Hour	Total Time	6826.4	Pcu Hr
	Delay	421.7	Pcu Hr
	Total distance	539370.6	Pcu KM
	Speed	79.0	KM/h
Evening Peak Hour	Total Time	11057.2	Pcu Hr
	Delay	1631	Pcu Hr
	Total distance	745919.4	Pcu KM
	Speed	67.5	KM/h

Overall, the speed in Cherwell District is in the same range as of OSM model which is of 76 km/h, 83 km/h and 74 km/h in Morning Peak, Inter Peak and Evening Peak respectively.

At a more detailed level the performance on individual links and junctions (for the area as shown in Figure 2-2) is provided in Table 2-6 for the morning and evening peaks. The assessment is organised in to routes and focuses primarily on the link performance in to key junctions along the route and also provides further detail relating specifically to junction performance where that differs to the link performance.

In the table junctions are highlighted in red if in the AM or PM peak the junction is over capacity and is highlighted in amber if in the AM or PM peak the junction is operating at capacity.

Figure 2-3 and Figure 2-4 show the network link and junction performance are measured by the volume to capacity (v/c) ratio and highlights those links on the highway network that are operating below operational capacity (v/c <85%), at operational capacity (v/c between 85% and 95%) and those that are exceeding operational capacity (v/c >95%).

The junction performance described below refers to results from a forecast of the strategic highway model and it is possible that detailed junction modelling software would not only be able to optimise signalised junction performance, but also produce marginally different junction performance results.

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Figure 2-2 Cherwell Area of Assessment

Table 2-6 Base Year (2013) network performance assessment

Link	Junction	Junction Number	Morning peak hour	Evening peak hour
A361	London Road and Banbury Road Junction	1	Overall the performance of this junction is below capacity. However 3 turns perform over capacity. With reference to the links entering this junction, the northbound link performs over capacity.	Overall the performance of this junction is below capacity. However 3 turns perform over capacity. With reference to the links entering this junction, the northbound link performs over capacity.
	A361 and B4031 Junction	2	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.
	A361 and Bloxham Road Junction	3	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.
	S Newington Road and Barford Road Junction	4	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.
	A361 and B4100 Junction	5	Overall the performance of this junction is below capacity. However 2 turns perform over capacity. With reference to the links entering this junction, the northbound link performs over capacity.	Overall the performance of this junction is below capacity. However 1 turn perform over capacity. With reference to the links entering this junction, the northbound link performs at capacity.
A4260	A4260 and Twyford Road Junction	6	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.

Link	Junction	Junction Number	Morning peak hour	Evening peak hour
	A4260 and Aynho Road Junction Adderbury	7	Overall the performance of this junction is below capacity. However 1 turn perform at capacity and 2 turns perform over capacity. With reference to the links entering this junction, the westbound link performs over capacity.	Overall the performance of this junction is below capacity. However 1 turn perform at capacity. With reference to the links entering this junction, all links perform below capacity.
	A4260 and Hempton Road Junction Deddington	8	Overall the performance of this junction is at capacity. However 2 turns perform at capacity and 9 turns perform over capacity. With reference to the links entering this junction, the eastbound link performs over capacity; the southbound link performs over capacity; the westbound link performs over capacity.	Overall the performance of this junction is over capacity. However 12 turns perform over capacity. With reference to the links entering this junction, the northbound link performs over capacity; the eastbound link performs over capacity; the southbound link performs over capacity; the westbound link performs over capacity.
	A4260 and Somerton Road Junction North Aston	9	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.
	A4260 and B4030 Junction Hopcrofts Holt	10	Overall the performance of this junction is below capacity. However 3 turns perform over capacity. With reference to the links entering this junction, the southbound link performs over capacity.	Overall the performance of this junction is below capacity. However 1 turn perform at capacity and 2 turns perform over capacity. With reference to the links entering this junction, the northbound link performs over capacity.
	A4260 and Langford Lane Junction	11	Overall the performance of this junction is below capacity. However 1 turn perform over capacity. With reference to the links entering this junction, all	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.

Link	Junction	Junction Number	Morning peak hour	Evening peak hour
			links perform below capacity.	
M40 J11	Slips		The M40 northbound and southbound off-slips perform below operational capacity.	The M40 northbound and southbound off-slips perform below operational capacity.
	Circulation		The circulatory carriageway is over capacity.	The circulatory carriageway is over capacity.
M40 J10	Slips		The M40 northbound and southbound off-slips perform below operational capacity.	The M40 northbound and southbound off-slips perform below operational capacity.
	B430 Roundabout	12	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.
	A43 Roundabout	13	Overall the performance of this junction is below capacity. With reference to the links entering this junction, the southbound link performs at capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.
Bicester Ring Road	Middleton Stoney Road Junction	14	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.
	Banbury Road Junction	15	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.
	Launton Road Junction	16	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.

Link	Junction	Junction Number	Morning peak hour	Evening peak hour
	A41 Junction	17	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.
A34	A34 and M40 Junction 9		The M40 and A34 northbound and southbound off-slips perform below operational capacity.	The M40 and A34 northbound and southbound off-slips perform below operational capacity.
	A34 Circulation at M40 Junction 9		The circulatory carriageway is over capacity.	The circulatory carriageway is over capacity.
	A34 Slips Kidlington		The A34 southbound on-slip performs at capacity.	The A34 northbound and southbound off-slips perform below operational capacity.
	A34 Circulation at M40		The circulatory carriageway below operational capacity.	The circulatory carriageway below operational capacity.
Hennef Way	Hennef Way and Ermont Way Junction	18	Overall the performance of this junction is below capacity. However 3 turns perform over capacity. With reference to the links entering this junction, the northbound link performs over capacity; the westbound link performs at capacity.	Overall the performance of this junction is over capacity. However 2 turns perform at capacity and 4 turns perform over capacity. With reference to the links entering this junction, the northbound link performs over capacity; the eastbound link performs at capacity; the southbound link performs over capacity; the westbound link performs at capacity.
	Hennef Way and Concord Avenue	19	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. However 1 turn perform at capacity. With reference to the links entering this junction, the eastbound link performs at capacity.
	Hennef Way and Southam Road	20	Overall the performance of this junction is below capacity.	Overall the performance of this junction is below capacity.

Link	Junction	Junction Number	Morning peak hour	Evening peak hour
			With reference to the links entering this junction, all links perform below capacity.	With reference to the links entering this junction, the southbound link performs at capacity.
Cherwell Street	Cherwell street and Bridge Street junction	23	Overall the performance of this junction is below capacity. However 1 turn perform over capacity. With reference to the links entering this junction, the westbound link performs over capacity.	Overall the performance of this junction is below capacity. However 2 turns perform over capacity. With reference to the links entering this junction, the westbound link performs over capacity.
Camp Road Station Rd to B4030	Camp Road and Station Road Junction	24	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.
	Camp Road and Unnamed Road Junction	25	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.
	Camp Road and B4030 Junction	26	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.
Unnamed Road between Camp Road and B430	Unnamed Road and B430 Junction	27	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.
	Camp Road and Unnamed Road Junction	25	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.

Link	Junction	Junction Number	Morning peak hour	Evening peak hour
Station Road Camp Road to B4030	Station Road and B4030 Junction	28	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.
	Camp Road and Station Road Junction	24	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.
B4030 Bicester to A4260	B4030 and A4095 Howes Lane Junction	14	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.
	Middleton Stoney Junction	29	Overall the performance of this junction is below capacity. However 5 turns perform over capacity. With reference to the links entering this junction, the eastbound link performs over capacity; the westbound link performs over capacity.	Overall the performance of this junction is below capacity. However 1 turn perform at capacity and 2 turns perform over capacity. With reference to the links entering this junction, the eastbound link performs at capacity; the westbound link performs over capacity.
	Camp Road and B4030 Junction	26	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.
	Station Road and B4030 Junction	28	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.
	Rousham	30	Overall the performance of this junction is below capacity.	Overall the performance of this junction is below capacity.

Link	Junction	Junction Number	Morning peak hour	Evening peak hour
			With reference to the links entering this junction, all links perform below capacity.	With reference to the links entering this junction, all links perform below capacity.
	Holt Junction (B4030 and A4260)	10	Overall the performance of this junction is below capacity. However 3 turns perform over capacity. With reference to the links entering this junction, the southbound link performs over capacity.	Overall the performance of this junction is below capacity. However 1 turn perform at capacity and 2 turns perform over capacity. With reference to the links entering this junction, the northbound link performs over capacity.
B430 Ardley to A34	B430 and Ardley Road Junction	32	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.
	Unnamed Road and B430 Junction	27	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.
	Middleton Stoney Junction	29	Overall the performance of this junction is below capacity. However 5 turns perform over capacity. With reference to the links entering this junction, the eastbound link performs over capacity; the westbound link performs over capacity.	Overall the performance of this junction is below capacity. However 1 turn perform at capacity and 2 turns perform over capacity. With reference to the links entering this junction, the eastbound link performs at capacity; the westbound link performs over capacity.
	B430 and A4095 Junction	32	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.

Link	Junction	Junction Number	Morning peak hour	Evening peak hour
	A34 Junction	33	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.

Figure 2-3 Base Year (2013) network performance (Morning Peak Hour)

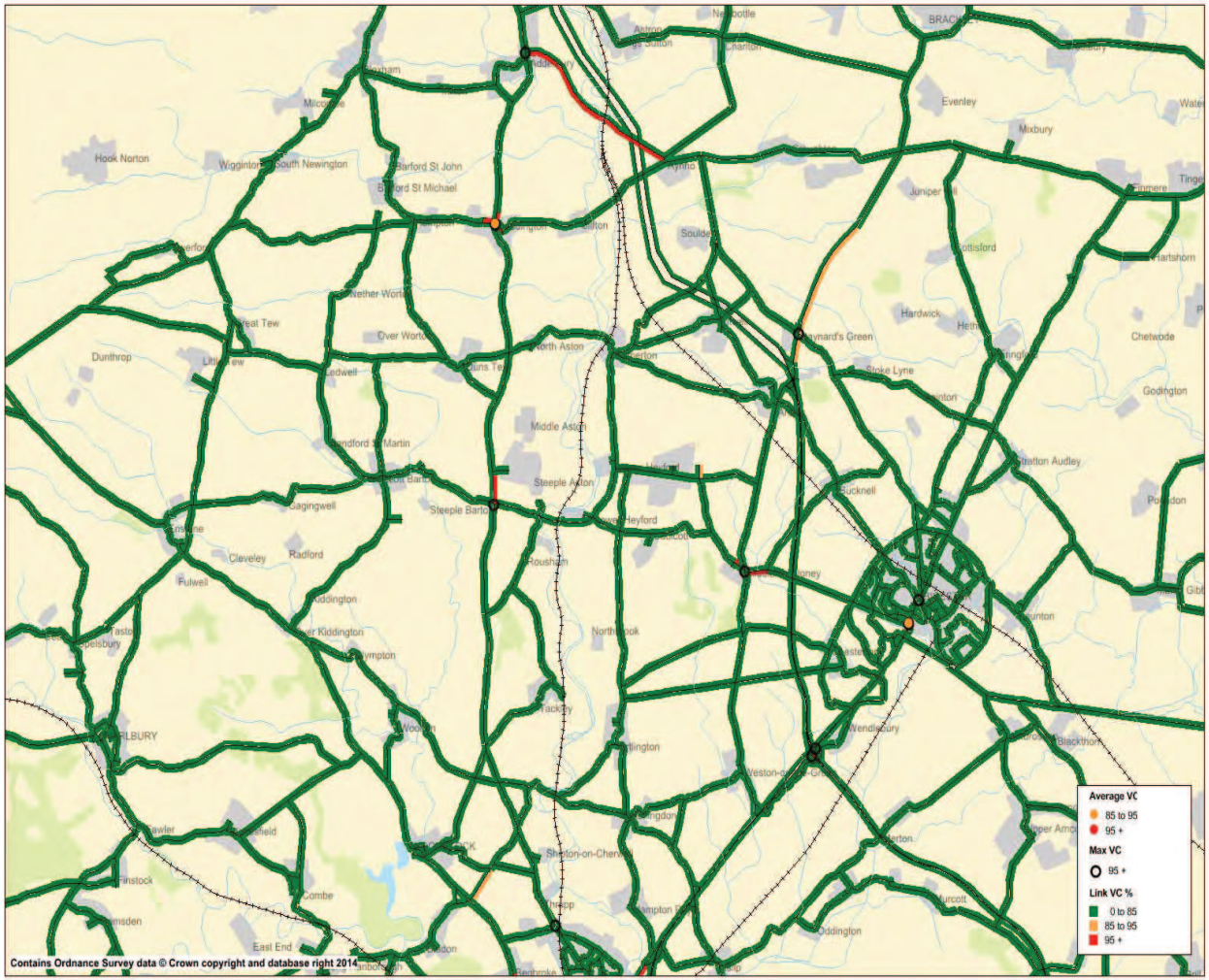
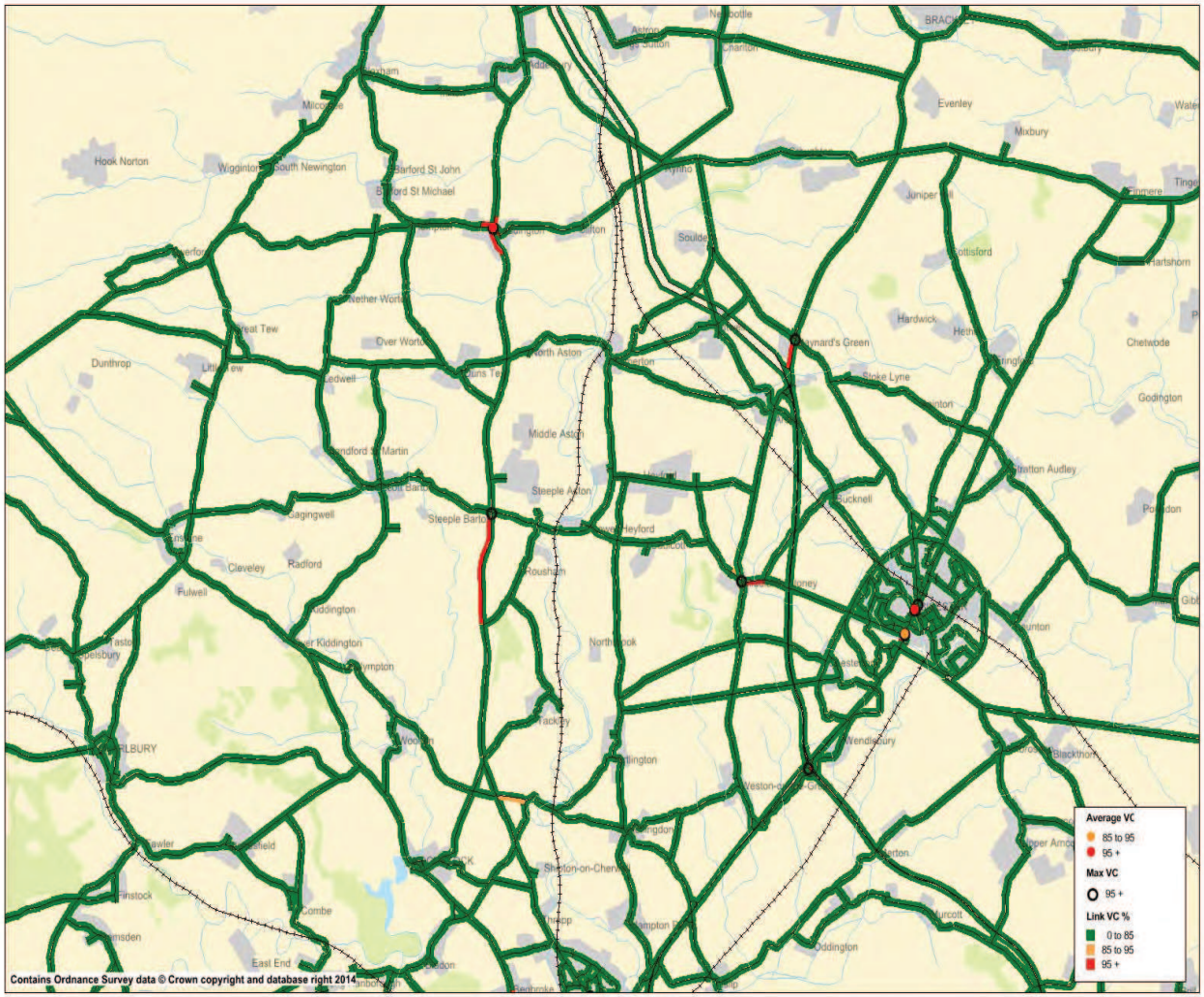


Figure 2-4 Base Year (2013) network performance (Evening Peak Hour)



2.3. Public Transport Network

The following tables show the base year (2013) public transport loads on the main corridors in Cherwell District. These are:

- Oxford to Bicester
- Oxford to Upper Heyford
- Oxford to Banbury.

Table 2-7 shows the public transport loads (per hour) for rail and bus in the Oxford to Bicester Corridor. It can be observed that the rail demand is very low between Oxford and Bicester, whilst the bus demand on the competing corridor is larger. This is due to the low frequency of the rail service (of less than one train per hour in each direction). More detail is provided in the plots shown in Figure 2-5.

Table 2-7 Public Transport Patronage: Oxford-Bicester Corridor

Mode	Time period	Oxford to Bicester	Bicester to Oxford
Rail	AM	17	40
	IP	11	12
	PM	42	11
Bus	AM	103	159
	IP	121	102
	PM	213	87

Table 2-8 (and Figure 2-6) shows the loadings per hour on the bus service 25A which operates on the Oxford to Upper Heyford Corridor. This shows modest loadings on the bus services in all of the modelled hours.

Table 2-8 Public Transport Patronage: Oxford-Upper Heyford

Mode	Time period	Oxford to Upper Heyford	Upper Heyford to Oxford
Bus	AM	1	10
	IP	5	5
	PM	18	7

Table 2-9 shows the public transport loadings per hour in the Oxford to Banbury Corridor. Rail patronage is greater than on bus due to the greater frequency of the rail services (approximately three trains per hour in each direction) and the shorter journey times. Further detail can be seen in Figure 2-7.

Table 2-9 Public Transport Patronage: Oxford-Banbury Corridor

Mode	Time period	Oxford to Banbury	Banbury to Oxford
Rail	AM	159	352
	IP	113	86
	PM	550	146
Bus	AM	11	40
	IP	15	22
	PM	37	17

The locations for the flows shown in the tables above can be seen in the following figures. They represent a mid-point on each route and do not show total public transport boardings and alightings.

Figure 2-5 Public Transport Patronage: Oxford-Bicester Corridor

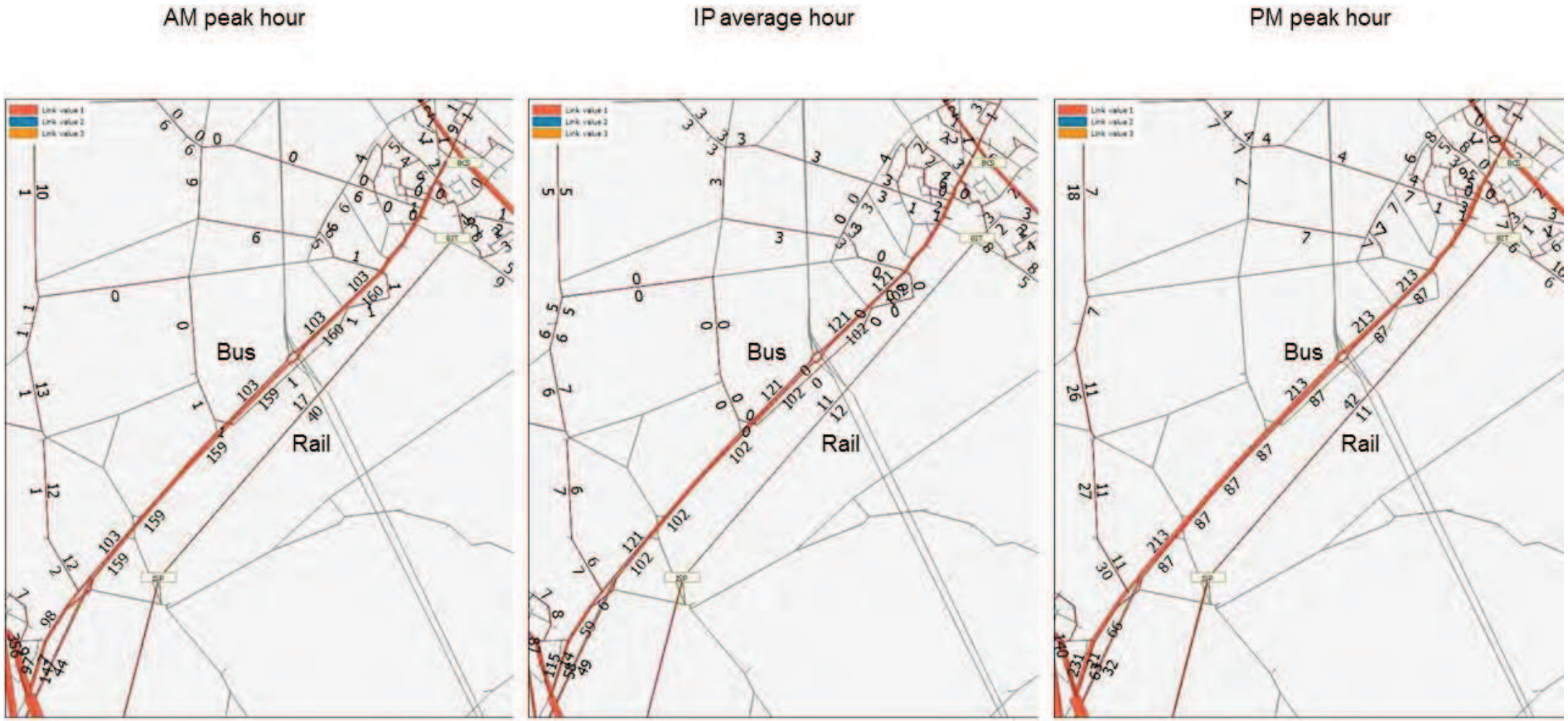
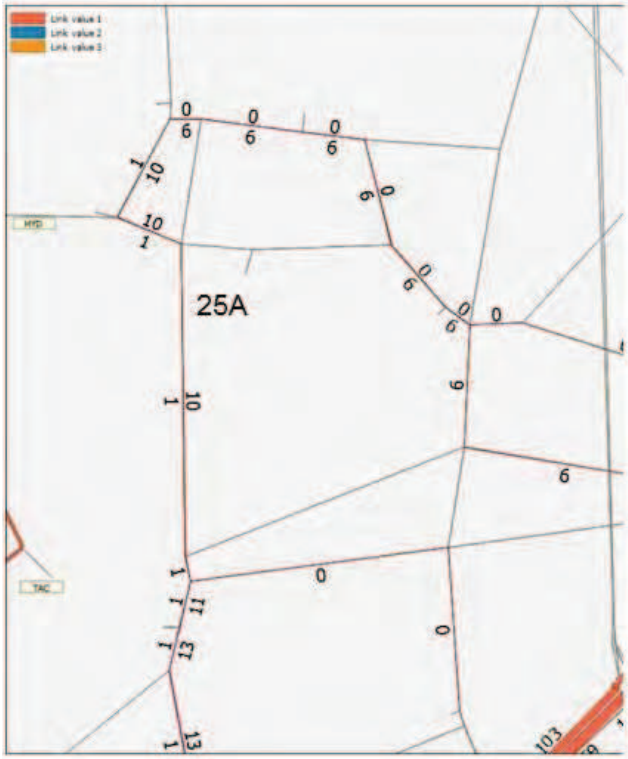
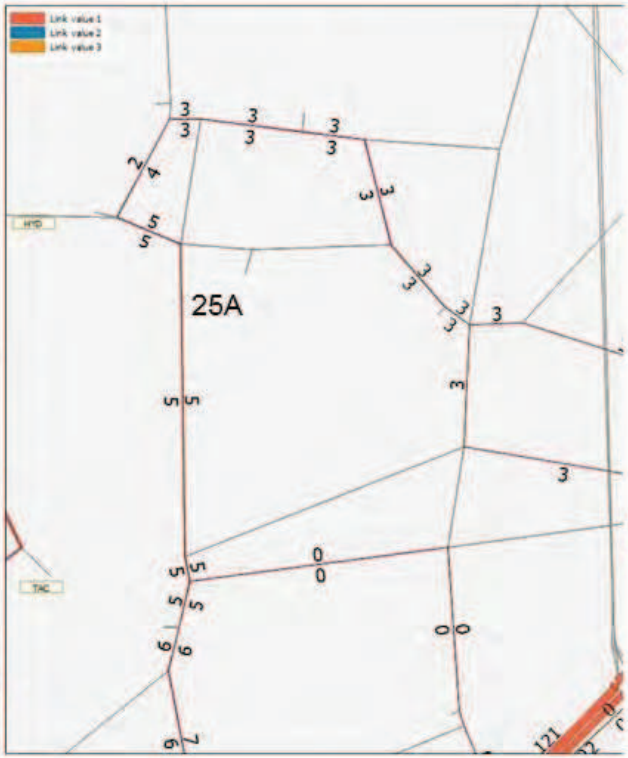


Figure 2-6 Public Transport Patronage: Oxford-Upper Heyford Corridor

AM peak hour



IP average hour



PM peak hour

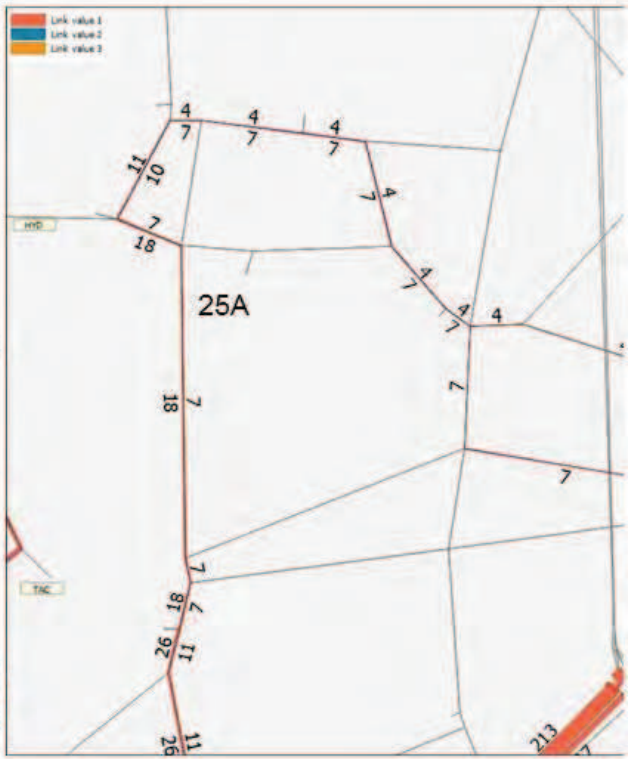
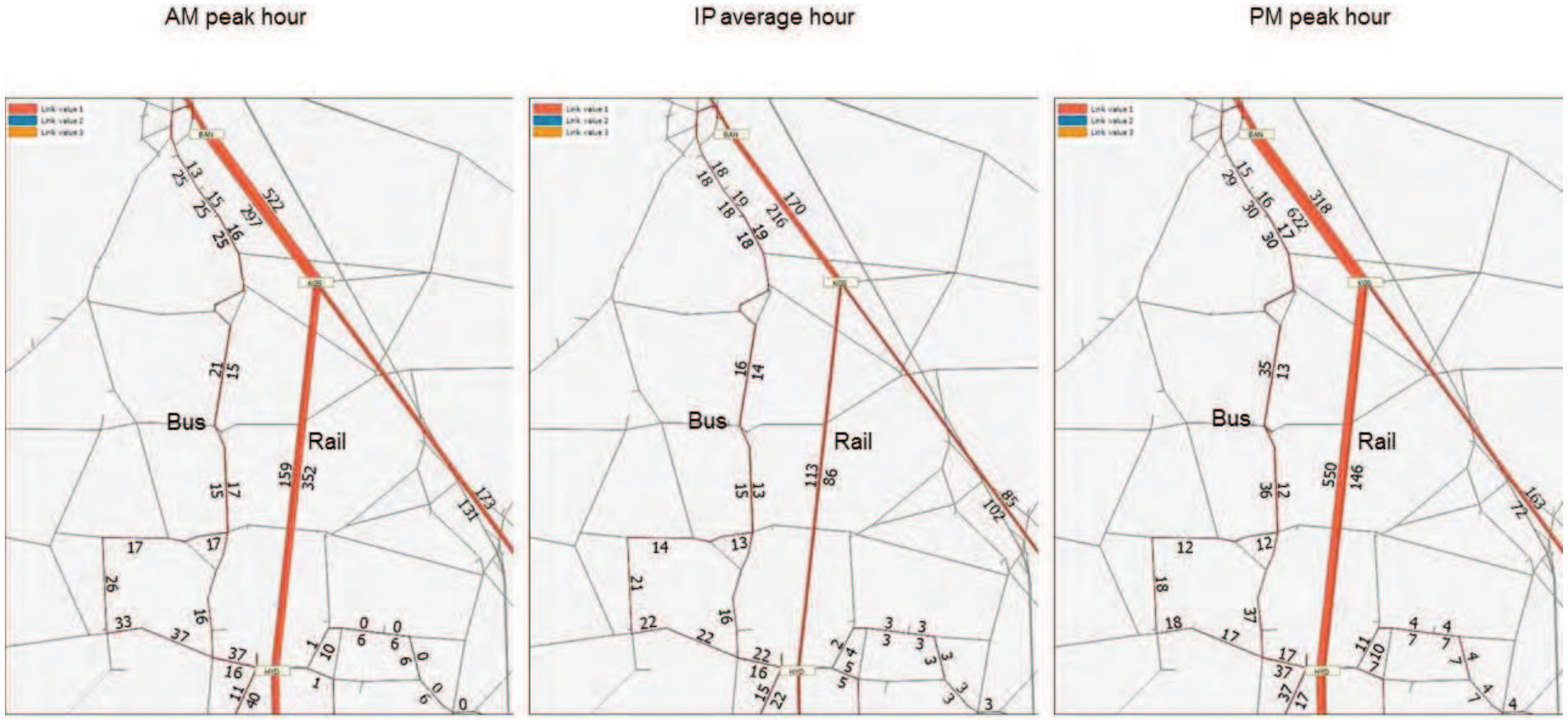


Figure 2-7 Public Transport Patronage: Oxford-Banbury Corridor



Technical note

3. Scenario 2

3.1. Scenario 2 - Assumptions

The first modelled scenario includes the 2031 Local Plan Modifications demand with the transport mitigation measures identified for the Local Plan. It does not include any additional mitigation measures for the Local Plan Modification demand. Table 3-1 shows the Local Plan land use inputs whilst Table 3-2 shows the additional land use inputs that form the Local Plan Modifications.

Table 3-1 Land Use Inputs – Local Plan 2031

Type	District and site	House	Jobs
Residential	Bankside Phase 1 and 2	1492	
Residential	Canalside	950	
Residential	Graven Hill	1900	
Residential	N of Hanwell Fields	500	
Residential	NW Bicester Phase 1 and 2	1793	
Residential	South East Bicester	400	
Residential	Southam Road	600	
Residential	SW Bicester Phase 1 and 2	2241	
Residential	Upper Heyford	761	
Residential	W of Bretch Hill	400	
Commercial	Bicester Business Park		3850
Commercial	Bicester Gateway		900
Commercial	Graven Hill		2070
Commercial	Land W of M40		1951
Commercial	NE Bicester business park		1092
Commercial	NW Bicester Phase 1 and 2		1800
Commercial	SE Bicester business park		2000
Commercial	Upper Heyford		1500
TOTAL		**11037**	**15163**

Table 3-2 Additional Land Use Inputs – Local Plan Modifications 2031

Type	District and site	House	Jobs
Residential	Bankside Phase 2	200	
Residential	Bolton Road	200	
Residential	Canalside	-250	
Residential	Drayton Lodge Farm	250	
Residential	Gavray Drive	300	
Residential	Graven Hill	200	
Residential	Higham Way	150	
Residential	N of Hanwell Fields	44	
Residential	NW Bicester Eco Town	1500	
Residential	South East Bicester	1100	
Residential	South of Salt Way area – Crouch Farm to Bodicote	1495	
Residential	SW Bicester	76	
Residential	*Upper Heyford*	*1600*	
Commercial	Bicester Business Park		2150
Commercial	Bicester Gateway		2600
Commercial	Graven Hill		-70

Type	District and site	House	Jobs
Commercial	Land North East of Junction 11 – Banbury 15		3500
Commercial	Land W of M40		550
Commercial	NE Bicester business park		-92
Commercial	NW Bicester Eco Town		400
Commercial	NW Bicester Eco Town		400
Commercial	NW Bicester Eco Town		400
Commercial	South East Bicester		333
Commercial	South East Bicester		333
Commercial	South East Bicester		333
Commercial	*Upper Heyford*		*0*
TOTAL		**6865**	**10837**

In total the Local Plan and the Local Plan Modifications comprise 17,902 dwellings and 26,000 jobs distributed across several locations in Cherwell District.

The trip rates used for these additional dwellings in Upper Heyford are presented Table 3-3 in below.

Table 3-3 Trip rates for Upper Heyford additional dwellings

Time Period	Car		Public Transport	
	Arrival	Departure	Arrival	Departure
AM Period	0.587	1.383	0.015	0.045
IP Period	1.718	1.577	0.036	0.033
PM Period	1.475	0.963	0.033	0.006

The highway and public transport schemes coded in as per the Local Plan are presented in Table 3-4 and Table 3-5 below respectively.

Table 3-4 Highway Schemes - Local Plan Modifications with Local Plan Mitigation 2031

Highway Scheme	Include in 2031 model?
A41 Oxford Road / Boundary Way roundabout	Yes
Bucknell Road/A4095 Howes Lane new priority junction	Yes
M40 J10	Yes
M40 J9 Phase 2	Yes
Park and Ride Southwest of Bicester	Included as Bus Service
South West Bicester Link Road	Yes
Bicester Town centre changes	Yes
Upper Heyford Improvement	Yes
A34 Milton Interchange Hamburger	Yes
A34 Chilton Northern Slip Roads	Yes
A34 Milton Interchange Hamburger	Yes
A41 / Neunkirchen Way roundabout (Rodney House)	Yes
A4130 new signalled T-junctions to development EZ	Yes
A415 Ducklington Lane/Station Lane junction improvement	Yes
Access to Harwell Section 1 (B4493 –A417)	Yes
Access to Harwell Section 2 (Hagbourne Hill)	Yes
Barton Transport Assessment, A40	Yes
Coding to reflect traffic management measures in villages (Harwell)	Yes
Didcot Northern Perimeter Road (NPR) 3 and associated junctions	Yes
Down's Road/A40 new junction	Yes

Highway Scheme	Include in 2031 model?
Featherbed/Steventon Lights junction and on-line improvements	Yes
Foxhall Bridge Widening	Yes
Frideswide Square including changes to Beckett Street	Yes
Great Western Park (GWP) and signalised access junctions	Yes
Grove Northern link Rd	Yes
Harwell Oxford all access points junction improvements	Yes
Headington roundabout/London Road bus lane improvements	Yes
Hinksey Hill	Yes
Jubilee roundabout scheme	Yes
Kennington Roundabout Improvements	Yes
Links through Valley Park to Science Bridge	Yes
Milton Park LDO mitigation schemes on Milton Park Road	Yes
Oxford Road / Pingle Drive junction	Yes
Relief to Manor Bridge (Science Bridge)	Yes
Rowstock Roundabout improvements	Yes
Transform Oxford Approach Roads, West Way Botley Road Junction	Yes
Valley Park spine road (A4130 – B4493)	Yes
Wantage Eastern Link Road	Yes
Bus priority on A41 corridor	No – scheme not defined
Widening of A41	No – scheme not defined

Table 3-5 Public Transport Schemes - Local Plan Modifications with Local Plan Mitigation 2031

Location	Scheme description	Include in 2031 model?
West Witney	To be served by extension of service S1 from Thorney Leys two times per hour, through the site and thus onwards to Carterton. This in addition to the existing 2 buses per hour via Curbridge.	Yes
Barton West	assume 3 buses per hour across the A40 to the John Radcliffe, as extension of service x13 Abingdon-City Centre JR.	Yes
Bankside	2 new buses per hour to Banbury via Bankside plus enhancement of service s4 between Deddington and Banbury via main road.	Yes
Crabhill	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).	Yes
NW Bicester	Services will increase in frequency as site builds out. Site will require separate services east and west of the railway. For 1793 dwellings (one third of build out) assume 4 new buses per hour to Bicester Town Centre and Bicester Town station.	Yes
Graven Hill/SW Bicester	"Graven Hill, assume 2 buses per hour to western side, plus enhanced service s5 two times per hour to eastern side, operating Arncott-Ambrosden-diversion into part of Graven Hill-Bicester Town Centre - possibly on to Oxford" "South West Bicester, 4 new buses per hour to Bicester Town Centre and station, plus s5 service to Oxford, 2 per hour through the site ideally or certainly via Middleton Stoney Road, then 4 per hour along the A41 (Accessed at Bicester Village stop, new Business Park stop and at Park and Ride)"	Yes

Location	Scheme description	Include in 2031 model?
NE Didcot	"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"	Yes
Valley Park	"Valley Park, 2 buses per hour Didcot-Wantage Road-Valley Park-Milton Park plus 2 buses per hour Didcot - main road - Valley Park – Harwell"	Yes
Great Western Park	"Great Western Park, same pattern as at Valley Park, 4 per hour to Didcot Town Centre, 2 to Milton Park, 2 to Harwell"	Yes
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.	Yes
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.	Yes
Upper Heyford	Create a new service between Upper Heyford and Bicester with a frequency of 1 bph for all time periods.	Yes

3.2. Impact of Scenario 2 at Cherwell

This section describes the impact that the new demand and mitigation schemes have on the results from the models.

3.2.1. Demand Model

Table 3-6 to Table 3-9 summarise the **Reference Forecast** and the **Forecast Scenario** demand for **Cherwell District** in the Local Plan Modifications Demand with Local Plan Mitigation scenario. The demand model, which can change trip frequency, time and mode, shows a greater impact on the people having Cherwell as destinations, both at time period level and over the 12 hour period.

For the people who have Cherwell as **origin**, the demand model results in 1.5% reduction in car vehicle trips over the 12 hour period, with a significant increase in bus (8.5%) and rail (4.5%). The overall impact is a small reduction (1%) in total trips from the district (assuming an average vehicle occupancy of 1.25). For the people who have Cherwell as **destination**, the demand model results in 4.3% reduction in car vehicle trips over the 12 hour period, with a significant increase in bus (10.3%) and rail (15.2%). The overall impact is a small reduction (3.3%) in total trips from the district (assuming an average vehicle occupancy of 1.25).

Table 3-6 Forecast demand for Cherwell in Local Plan Modifications with Local Plan Mitigation (AM period)

	Forecast Scenario		Reference Scenario		Difference	
Mode	Origin	Destination	Origin	Destination	Origin	Destination
Car (vehicles)	71174	65531	72935	69994	-1762	-4462
Bus (people)	4647	4222	4449	3323	198	899
Rail (people)	3503	3500	3415	2820	89	680
TOTAL (people)	97118	89636	99033	93636	-1916	-3999
PT Mode Share	8.4%	8.6%	7.9%	6.6%		

Table 3-7 Forecast demand for Cherwell in Local Plan Modifications with Local Plan Mitigation (IP period)

Mode	Forecast Scenario		Reference Scenario		Difference	
	Origin	Destination	Origin	Destination	Origin	Destination
Car (vehicles)	122800	119097	119903	120707	2897	-1610
Bus (people)	5134	5181	4728	4954	406	227
Rail (people)	2788	3425	2959	3088	-172	337
TOTAL (people)	161422	157477	157566	158926	3855	-1449
PT Mode Share	4.9%	5.5%	4.9%	5.1%		

Table 3-8 Forecast demand for Cherwell in Local Plan Modifications with Local Plan Mitigation (PM period)

Mode	Forecast Scenario		Reference Scenario		Difference	
	Origin	Destination	Origin	Destination	Origin	Destination
Car (vehicles)	83544	83881	88908	89764	-5364	-5883
Bus (people)	3081	3845	2673	3736	408	109
Rail (people)	3401	3511	2888	3153	513	359
TOTAL (people)	110912	112207	116696	119094	-5784	-6886
PT Mode Share	5.8%	6.6%	4.8%	5.8%		

Table 3-9 Forecast demand for Cherwell in Local Plan Modifications with Local Plan Mitigation (12 hour)

Mode	Forecast Scenario		Reference Scenario		Difference	
	Origin	Destination	Origin	Destination	Origin	Destination
Car (vehicles)	277517	268509	281746	280464	-4229	-11955
Bus (people)	12862	13248	11850	12014	1012	1235
Rail (people)	9692	10436	9262	9061	430	1376
TOTAL (people)	369450	359321	373295	371655	-3845	-12333
PT Mode Share	6.1%	6.6%	5.7%	5.7%		

Table 3-10 to Table 3-13 summarise the **Reference Forecast** and the **Forecast Scenario** demand for the **entire model** in the Local Plan Modifications Demand with Local Plan Mitigation scenario.

Table 3-10 Forecast demand for the entire model in Local Plan Modifications with Local Plan Mitigation (AM period)

Mode	Forecast Scenario	Reference Scenario	Difference
	Origin/Destination	Origin/Destination	Origin/Destination
Car (vehicles)	323143	324036	-892
Bus (people)	34484	34359	124
Rail (people)	13346	14192	-845
TOTAL (people)	451759	453596	-1836
PT Mode Share	10.6%	10.7%	

Table 3-11 Forecast demand for the entire model in Local Plan Modifications with Local Plan Mitigation (IP period)

Mode	Forecast Scenario	Reference Scenario	Difference
	Origin/Destination	Origin/Destination	Origin/Destination
Car (vehicles)	570034	556818	13216
Bus (people)	60204	59910	294
Rail (people)	13833	15514	-1681
TOTAL (people)	786580	771447	15133

Mode	Forecast Scenario	Reference Scenario	Difference
	Origin/Destination	Origin/Destination	Origin/Destination
PT Mode Share	9.4%	9.8%	

Table 3-12 Forecast demand for the entire model in Local Plan Modifications with Local Plan Mitigation (PM period)

Mode	Forecast Scenario	Reference Scenario	Difference
	Origin/Destination	Origin/Destination	Origin/Destination
Car (vehicles)	400325	407794	-7469
Bus (people)	35909	36588	-679
Rail (people)	15215	15704	-489
TOTAL (people)	551530	562035	-10504
PT Mode Share	9.3%	9.3%	

Table 3-13 Forecast demand for the entire model in Local Plan Modifications with Local Plan Mitigation (12 hour)

Mode	Forecast Scenario	Reference Scenario	Difference
	Origin/Destination	Origin/Destination	Origin/Destination
Car (vehicles)	1293503	1288648	4855
Bus (people)	130597	130857	-260
Rail (people)	42394	45409	-3015
TOTAL (people)	1789869	1787076	2794
PT Mode Share	9.7%	9.9%	

The demand model, which can change trip frequency, time and mode, results in a 0.4% increase in car vehicle across the OSM model in the 12 hour period, whilst the bus passenger trips and rail trips decrease by around 0.2% and 6.6% respectively. The overall impact is a small increase of 0.2% in total trips (assuming an average vehicle occupancy of 1.25).

3.2.2. Highway Network

This section describes the highway network performance in the Cherwell District. The overall Cherwell District network statistics for the model simulation area are shown below in Table 3-14.

Table 3-14 Scenario 2 Network Statistics

Time	Metric	Results	Unit
Morning Peak Hour	Total Time	14894	Pcu Hr
	Delay	2662	Pcu Hr
	Total distance	921185	Pcu KM
	Speed	61.85	KM/h
Inter Peak Hour	Total Time	11700	Pcu Hr
	Delay	1112	Pcu Hr
	Total distance	838729	Pcu KM
	Speed	71.69	KM/h
Evening Peak Hour	Total Time	17760	Pcu Hr
	Delay	4250	Pcu Hr
	Total distance	1005627	Pcu KM
	Speed	56.62	KM/h

The network performance assessment for the key corridors in the district is described in Table 3-15 whilst Figure 3-1 and Figure 3-2 show this for the morning and evening peak hours respectively. The assessment

is organised in to routes and focuses primarily on the link performance in to key junctions along the route and also provides further detail relating specifically to junction performance where that differs to the link performance.

The network link and junction performance are measured by the volume to capacity (v/c) ratio and highlights those links on the highway network that are operating below operational capacity (v/c <85%), at operational capacity (v/c between 85% and 95%) and those that are exceeding operational capacity (v/c >95%).

The junction performance described below refers to results from a forecast of the strategic highway model and it is possible that detailed junction modelling software would not only be able to optimise signalised junction performance, but also produce marginally different junction performance results.

Table 3-15 Scenario 2 network performance assessment

Link	Junction	Junction Number	Morning peak hour	Evening peak hour
A361	London Road and Banbury Road Junction	1	Overall the performance of this junction is below capacity. However 1 turn performs at capacity and 3 turns perform over capacity. With reference to the links entering this junction, the northbound link performs over capacity; the westbound link performs at capacity.	Overall the performance of this junction is below capacity. However 1 turn performs at capacity and 3 turns perform over capacity. With reference to the links entering this junction, the northbound link performs over capacity; the westbound link performs at capacity.
	A361 and B4031 Junction	2	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.
	A361 and Bloxham Road Junction	3	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.
	S Newington Road and Barford Road Junction	4	Overall the performance of this junction is at capacity. However 1 turn performs at capacity and 2 turns perform over capacity. With reference to the links entering this junction, the northbound link performs over capacity; the southbound link performs over capacity.	Overall the performance of this junction is at capacity. However 4 turns perform over capacity. With reference to the links entering this junction, the northbound link performs over capacity; the southbound link performs over capacity.

Link	Junction	Junction Number	Morning peak hour	Evening peak hour
	A361 and B4100 Junction	5	Overall the performance of this junction is below capacity. However 2 turns perform over capacity. With reference to the links entering this junction, the northbound link performs over capacity.	Overall the performance of this junction is below capacity. However 2 turns perform over capacity. With reference to the links entering this junction, the northbound link performs over capacity.
A4260	A4260 and Twyford Road Junction	6	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is at capacity. However 2 turns perform at capacity. With reference to the links entering this junction, the southbound link performs over capacity.
	A4260 and Aynho Road Junction Adderbury	7	Overall the performance of this junction is below capacity. However 4 turns perform over capacity. With reference to the links entering this junction, the southbound link performs over capacity; the westbound link performs over capacity.	Overall the performance of this junction is at capacity. However 4 turns perform over capacity. With reference to the links entering this junction, the southbound link performs over capacity; the westbound link performs over capacity.
	A4260 and Hempton Road Junction Deddington	8	Overall the performance of this junction is over capacity. However 12 turns perform over capacity. With reference to the links entering this junction, the northbound link performs over capacity; the eastbound link performs over capacity; the southbound link performs over capacity; the westbound link performs over capacity.	Overall the performance of this junction is over capacity. However 12 turns perform over capacity. With reference to the links entering this junction, the northbound link performs over capacity; the eastbound link performs over capacity; the southbound link performs over capacity; the westbound link performs over capacity.
	A4260 and Somerton Road Junction North Aston	9	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.

Link	Junction	Junction Number	Morning peak hour	Evening peak hour
	A4260 and B4030 Junction Hopcrofts Holt	10	Overall the performance of this junction is below capacity. However 3 turns perform over capacity. With reference to the links entering this junction, the eastbound link performs at capacity; the southbound link performs over capacity.	Overall the performance of this junction is at capacity. However 8 turns perform over capacity. With reference to the links entering this junction, the northbound link performs over capacity; the eastbound link performs over capacity; the southbound link performs over capacity.
	A4260 and Langford Lane Junction	11	Overall the performance of this junction is below capacity. However 1 turn performs over capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. However 2 turns perform over capacity. With reference to the links entering this junction, the northbound link performs over capacity.
M40 J11	Slips		The M40 northbound and southbound off-slips perform below operational capacity. The M40 southbound on-slip and A361 southbound approach perform over capacity. The A422 eastbound approach performs at capacity.	The M40 northbound off-slip performs at capacity. The A361 southbound approach performs over capacity. The A422 eastbound approach performs over capacity.
	Circulation		The circulatory carriageway is over capacity.	The circulatory carriageway is over capacity.
M40 J10	Slips		The M40 northbound and southbound off-slips perform below operational capacity. The link between the roundabout in the north and the new signalised junction performs over capacity.	The M40 northbound off-slip performs over capacity. The link between the roundabout in the north and the new signalised junction performs over capacity.

Link	Junction	Junction Number	Morning peak hour	Evening peak hour
	B430 Roundabout	12	Overall the performance of this junction is below capacity. However 2 turns perform over capacity. With reference to the links entering this junction, the northbound link performs over capacity.	Overall the performance of this junction is at capacity. However 2 turns perform at capacity and 2 turns perform over capacity. With reference to the links entering this junction, the northbound link performs over capacity; the westbound link performs over capacity.
	A43 Roundabout	13	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.
Bicester Ring Road	Middleton Stoney Road Junction	14	Overall the performance of this junction is below capacity. However 3 turns perform over capacity. With reference to the links entering this junction, the northbound link performs over capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.
	Banbury Road Junction	15	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, the westbound link performs at capacity.
	Launton Road Junction	16	Overall the performance of this junction is below capacity. However 2 turns perform over capacity. With reference to the links entering this junction, the southbound link performs over capacity.	Overall the performance of this junction is at capacity. However 1 turn performs at capacity and 2 turns perform over capacity. With reference to the links entering this junction, the northbound link performs over capacity; the eastbound link performs at capacity; the southbound link performs at capacity.

Link	Junction	Junction Number	Morning peak hour	Evening peak hour
	A41 Junction	17	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.
A34	A34 and M40 Junction 9		The A34 southbound off-slip performs over capacity and M40 southbound offslip performs at capacity.	The A34 southbound off-slip performs over capacity.
	A34 Circulation at M40 Junction 9		The circulatory carriageway is over capacity.	The circulatory carriageway is over capacity.
	A34 Slips Kidlington		The A34 southbound on-slip performs at capacity.	The A34 northbound on-slip performs over capacity. The northbound approach of A44 also performs over capacity.
	A34 Circulation at M40		The circulatory carriageway below operational capacity.	The circulatory carriageway below operational capacity.
Hennef Way	Hennef Way and Ermont way Junction	18	Overall the performance of this junction is over capacity. However 9 turns perform over capacity. With reference to the links entering this junction, the northbound link performs over capacity; the eastbound link performs over capacity; the southbound link performs over capacity; the westbound link performs over capacity.	Overall the performance of this junction is over capacity. However 6 turns perform over capacity. With reference to the links entering this junction, the northbound link performs over capacity; the westbound link performs over capacity.
	Hennef Way and Concord Avenue	19	Overall the performance of this junction is below capacity. However 2 turns perform over capacity. With reference to the links entering this junction, the eastbound link performs over capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.

Link	Junction	Junction Number	Morning peak hour	Evening peak hour
	Hennef Way and Southam Road	20	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is at capacity. With reference to the links entering this junction, the southbound link performs at capacity; the westbound link performs at capacity.
Cherwell Street	Cherwell street and Bridge Street junction	23	Overall the performance of this junction is below capacity. However 3 turns perform over capacity. With reference to the links entering this junction, the westbound link performs over capacity.	Overall the performance of this junction is below capacity. However 3 turns perform over capacity. With reference to the links entering this junction, the westbound link performs over capacity.
Camp Road Station Rd to B4030	Camp Road and Station Road Junction	24	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.
	Camp Road and Unnamed Road Junction	25	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.
	Camp Road and B4030 Junction	26	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.
Unnamed Road between Camp Road and B430	Unnamed Road and B430 Junction	27	Overall the performance of this junction is below capacity. However 2 turns perform over capacity. With reference to the links entering this junction, the eastbound link performs over capacity.	Overall the performance of this junction is below capacity. However 1 turn performs at capacity. With reference to the links entering this junction, the eastbound link performs at capacity.

Link	Junction	Junction Number	Morning peak hour	Evening peak hour
	Camp Road and Unnamed Road Junction	25	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.
Station Road Camp Road to B4030	Station Road and B4030 Junction	28	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.
	Camp Road and Station Road Junction	24	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.
B4030 Bicester to A4260	B4030 and A4095 Howes Lane Junction	14	Overall the performance of this junction is below capacity. However 3 turns perform over capacity. With reference to the links entering this junction, the northbound link performs over capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.
	Middleton Stoney Junction	29	Overall the performance of this junction is below capacity. However 6 turns perform over capacity. With reference to the links entering this junction, the eastbound link performs over capacity; the westbound link performs over capacity.	Overall the performance of this junction is below capacity. However 9 turns perform over capacity. With reference to the links entering this junction, the northbound link performs over capacity; the eastbound link performs over capacity; the westbound link performs over capacity.

Link	Junction	Junction Number	Morning peak hour	Evening peak hour
	Camp Road and B4030 Junction	26	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.
	Station Road and B4030 Junction	28	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.
	Rousham	30	Overall the performance of this junction is below capacity. However 3 turns perform over capacity. With reference to the links entering this junction, the westbound link performs over capacity.	Overall the performance of this junction is below capacity. However 3 turns perform over capacity. With reference to the links entering this junction, the westbound link performs over capacity.
	Holt Junction (B4030 and A4260)	10	Overall the performance of this junction is below capacity. However 3 turns perform over capacity. With reference to the links entering this junction, the eastbound link performs at capacity; the southbound link performs over capacity.	Overall the performance of this junction is at capacity. However 8 turns perform over capacity. With reference to the links entering this junction, the northbound link performs over capacity; the eastbound link performs over capacity; the southbound link performs over capacity.
B430 Ardley to A34	B430 and Ardley Road Junction	32	Overall the performance of this junction is below capacity. However 6 turns perform over capacity. With reference to the links entering this junction, the eastbound link performs over capacity; the westbound link performs over capacity.	Overall the performance of this junction is below capacity. However 1 turn performs at capacity and 3 turns perform over capacity. With reference to the links entering this junction, the southbound link performs at capacity; the westbound link performs over capacity.

Link	Junction	Junction Number	Morning peak hour	Evening peak hour
	Unnamed Road and B430 Junction	27	Overall the performance of this junction is below capacity. However 2 turns perform over capacity. With reference to the links entering this junction, the eastbound link performs over capacity.	Overall the performance of this junction is below capacity. However 1 turn performs at capacity. With reference to the links entering this junction, the eastbound link performs at capacity.
	Middleton Stoney Junction	29	Overall the performance of this junction is below capacity. However 6 turns perform over capacity. With reference to the links entering this junction, the eastbound link performs over capacity; the westbound link performs over capacity.	Overall the performance of this junction is below capacity. However 9 turns perform over capacity. With reference to the links entering this junction, the northbound link performs over capacity; the eastbound link performs over capacity; the westbound link performs over capacity.
	B430 and A4095 Junction	32	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.
	A34 Junction	33	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.

Figure 3-1 Scenario 2 AM Peak Network Performance

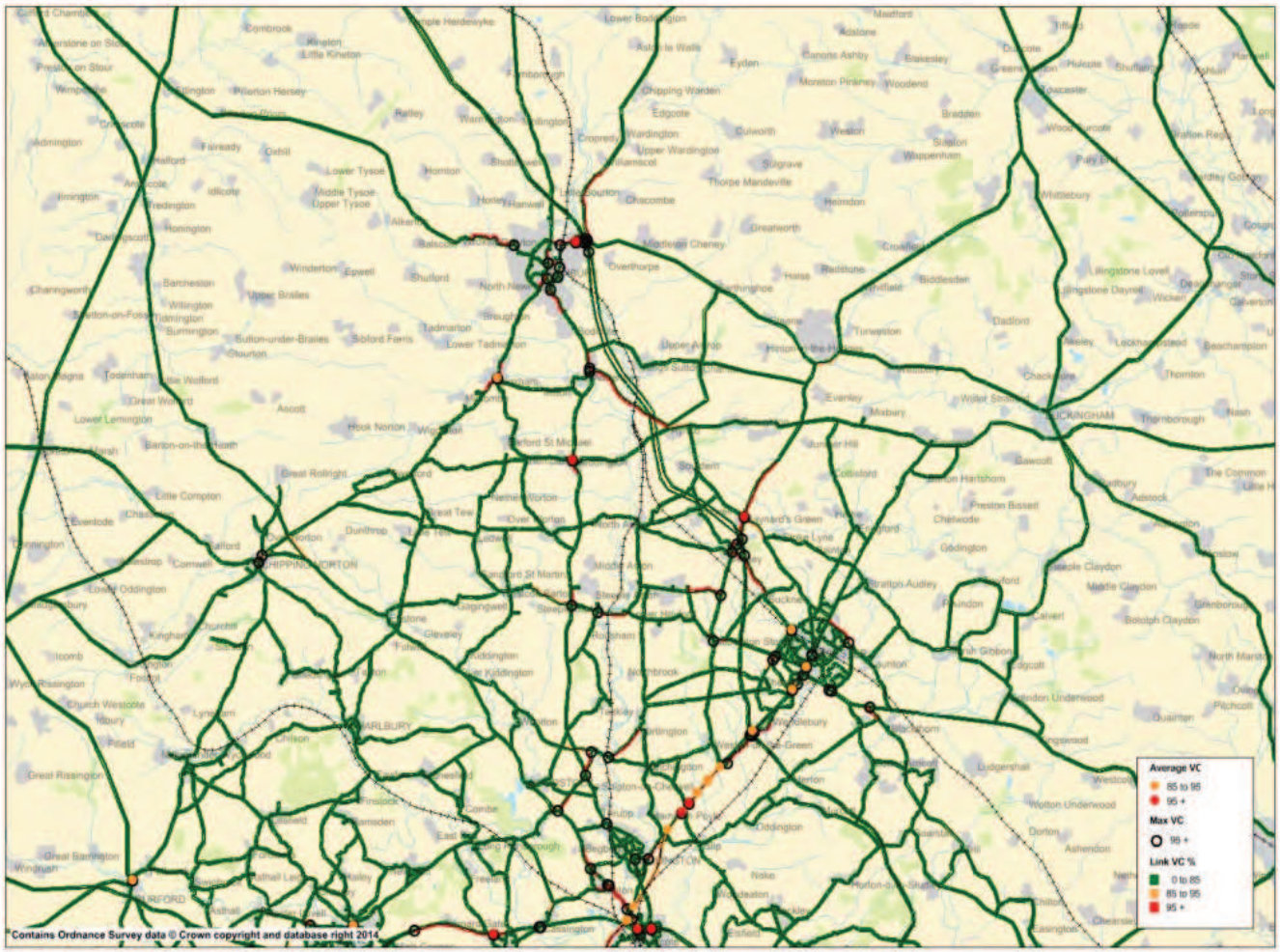
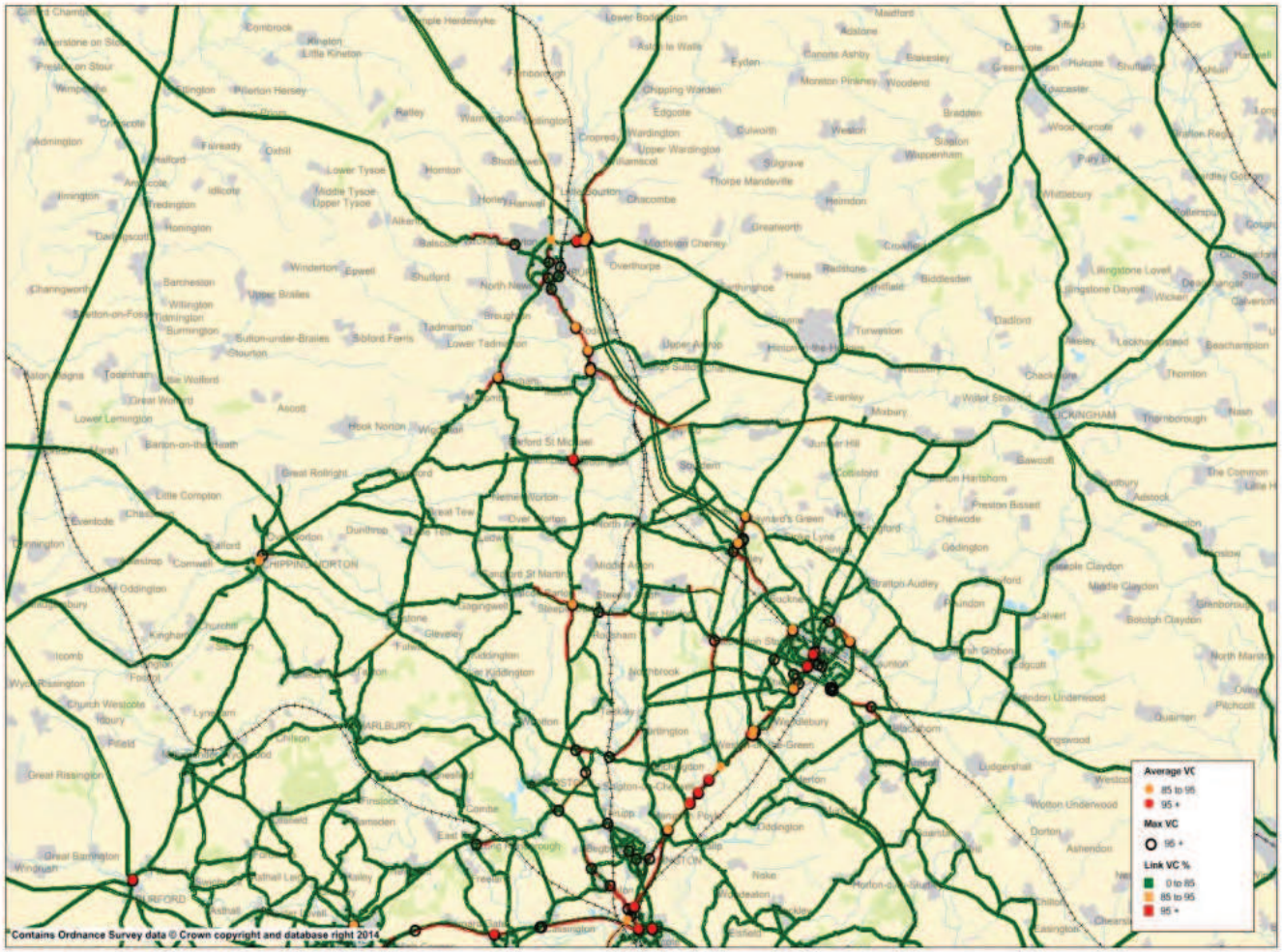


Figure 3-2 Scenario 2 PM Peak Network Performance



3.2.3. Public Transport Network

In the following tables and figures are presented the loads for bus and rail on the main corridors in Cherwell District in Scenario 2:

- Oxford to Bicester
- Oxford to Upper Heyford
- Oxford to Banbury.

Table 3-16 shows the public transport patronage (per hour) in the Oxford-Bicester Corridor. Due to the development sites in Oxford and Bicester, the travel demand increases significantly. The increase in supply both for rail (frequency of 4 trains per hour) and bus (frequency of 9 buses per hour) attracts a part of this demand. The train frequency is now competitive with the bus and hence loadings are broadly similar. More detail is shown in the plots Figure 3-3.

Table 3-16 Public Transport Patronage: Oxford-Bicester Corridor 2031 in Scenario 2

Mode	Time period	Oxford to Bicester	Bicester to Oxford
Rail	AM	715	451
	IP	246	155
	PM	596	554
Bus	AM	743	251
	IP	261	270
	PM	361	556

The public transport patronage between Oxford and Upper Heyford can be seen in Table 3-17 and this is shown in more detail Figure 3-4. Public transport is limited to the bus service 25A on this corridor. The development sites in Upper Heyford contain 1,500 jobs and 2,361 dwellings but this does not translate into more passengers for the bus due to the low frequency.

Table 3-17 Public Transport Patronage: Oxford-Upper Heyford Corridor 2031 in Scenario 2

Mode	Time period	Oxford to Upper Heyford	Upper Heyford to Oxford
Bus	AM	8	8
	IP	5	10
	PM	11	12

Public transport demand on the Oxford to Banbury Corridor is shown in Table 3-18 with further detail being shown in Figure 3-5. Due to the development sites in Oxford and Banbury, the travel demand increases significantly for the bus but has a neutral impact on rail.

Table 3-18 Public Transport Patronage: Oxford-Banbury Corridor 2031 in Scenario 2

Mode	Time period	Oxford to Banbury	Banbury to Oxford
Rail	AM	202	479
	IP	133	107
	PM	577	204
Bus	AM	211	101
	IP	43	65
	PM	83	117

The locations for the flows shown in the tables above can be seen in the following figures. They represent a mid-point on each route and do not show total public transport boardings and alightings.

Figure 3-3 Public Transport Patronage: Oxford-Bicester Corridor 2031 in Scenario 2

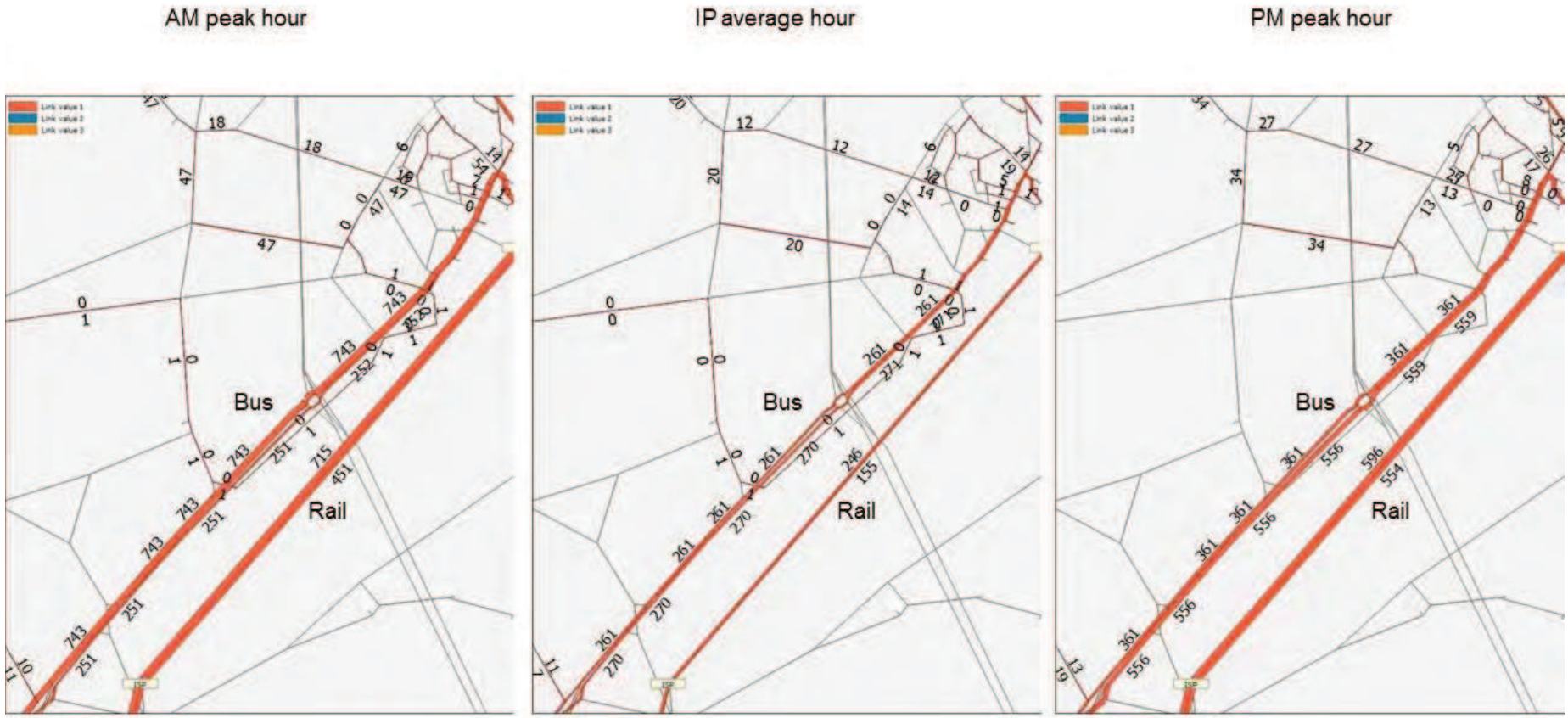


Figure 3-4 Public Transport Patronage: Oxford-Upper Heyford Corridor 2031 in Scenario 2

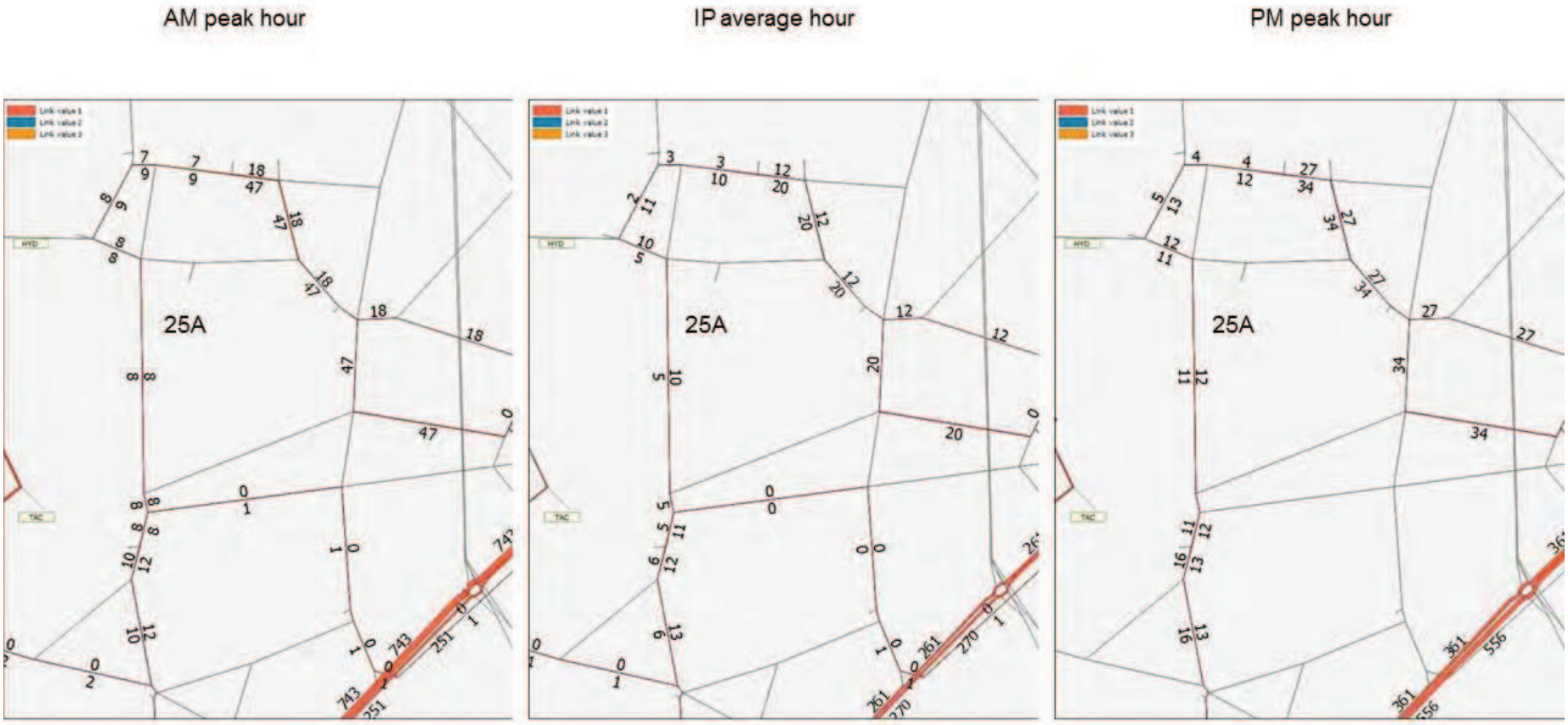
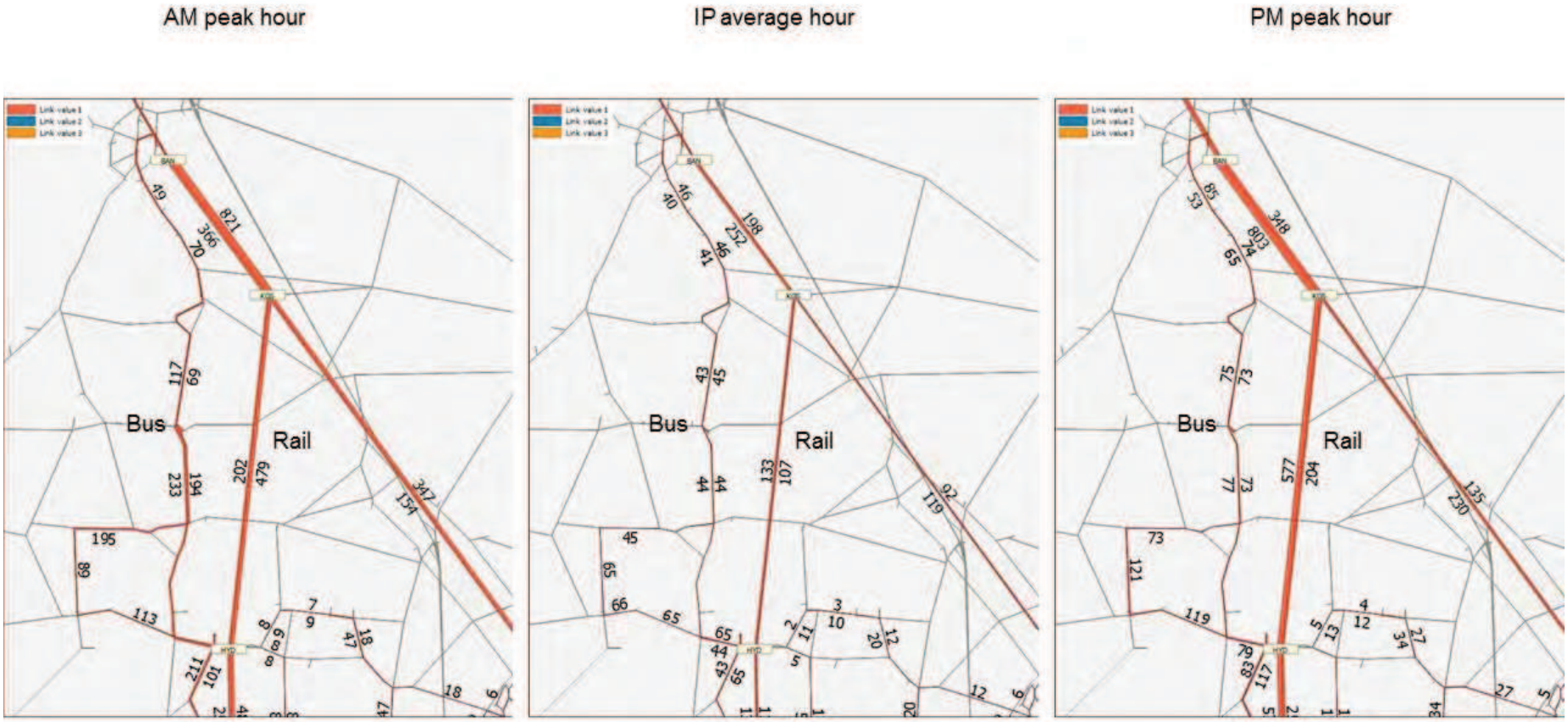


Figure 3-5 Public Transport Patronage: Oxford-Banbury Corridor 2031 in Scenario 2



Technical note

4. Scenario 5

4.1. Scenario 5 - Assumptions

The second model scenario represents the 2031 Local Plan Modifications demand with the transport mitigation measures identified for both the Local Plan demand and for the Local Plan Modifications demand (including those for the Upper Heyford development). The demand assumptions are the same as in Scenario 2 reported above, and comprise 17,902 dwellings and 26,000 jobs.

The additional highway and public transport schemes included in the model are presented in Table 4-1 and Table 4-2.

Table 4-1 Highway Schemes - Local Plan Modifications with Local Plan Mitigation and Modifications Mitigation 2031

Highway Scheme
Signal optimisation at Junction 11
Signals at the junctions along Hennef Way (Including Ermont Way, Concord Avenue and Southam Road)
The new link road through the development south of Salt Way and a connection onto White Post Road / Oxford Road
Improvements to the Upper Cherwell Street corridor, including at Bridge Street junction
B430/Ardley Village Junction - 4-Arm Staggered traffic signal junction
B430/Camp Road Junction - 3-Arm traffic signal junction
B430 Middleton Stoney Junction – effectively a 3-Arm traffic signal junction with eastbound approach prioritised for public transport and 'local' access only
B4030 Station Road/Lower Heyford Road - Traffic Signals Optimised to 'manage' east-west movement north to Camp Road
B4030 Lower Heyford Road /B4030 Heyford Road - Traffic Signals Optimised to 'manage' east-west movement north to Camp Road and provide for bus movement
B4030/A4260 - Traffic Signals Optimised to 'manage' east-west movement

Table 4-2 Public Transport Schemes - Local Plan Modifications with Local Plan Mitigation and Modifications Mitigation 2031

Location	Scheme description
Upper Heyford	Increase of the frequency of bus service 25A, changing to 3 bph for all time periods.
Upper Heyford	New bus service between Bicester – Upper Heyford – Deddington – Aderbury – Banbury with a frequency of 1 bph

4.2. Impact of Scenario 5 at Cherwell

This section describes the impact that the new demand and mitigation schemes will have on the results from the models.

4.2.1. Demand Model

Table 4-3 to Table 4-6 summarise the **Reference Forecast** and the **Forecast Scenario** demand for **Cherwell District** in the Local Plan Modifications with full mitigation scenario. Similar to Scenario 2, the demand model, which can change trip frequency, time and mode, shows a greater impact on the people having Cherwell as destinations, both at time period level and over the 12 hour period.

For the people who have **Cherwell as origin**, the demand model results in 1.6% reduction in car vehicle trips over the 12 hour period, with a significant increase in bus (29.4%) and a decrease in rail (9.6%). The overall impact is a small reduction (0.8%) in total trips from the district (assuming an average vehicle occupancy of 1.25). For the people who have **Cherwell as destination**, the demand model results in 4.4% reduction in car vehicle trips over the 12 hour period, with a significant increase in bus (32.9%) and rail

(1.6%). The overall impact is a small reduction (3.1%) in total trips from the district (assuming an average vehicle occupancy of 1.25).

Table 4-3 Forecast demand for Cherwell in Local Plan Modifications with Local Plan Mitigation and Modifications Mitigation (AM period)

Mode	Forecast Scenario		Reference Scenario		Difference	
	Origin	Destination	Origin	Destination	Origin	Destination
Car (vehicles)	71206	65753	72935	69994	-1729	-4241
Bus (people)	5458	5434	4449	3323	1010	2111
Rail (people)	2994	3048	3415	2820	-421	228
TOTAL (people)	97460	90673	99033	93636	-1572	-2962
PT Mode Share	8.7%	9.4%	7.9%	6.6%		

Table 4-4 Forecast demand for Cherwell in Local Plan Modifications with Local Plan Mitigation and Modifications Mitigation (IP period)

Mode	Forecast Scenario		Reference Scenario		Difference	
	Origin	Destination	Origin	Destination	Origin	Destination
Car (vehicles)	122333	118788	119903	120707	2430	-1919
Bus (people)	6020	6018	4728	4954	1292	1064
Rail (people)	2399	3078	2959	3088	-561	-10
TOTAL (people)	161335	157581	157566	158926	3769	-1345
PT Mode Share	5.2%	5.8%	4.9%	5.1%		

Table 4-5 Forecast demand for Cherwell in Local Plan Modifications with Local Plan Mitigation and Modifications Mitigation (PM period)

Mode	Forecast Scenario		Reference Scenario		Difference	
	Origin	Destination	Origin	Destination	Origin	Destination
Car (vehicles)	83622	83576	88908	89764	-5286	-6188
Bus (people)	3850	4510	2673	3736	1177	774
Rail (people)	2980	3076	2888	3153	92	-77
TOTAL (people)	111358	112056	116696	119094	-5339	-7038
PT Mode Share	6.1%	6.8%	4.8%	5.8%		

Table 4-6 Forecast demand for Cherwell in Local Plan Modifications with Local Plan Mitigation and Modifications Mitigation (12 Hour)

Mode	Forecast Scenario		Reference Scenario		Difference	
	Origin	Destination	Origin	Destination	Origin	Destination
Car (vehicles)	277161	268116	281746	280464	-4586	-12348
Bus (people)	15328	15963	11850	12014	3479	3949
Rail (people)	8373	9202	9262	9061	-889	141
TOTAL (people)	370152	360310	373295	371655	-3143	-11345
PT Mode Share	6.4%	7.0%	5.7%	5.7%		

Table 4-7 to Table 4-10 summarise the **Reference Forecast** and the **Forecast Scenario** demand for the **entire model** in the Local Plan Modifications with full mitigation scenario. The demand model, which can change trip frequency, time and mode, results in a small (0.3%) increase in car vehicle trips in the OSM model area in the 12 hour period and a small increase in bus trips (1.6%) and a decrease in rail trips by 10.4%. The overall impact is a slight increase (0.2%) in total trips to/from the district (assuming an average vehicle occupancy of 1.25).

Table 4-7 Forecast demand in Local Plan Modifications with Local Plan Mitigation and Modifications Mitigations (All model) (AM period)

Mode	Forecast Scenario	Reference Scenario	Difference
	Origin/Destination	Origin/Destination	Origin/Destination
Car (vehicles)	323055	324036	-981
Bus (people)	35517	34359	1158
Rail (people)	12734	14192	-1457
TOTAL (people)	452070	453596	-1525
PT Mode Share	10.7%	10.7%	

Table 4-8 Forecast demand in Local Plan Modifications with Local Plan Mitigation and Modifications Mitigations (All model) (IP period)

Mode	Forecast Scenario	Reference Scenario	Difference
	Origin/Destination	Origin/Destination	Origin/Destination
Car (vehicles)	569610	556818	12791
Bus (people)	60861	59910	952
Rail (people)	13310	15514	-2204
TOTAL (people)	786184	771447	14737
PT Mode Share	9.4%	9.8%	

Table 4-9 Forecast demand in Local Plan Modifications with Local Plan Mitigation and Modifications Mitigations (All model) (PM period)

Mode	Forecast Scenario	Reference Scenario	Difference
	Origin/Destination	Origin/Destination	Origin/Destination
Car (vehicles)	400286	407794	-7508
Bus (people)	36580	36588	-9
Rail (people)	14637	15704	-1067
TOTAL (people)	551575	562035	-10461
PT Mode Share	9.3%	9.3%	

Table 4-10 Forecast demand in Local Plan Modifications with Local Plan Mitigation and Modifications Mitigations (All model) (12 hour period)

Mode	Forecast Scenario	Reference Scenario	Difference
	Origin/Destination	Origin/Destination	Origin/Destination
Car (vehicles)	1292950	1288648	4303
Bus (people)	132958	130857	2101
Rail (people)	40681	45409	-4728
TOTAL (people)	1789827	1787076	2752
PT Mode Share	9.7%	9.9%	

4.2.1. Highway Network

This section describes the highway network performance in the Cherwell District. The overall Cherwell District network statistics for the model simulation area are shown below in Table 4-11.

Table 4-11 Scenario 5 Network Statistics

Time	Metric	Results	Unit
Morning Peak Hour	Total Time	14615	Pcu Hr
	Delay	2523	Pcu Hr
	Total distance	914220	Pcu KM

Time	Metric	Results	Unit
	Speed	62.55	KM/h
Inter Peak Hour	Total Time	11635	Pcu Hr
	Delay	1140	Pcu Hr
	Total distance	834027	Pcu KM
	Speed	71.69	KM/h
Evening Peak Hour	Total Time	17253	Pcu Hr
	Delay	3877	Pcu Hr
	Total distance	1002420	Pcu KM
	Speed	58.10	KM/h

The network performance assessment for the key corridors in the district is described in Table 4-12 whilst Figure 4-1 and 4-2 show this for the morning and evening peak hours respectively. The assessment is organised in to routes and focuses primarily on the link performance in to key junctions along the route and also provides further detail relating specifically to junction performance where that differs to the link performance.

The network link and junction performance are measured by the volume to capacity (v/c) ratio and highlights those links on the highway network that are operating below operational capacity (v/c <85%), at operational capacity (v/c between 85% and 95%) and those that are exceeding operational capacity (v/c >95%).

The junction performance described below refers to results from a forecast of the strategic highway model and it is possible that detailed junction modelling software would not only be able to optimise signalised junction performance, but also produce marginally different junction performance results.

Table 4-12 Scenario 5 network performance assessment

Link	Junction	Junction Number	Morning peak hour	Evening peak hour
A361	London Road and Banbury Road Junction	1	Overall the performance of this junction is below capacity. However 1 turn performs at capacity and 3 turns perform over capacity. With reference to the links entering this junction, the northbound link performs over capacity; the westbound link performs at capacity.	Overall the performance of this junction is below capacity. However 2 turns perform at capacity and 3 turns perform over capacity. With reference to the links entering this junction, the northbound link performs over capacity; the westbound links perform at capacity.
	A361 and B4031 Junction	2	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.

Link	Junction	Junction Number	Morning peak hour	Evening peak hour
	A361 and Bloxham Road Junction	3	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.
	S Newington Road and Barford road Junction	4	Overall the performance of this junction is at capacity. However 1 turn performs at capacity and 2 turns perform over capacity. With reference to the links entering this junction, the northbound link performs at capacity; the southbound link performs over capacity.	Overall the performance of this junction is at capacity. However 4 turns perform over capacity. With reference to the links entering this junction, the northbound link performs over capacity; the southbound link performs over capacity.
	A361 and B4100 Junction	5	Overall the performance of this junction is below capacity. However 2 turns perform over capacity. With reference to the links entering this junction, the northbound link performs over capacity.	Overall the performance of this junction is below capacity. However 1 turn performs at capacity. With reference to the links entering this junction, all links perform below capacity.
A4260	A4260 and Twyford Road Junction	6	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. However 1 turn performs at capacity. With reference to the links entering this junction, the southbound link performs at capacity.
	A4260 and Aynho Road Junction Adderbury	7	Overall the performance of this junction is below capacity. However 4 turns perform over capacity. With reference to the links entering this junction, the southbound link performs over capacity; the westbound link performs over capacity.	Overall the performance of this junction is at capacity. However 4 turns perform over capacity. With reference to the links entering this junction, the southbound link performs over capacity; the westbound link performs over capacity.

Link	Junction	Junction Number	Morning peak hour	Evening peak hour
	A4260 and Hempton Road Junction Deddington	8	Overall the performance of this junction is over capacity. However 12 turns perform over capacity. With reference to the links entering this junction, the northbound link performs over capacity; the eastbound link performs over capacity; the southbound link performs over capacity; the westbound link performs over capacity.	Overall the performance of this junction is over capacity. However 12 turns perform over capacity. With reference to the links entering this junction, the northbound link performs over capacity; the eastbound link performs over capacity; the southbound link performs over capacity; the westbound link performs over capacity.
	A4260 and Somerton Road Junction North Aston	9	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.
	A4260 and B4030 Junction Hopcrofts Holt	10	Overall the performance of this junction is below capacity. However 3 turns perform over capacity. With reference to the links entering this junction, the southbound link performs over capacity;	Overall the performance of this junction is at capacity. However 8 turns perform over capacity. With reference to the links entering this junction, the northbound link performs over capacity; the eastbound link performs over capacity; the southbound link performs over capacity.
	A4260 and Langford Lane Junction	11	Overall the performance of this junction is below capacity. However 1 turn performs over capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. However 2 turns perform over capacity. With reference to the links entering this junction, the northbound link performs over capacity.

Link	Junction	Junction Number	Morning peak hour	Evening peak hour
M40 J11	Slips		The M40 northbound off-slip and southbound on-slip perform at capacity. The A361 southbound approach performs over capacity. The A422 eastbound approach performs at capacity.	The M40 northbound off-slip performs at capacity. The M40 southbound, A361 southbound approach and the A422 eastbound approach performs over capacity.
	Circulation		The circulatory carriageway is at capacity.	The circulatory carriageway is over capacity.
M40 J10	Slips		The M40 northbound and southbound off-slips perform below operational capacity. The link between the roundabout in the north and the new signalised junction performs over capacity.	The M40 northbound off-slip performs over capacity. The link between the roundabout in the north and the new signalised junction performs over capacity.
	B430 Roundabout	12	Overall the performance of this junction is below capacity. However 2 turns perform at capacity. With reference to the links entering this junction, the northbound link performs at capacity.	Overall the performance of this junction is at capacity. However 2 turns perform over capacity. With reference to the links entering this junction, the northbound link performs at capacity; the westbound link performs over capacity.
	A43 Roundabout	13	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.
Bicester Ring Road	Middleton Stoney Road Junction	14	Overall the performance of this junction is below capacity. However 2 turns perform over capacity. With reference to the links entering this junction, the northbound link performs over capacity.	Overall the performance of this junction is below capacity. However 2 turns perform at capacity. With reference to the links entering this junction, the northbound link performs over capacity.

Link	Junction	Junction Number	Morning peak hour	Evening peak hour
	Banbury Road Junction	15	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, the westbound link performs at capacity.
	Launton Road Junction	16	Overall the performance of this junction is below capacity. However 2 turns perform over capacity. With reference to the links entering this junction, the southbound link performs over capacity.	Overall the performance of this junction is at capacity. However 1 turn performs at capacity and 2 turns perform over capacity. With reference to the links entering this junction, the northbound link performs over capacity; the southbound link performs at capacity.
	A41 Junction	17	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.
A34	A34 and M40 Junction 9		The M40 southbound off-slip and A34 southbound off-slip perform at capacity.	The A34 southbound off-slip performs over capacity.
	A34 Circulation at M40		The circulatory carriageway is over capacity.	The circulatory carriageway is over capacity.
	A34 Slips Kidlington		The A34 southbound on-slip and the northbound approach from Woodstock Road perform at capacity.	The A34 northbound on-slip and the northbound approach from Woodstock Road perform over capacity.
	A34 Circulation at M40		The circulatory carriageway below operational capacity.	The circulatory carriageway below operational capacity.

Link	Junction	Junction Number	Morning peak hour	Evening peak hour
Hennef Way	Hennef Way and Ermont Way Junction	18	Overall the performance of this junction is at capacity. However 1 turn performs at capacity and 7 turns perform over capacity. With reference to the links entering this junction, the northbound link performs over capacity; the westbound link performs at capacity.	Overall the performance of this junction is at capacity. However 9 turns perform over capacity. With reference to the links entering this junction, the northbound link performs over capacity; the eastbound link performs at capacity; the westbound link performs at capacity.
	Hennef Way and Concord Avenue	19	Overall the performance of this junction is at capacity. However 1 turn performs at capacity and 3 turns perform over capacity. With reference to the links entering this junction, the eastbound link performs over capacity; the westbound link performs at capacity.	Overall the performance of this junction is below capacity. However 1 turn performs at capacity and 3 turns perform over capacity. With reference to the links entering this junction, the westbound link performs over capacity.
	Hennef Way and Southam Road	20	Overall the performance of this junction is over capacity. However 11 turn performs over capacity. With reference to the links entering this junction, the northbound link performs over capacity; the eastbound link performs over capacity; the southbound link performs over capacity; the westbound link performs over capacity.	Overall the performance of this junction is over capacity. However 9 turns perform over capacity. With reference to the links entering this junction, the northbound link performs over capacity; the eastbound link performs over capacity; the southbound link performs over capacity; the westbound link performs over capacity.
New link Road through Salt way development	Bloxham Road and New link Road Junction	21	Overall the performance of this junction is below capacity. However 1 turn performs over capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.

Link	Junction	Junction Number	Morning peak hour	Evening peak hour
	A4260 and New link road junction	22	Overall the performance of this junction is below capacity. However 1 turn performs at capacity. With reference to the links entering this junction, the southbound link performs at capacity.	Overall the performance of this junction is below capacity. However 1 turn performs at capacity and 7 turns perform over capacity. With reference to the links entering this junction, the northbound link performs over capacity; the southbound link performs over capacity; the access link performs over capacity.
Cherwell Street	Cherwell street and Bridge Street junction	23	Overall the performance of this junction is below capacity. However 2 turns perform over capacity. With reference to the links entering this junction, the westbound link performs over capacity.	Overall the performance of this junction is below capacity. However 2 turns perform over capacity. With reference to the links entering this junction, the westbound link performs over capacity.
Camp Road Station Rd to B4030	Camp Road and Station Road Junction	24	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.
	Camp Road and Unnamed Road Junction	25	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.
	Camp Road and B4030 Junction	26	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.

Link	Junction	Junction Number	Morning peak hour	Evening peak hour
Unnamed Road between Camp Road and B430	Unnamed Road and B430 Junction	27	Overall the performance of this junction is below capacity. However 1 turn performs over capacity. With reference to the links entering this junction, the eastbound link performs at capacity.	Overall the performance of this junction is below capacity. However 1 turn performs at capacity. With reference to the links entering this junction, all links perform below capacity.
	Camp Road and Unnamed Road Junction	25	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.
Station Road Camp Road to B4030	Station Road and B4030 Junction	28	Overall the performance of this junction is below capacity. However 1 turn performs over capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. However 1 turn performs over capacity. With reference to the links entering this junction, all links perform below capacity.
	Camp Road and Station Road Junction	24	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.
B4030 Bicester to A4260	B4030 and A4095 Howes Lane Junction	14	Overall the performance of this junction is below capacity. However 2 turns perform over capacity. With reference to the links entering this junction, the northbound link performs over capacity;	Overall the performance of this junction is below capacity. However 2 turns perform at capacity. With reference to the links entering this junction, the northbound link performs over capacity;

Link	Junction	Junction Number	Morning peak hour	Evening peak hour
	Middleton Stoney Junction	29	Overall the performance of this junction is below capacity. However 1 turn performs at capacity and 6 turns perform over capacity. With reference to the links entering this junction, the eastbound link performs over capacity;	Overall the performance of this junction is below capacity. However 1 turn performs at capacity and 4 turns perform over capacity. With reference to the links entering this junction, the northbound link performs at capacity; the eastbound link performs over capacity;
	Camp Road and B4030 Junction	26	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.
	Station Road and B4030 Junction	28	Overall the performance of this junction is below capacity. However 1 turn performs over capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. However 1 turn performs over capacity. With reference to the links entering this junction, all links perform below capacity.
	Rousham	30	Overall the performance of this junction is below capacity. However 3 turns perform over capacity. With reference to the links entering this junction, the westbound link performs over capacity.	Overall the performance of this junction is below capacity. However 3 turns perform over capacity. With reference to the links entering this junction, the westbound link performs over capacity.

Link	Junction	Junction Number	Morning peak hour	Evening peak hour
	Holt Junction (B4030 and A4260)	10	Overall the performance of this junction is below capacity. However 3 turns perform over capacity. With reference to the links entering this junction, the southbound link performs over capacity.	Overall the performance of this junction is at capacity. However 8 turns perform over capacity. With reference to the links entering this junction, the northbound link performs over capacity; the eastbound link performs over capacity; the southbound link performs over capacity.
B430 Ardley to A34	B430 and Ardley Road Junction	32	Overall the performance of this junction is at capacity. However 9 turns perform over capacity. With reference to the links entering this junction, the northbound link performs over capacity; the eastbound link performs over capacity; the westbound link performs over capacity.	Overall the performance of this junction is over capacity. However 1 turn performs at capacity and 8 turns perform over capacity. With reference to the links entering this junction, the northbound link performs over capacity; the southbound link performs over capacity; the westbound link performs over capacity.
	Unnamed Road and B430 Junction	27	Overall the performance of this junction is below capacity. However 1 turn performs over capacity. With reference to the links entering this junction, the eastbound link performs at capacity.	Overall the performance of this junction is below capacity. However 1 turn performs at capacity. With reference to the links entering this junction, all links perform below capacity.

Link	Junction	Junction Number	Morning peak hour	Evening peak hour
	Middleton Stoney Junction	29	Overall the performance of this junction is below capacity. However 1 turn performs at capacity and 6 turns perform over capacity. With reference to the links entering this junction, the eastbound link performs over capacity.	Overall the performance of this junction is below capacity. However 1 turn performs at capacity and 4 turns perform over capacity. With reference to the links entering this junction, the northbound link performs at capacity; the eastbound link performs over capacity.
	B430 and A4095 Junction	32	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.
	A34 Junction	33	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.

Figure 4-1 Scenario 5 AM Peak Network Performance

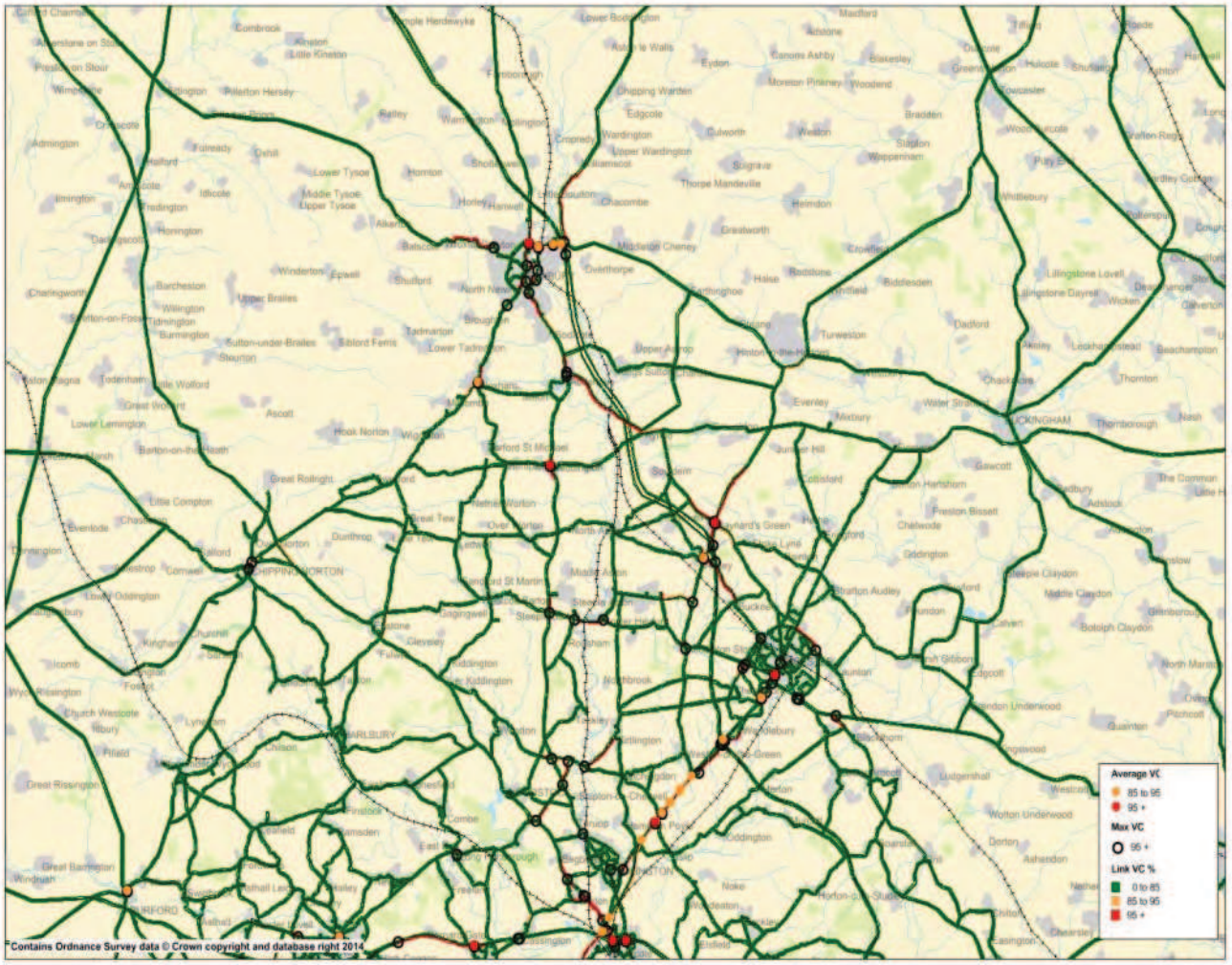
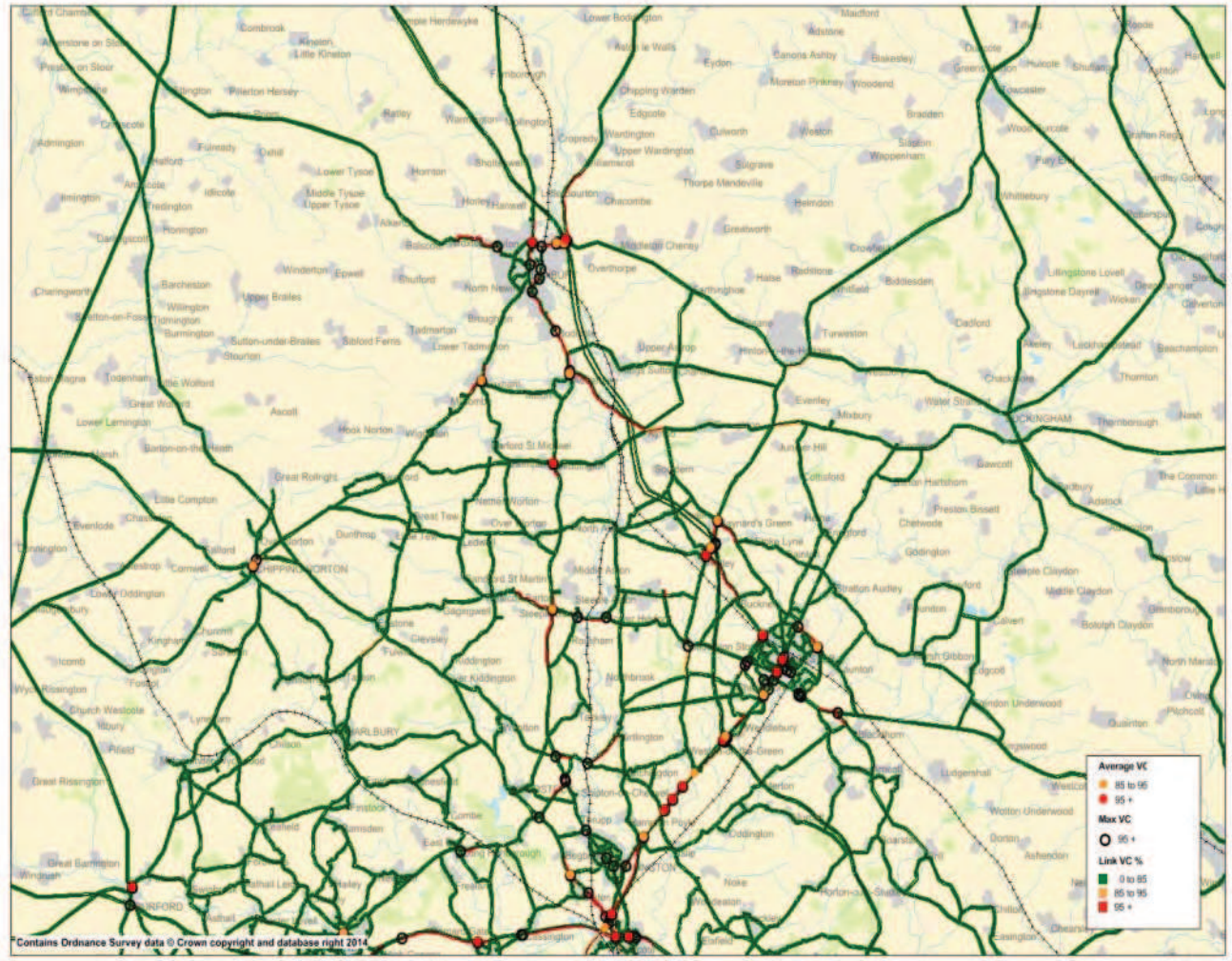


Figure 4-2 Scenario 5 PM Peak Network Performance



4.2.2. Public Transport Network

In the following tables and figures are presented the loads for bus and rail on the main corridors in Cherwell District in Scenario 2:

- Oxford to Bicester
- Oxford to Upper Heyford
- Oxford to Banbury.

The total reference case demand for Scenarios 2 and 5 is identical and so changes in public transport demand are a results of improvements related to the additional mitigation measures.

Table 4-13 shows the public transport loads between Oxford and Bicester and these are shown in further detail in Figure 4-3. For this corridor, results are similar to Scenario 4, with a significant increase in bus and rail patronage.

Table 4-13 Public Transport Patronage: Oxford-Bicester Corridor 2031 in Scenario 5

Mode	Time period	Oxford to Bicester	Bicester to Oxford
Rail	AM	702	435
	IP	238	148
	PM	570	540
Bus	AM	751	205
	IP	254	239
	PM	346	537

The public transport loads between Oxford and Upper Heyford are shown in Table 4-14 (and in more detail in Figure 4-4). The demand is using bus service 25A which operates on this corridor. The results for this Scenario are significantly higher than in Scenario 4 due to the improvements in frequency for service 25A.

Further analysis is being undertaken to understand the drivers behind the bus demand from Oxford to Upper Heyford being greater than to Oxford from Upper Heyford.

Table 4-14 Public Transport Patronage: Oxford-Upper Heyford Corridor 2031 in Scenario 5

Mode	Time period	Oxford to Upper Heyford	Upper Heyford to Oxford
Bus	AM	218	47
	IP	43	65
	PM	83	117

Public transport demand on the Oxford to Banbury Corridor is shown in Table 4-15 with further detail shown in Figure 4-5. For this corridor, results are similar to Scenario 4, with the travel demand increasing significantly for the bus but having a neutral impact on rail.

Table 4-15 Public Transport Patronage: Oxford-Banbury Corridor 2031 Scenario in 5

Mode	Time period	Oxford to Banbury	Banbury to Oxford
Rail	AM	177	406
	IP	113	94
	PM	512	179
Bus	AM	172	140
	IP	26	48
	PM	48	83

The locations for the flows shown in the tables above can be seen in the following figures. They represent a mid-point on each route and do not show total public transport boardings and alightings.

Figure 4-3 Public Transport Patronage: Oxford-Bicester Corridor 2031 in Scenario 5

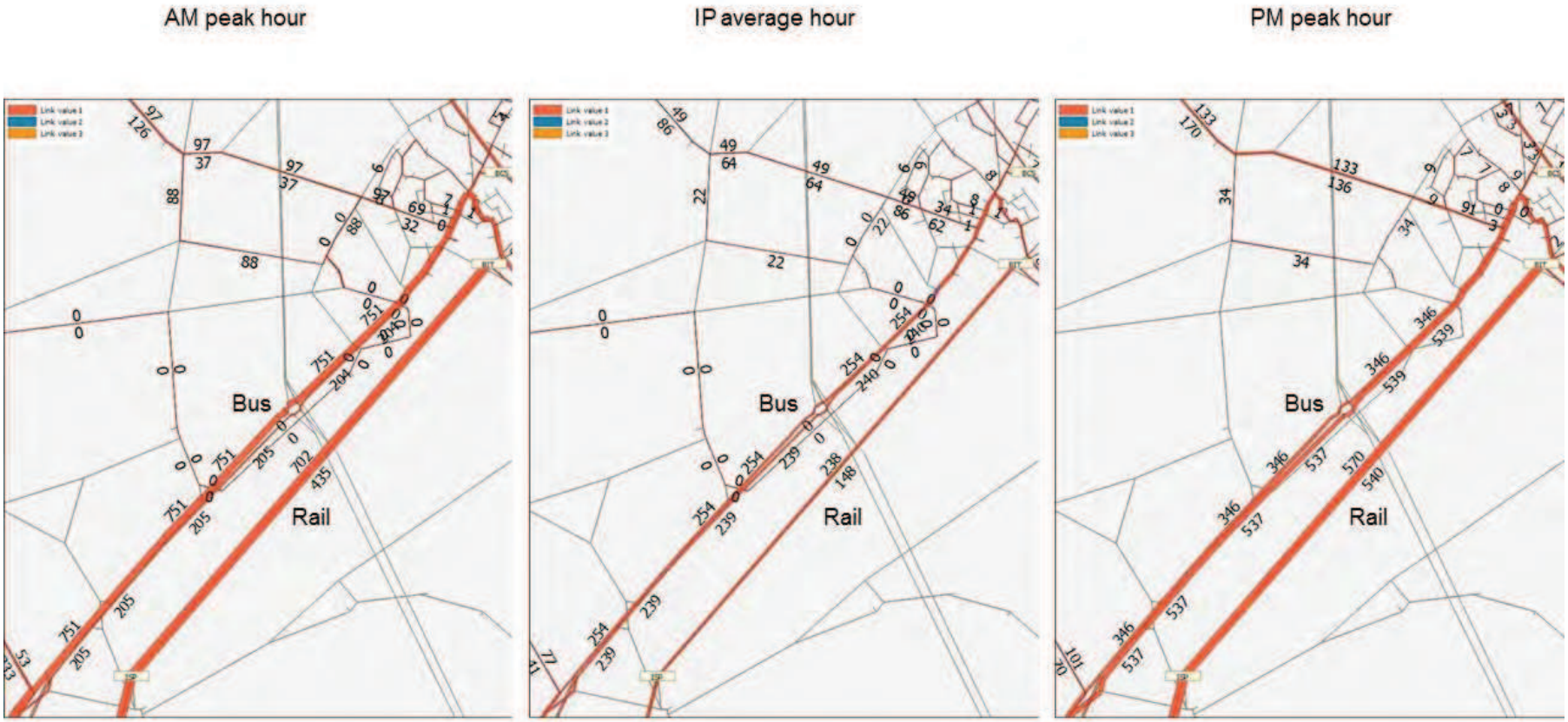


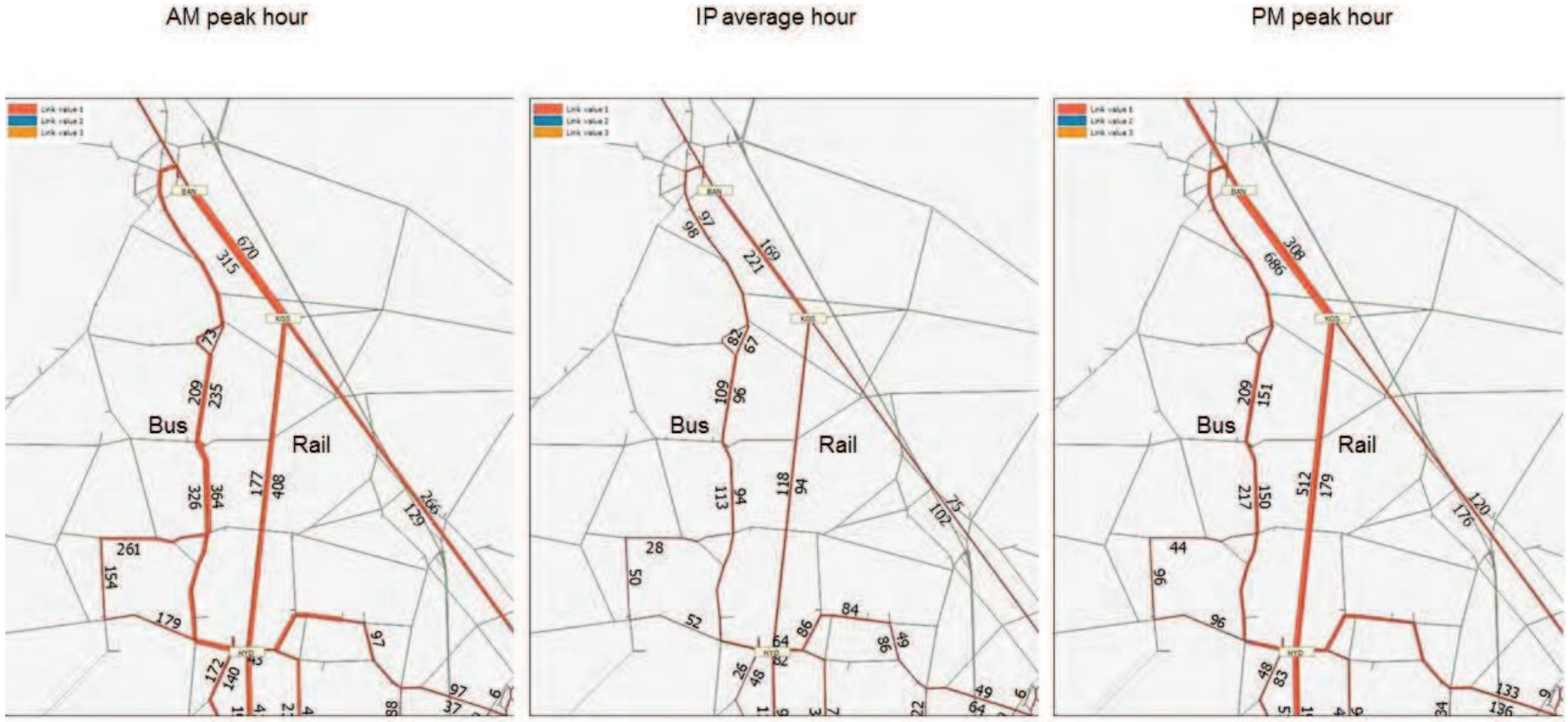
Figure 4-4 Public Transport Patronage: Oxford-Upper Heyford Corridor 2031 in Scenario 5

AM peak hour

IP average hour

PM peak hour

Figure 4-5 Public Transport Patronage: Oxford-Banbury Corridor 2031 in Scenario 5



5. Summary

Two 2031 forecast model scenarios were run testing the Local Plan and the Local Plan Modifications with and without transport mitigation measures for the Local Plan Modifications. The following scenarios were run:

- Base Year 2013
- 2031 Local Plan Modifications demand with the transport mitigation measures identified for the Local Plan demand (Scenario 2)
- 2031 Local Plan Modifications demand with the transport mitigation measures identified for both the Local Plan demand and for the Local Plan Modifications demand (including those for the Upper Heyford development) (Scenario 5)

Section 2 of this technical note describes the transport conditions (from runs of the OSM) in the 2013 base year, whilst Section 3 and Section 4 describe the results of the 2031 OSM model runs for Scenarios 2 and 5 respectively (as detailed above). The key difference between the two scenarios is the introduction of transport mitigation measures to address the impacts of the Local Plan modifications.

Table 5-1 compares the 2031 12 hour forecast demand for the Cherwell District for the Reference Scenario and the two forecast scenarios (Scenarios 2 and 5). It can be seen that the introduction of the mitigation measures results in a decrease in both car and rail travel and increase in bus travel. As the mitigation measures are a combination of highway improvements, increased bus provision and measures to manage traffic on the highway network these results are intuitive.

Table 5-1 2031 Forecast demand for Cherwell District – Scenarios 2 and 5 (12 Hour)

Mode	Reference Scenario		Forecast Scenario 2		Forecast Scenario 5	
	Origin	Destination	Origin	Destination	Origin	Destination
Car (vehicles)	281746	280464	277517	268509	277161	268116
Bus (people)	11850	12014	12862	13248	15328	15963
Rail (people)	9262	9061	9692	10436	8373	9202
TOTAL (people)	373295	371655	369450	359321	370152	360309

Table 5-2 shows equivalent results for the full OSM model area and the results are similar to those observed above for Cherwell District with an increase in bus demand and reduction in car and rail demand.

Table 5-2 2031 Forecast demand for the entire model – Scenarios 2 and 5 (12 hour)

Mode	Reference Scenario	Forecast Scenario 2	Forecast Scenario 5
	Origin/Destination	Origin/Destination	Origin/Destination
Car (vehicles)	1288648	1293503	1292950
Bus (people)	130857	130597	132958
Rail (people)	45409	42394	40681
TOTAL (people)	1787076	1789869	1789827

The difference of trips between the forecast scenario and reference scenario are presented in Table 5-3 below.

Table 5-3 Change in the number of movements in the scenarios considered

Mode	Scenario 2_Difference		Scenario 5_Difference	
	Origin	Destination	Origin	Destination
Car (vehicles)	-4229	-11955	-4586	-12348
Bus (people)	1012	1235	3479	3949
Rail (people)	430	1376	-889	141
TOTAL (people)	-3845	-12333	-3143	-11345

The change in the percentage of public transport trips is presented in Table 5-4 below.

Table 5-4 Change in percentage of Public Transport for the two scenarios

Scenario	Forecast	Reference	Difference
Scenario 2	6.10%	5.66%	0.45%
Scenario 5	6.40%	5.66%	0.75%

Speed and delay statistics for the four scenarios considered is presented in Table 5-5.

Table 5-5 Speed and Delay Statistics for the two scenarios

Scenario Number	Morning Peak Hour		Evening Peak Hour	
	Speed (Kmph)	Delay (PCU-Hr)	Speed (Kmph)	Delay (PCU-Hr)
Scenario 2	61.85	2662	56.62	4250
Scenario 5	62.55	2523	58.10	3877

It can be seen that the Local Plan Modification Mitigation measures are leading to an increase in bus patronage with a decrease in car and rail demand. The reduction in rail demand is greater than that for car which appears reasonable as the mitigation measures do include some highway improvement schemes.

Banbury Highway Model
Forecasting Report
Oxfordshire County Council

ATKINS

15th October 2014

Plan Design Enable

Notice

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Table of contents

1. Introduction

1.1. Background

Cherwell District Council (CDC) submitted its Local Plan in January 2014, which included 16,750 new homes. However, the Local Plan Examination was suspended because the Inspector ruled that the Plan should have taken into account Cherwell's unmet need for housing, as identified through Oxfordshire's Strategic Market Housing Assessment (SHMA); the SHMA identified a need for Cherwell to allow for 22,800 homes by 2031. CDC has therefore submitted Modifications to the Local Plan to deliver the additional housing.

Within Banbury, the main housing-related Modifications comprise new development sites to the south of Banbury (south of Salt Way -1495 dwellings), with smaller development sites proposed at Drayton Lodge Farm to the north of Banbury (150 dwellings), and at Higham Way (150 dwellings). Additional dwellings would also be delivered through extensions to Bankside Phase 2 (200 dwellings); increased development capacity north of Hanwell Fields; and through changed Policy Principles at Bolton Road.

The Main Modifications would also deliver increased employment in Banbury through extension of the West of M40 employment site. A new employment site (B1, B2 and B8) is also proposed north east of M40 Junction 11, providing approximately 3,500 jobs.

As part of Oxfordshire County Council's (OCC's) work on understanding the impact of the Local Plan Modifications, an updated Banbury Highway Model (BHM) was developed during the summer 2014. The BHM has been used to test the impact of the proposed growth on the highway network in Banbury in 2031 and to identify the mitigation required to manage the identified capacity issues. Mitigation requirements that have been tested using the BHM have also been informed by the Banbury Movement Study (February 2013), which was a supporting document to the January 2014 Cherwell Local Plan Submission.

It should be noted that whilst an 'Oxfordshire Strategic [Transport] Model' (OSM) has been developed, it is a strategic model covering the whole County. The Banbury area within OSM is not sufficiently well validated to support testing different scenarios and thus there was a need to develop a separate 'validated' model which focuses on the Banbury area.

1.2. Banbury Modelling System

Figure 1-1 shows the study area for the Banbury SATURN model and highlights the key calibration and validation screenlines within the model. Banbury is contained within the internal simulation model area of the SATURN model. The BHM 2031 forecast year model was developed from the validated 2014 base year demand model representing vehicle-based movements within Banbury for a typical weekday AM morning peak hour (08:00 – 09:00). The BHM is a fixed highway assignment model only. Therefore it does not allow for variations in demand for different modes of travel as a function of the increasing congestion. It also only considers trips by car, Light Goods Vehicles (LGV) and Heavy Goods Vehicles (HGV).

The 2031 forecast year scenarios modelled are as follows and are described in more detail in the following sections:

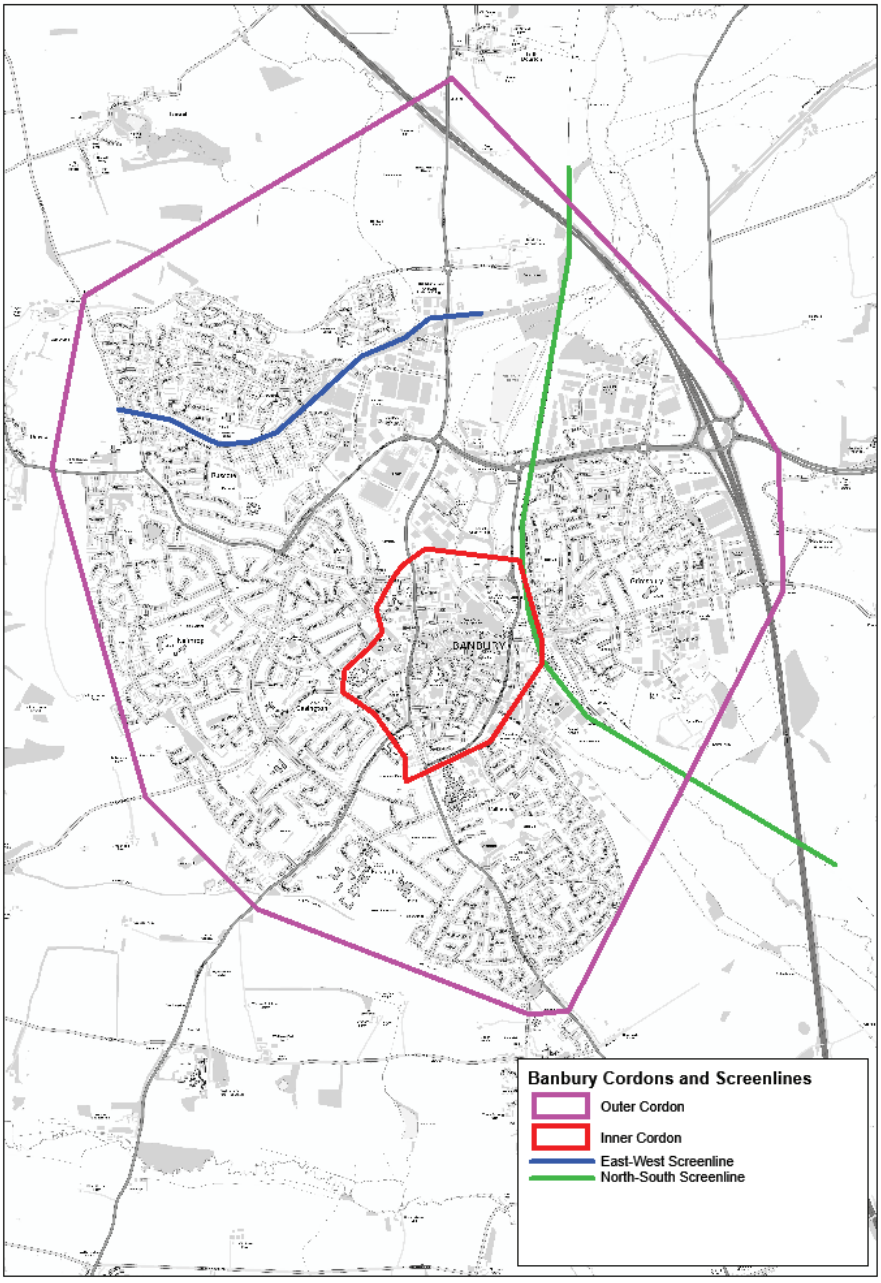
- Scenario 0 2031 'Without Intervention' Model; this represents the existing highway network from the 2014 base year model but with a growth in transport demand as discussed in Section 2
- Scenario 1 – Scenario 0 with the addition of a new link road between the A361 Bloxham Road and White Post Road. This link road has been identified by OCC as essential infrastructure to support housing development to the south of Banbury and specifically 'Banbury 17' of the Local Plan Mods.
- Scenario 2 – Scenario 1 with the addition of measures for the Promotion of Bankside, comprising i) Removal of traffic calming along Bankside; ii) Signalisation of Hightown/Bankside junction ; and iii) Signal timing optimisation at Swan Close Road.
- Scenario 3 – Scenario 2 with the addition of traffic calming along the A361 South Bar Street/ Horsefair corridor, to slow traffic down and consequently reduce the attractiveness of using this route.
- Scenario 4 – Scenario 3 with the signalisation of the Hennef Way/Ermont Way junction plus associated changes to the Middleton Road/Ermont Way roundabout.
- Scenario 5 – Scenario 4 plus a new link road between Overthorpe Way and the A422.
- Scenario 6 – Scenario 4 plus a new link road between Bankside and Overthorpe Way

1.3. Scope of Report

This report is structured as follows:

- Section Two describes development of the 'Reference Case' and the approach to calculation of traffic growth between the 2014 base year and 2031 forecast year;
- Section Three summarises Scenario 1, the 'Without Intervention Model'; this examines the results from the model for growth in travel up to 2031 assuming the existing road network is retained;
- Section Four examines the results from the BHM for Scenarios 1 to 6, providing analysis on the potential impacts on the road network for each scenario;
- Section Five provides conclusions and sets out additional Model testing that is recommended to further understand mitigation required to support the proposed Local Plan Mods., and the phasing of supporting infrastructure.

Figure 1-1 Banbury Model Study Area



2. Developing the 'Without Intervention' Model

2.1. Introduction

The 'Without Intervention' scenario was developed from the base year case by taking into account the growth in demand arising from changes in demographics, new development and changes in macro-economic factors between the 2014 base year and 2031 forecast year. The developments include those that are committed, as well as Local Plan proposals. The forecast growth in travel demand is described in more detail within this section.

By definition, the network within Banbury for the 2031 'Without Intervention' scenario is the same as for the 2014 base year model.

2.2. Growth in Demand

The growth in demand between the base year and the forecast year were derived using the following datasets:

- Committed development within Banbury, with data provided by CDC/ OCC;
- The Local Plan Main Modifications, as published by CDC in August 2014;
- Central Government forecasts provided by TEMPRO v6.2 dataset;
- National Trip End Model (for HGV growth).

Further details of each stage in the process are provided below.

2.2.1. Committed Development and Local Plan Main Modifications

For the growth in demand within Banbury, a list of committed developments and Local Plan Main Modifications was provided by OCC to Atkins.

The local planning data specified the location of development sites; the land-use including the number of dwellings/ employment Gross Floor Area (GFA); and (where available) trip generation rates of each development as provided in their respective Transport Assessments. For those developments where trip rates were not available, trip rates were robustly calculated using the following methodology, to ensure that optimistic bias was avoided:

- Residential developments: A trip rate of 0.4 vehicles per dwelling leaving a site, and 0.1 arriving at a site was used for the AM Peak period. This closely aligns with current trip rates calculated using TRICS, which is an industry standard database software program used to calculate the likely trips generated by different land use classes.

Employment (B1/B2/B8): Trip rates for Banbury 6 and Banbury 15 were derived from sensitivity trip rates calculated in the Transport Assessment produced by Peter Brett Associates for Banbury 6. Sensitivity rates essentially represent a high level trip rate (compared with an average trip rate which is normally calculated from TRICS) and are considered to provide a robust assessment of the likely traffic impact of larger developments. These trip rates are calculated per 100m² of GFA (Gross Floor Area) and then multiplied by the size of the development GFA, these are given in Table 2-1. The intended split of B2/B8 is 20%/80%, where the sensitivity applied is 50%/50%, giving a greater trip generation.

Table 2-1: Banbury 6 Sensitivity Rates

Land Use	AM Peak Hour (08:00-09:00)		PM Peak Hour (17:00-18:00)	
	Arrival	Departure	Arrival	Departure
B2 – Industrial Estate	0.371	0.169	0.102	0.324
B8 – Warehousing (Commercial)	0.077	0.044	0.031	0.080

The committed development and Local Plan Modifications sites modelled within the BHM are shown in Table 2-2.

Table 2-2: Developments in Banbury (2014 – 2031)

Location of Development	Type	Size
Bankside/College Fields	Residential	237 dwellings
Oxford Road/Weeping Road	Residential	833 dwellings
Oxford Road	Residential	22 dwellings
Crouch Farm	Residential	145 dwellings
Warwick Road/North Harwell Fields	Residential	400 dwellings
West of Southam Road	Residential	600 dwellings
West of Warwick Road	Residential	300 dwellings
Bretch Hill	Residential	400 dwellings
Land NE of Crouch Hill	Residential	40 dwellings
Southam Road	Residential	31 dwellings
Banbury Academy Land	Residential	44 dwellings
Warwick Road/Foundry Street	Residential	22 dwellings
Hightown Road	Residential	34 dwellings
Christchurch Court	Residential	43 dwellings
Tramway Road	Residential	14 dwellings
South Bar Street	Residential	13 dwellings
NW of Crouch Hill Road	Residential	26 dwellings
Lincoln Close	Residential	18 dwellings
Calthorpe Street	Residential	15 dwellings
Warwick Road	Residential	16 dwellings
The Fairway	Residential	11 dwellings
Canalside	Residential	700 dwellings
Bolton Road	Residential	200 dwellings
South of Salt Way (East)	Residential	1200 dwellings
South of Salt Way 9west)	Residential	150 dwellings
Higham Way	Residential	150 dwellings
Bankside Phase 2	Residential	590 dwellings
North of Hanwell Fields	Residential	144 dwellings
Drayton lodge Farm	Residential	250 dwellings
Various sites (unspecified)*	Residential	429 dwellings
Bankside/College Fields	Employment (B1)	2,200m²
Banbury Gateway Retail Park	Mixed Use	27,432m²
Relocated Pro-Drive Factory to Hella Site	Employment	-
Southam Road	Employment	59,000m²
Central M40	Employment	115,197m²
NE M40 Junction 11	Employment	49 ha – 3,500 jobs

*Various sites

2.2.2. TEMPRO

TEMPro (Trip End Model Presentation Program) is a tool used for transport planning purposes including the application of traffic growth factors. For the purposes of this model, TEMPro was used to derive the growth in traffic demand from car and LGV journeys that originate from outside of Banbury. TEMPro was used rather than the OSM outputs for the model. The growth rates applied are given in Table 2-3, note that due to the planned Banbury developments exceeding the projected TEMPro growth the growth factor for Banbury is set to 1, (i.e. no additional growth).

Table 2-3: TEMPro Growth Rates

All purposes		
Name	**Origin**	**Destination**
Derbyshire	1.1086	1.0891
Leicestershire	1.0951	1.1083
Lincolnshire	1.1003	1.0935
Northamptonshire	1.1699	1.1689
Nottinghamshire	1.1428	1.1527
Berkshire	1.1298	1.1246
Buckinghamshire	1.1521	1.1638
East Sussex	1.1065	1.1103
Hampshire	1.0933	1.0999
Isle of Wight	1.1270	1.1419
Kent	1.1113	1.1111
Oxfordshire	1.1086	1.0919
Cherwell	1.1029	1.0950
rural (Cherwell)	1.0982	1.0937
Banbury	1.0000	1.0000
Bicester	1.0995	1.0980
Kidlington	1.1079	1.0914
Bloxham	1.1493	1.1230
Oxford	1.1576	1.0855
South Oxfordshire	1.0824	1.0718
Vale of White Horse	1.1347	1.1322
West Oxfordshire	1.0585	1.0742
Surrey	1.0866	1.1169
West Sussex	1.0918	1.0889
Hereford & Worcester	1.0607	1.0593
Shropshire	1.0995	1.0983
Staffordshire	1.0800	1.0766
Warwickshire	1.0721	1.1235
West Midlands county	1.1688	1.1566

2.2.3. Growth for HGVs

The growth in HGV traffic between 2014 and 2031 was applied using a growth rate obtained from the National Trip End Model (RTF 2013). This rate was found to equal 1.174 and was applied equally across all zones within the model.

3. Without Intervention Scenario

The Without-Intervention case within the BHM represents a theoretical situation where growth, between 2014 and 2031, has been added to the road network but with the same highway network as was present in the 2014 base year model. The following chapter examines the key results from the model.

3.1. Network Statistics

Network statistics for the Without Intervention model are set out in Table 3-1. These figures have been calculated from the SATURN output and represent statistics for the average pcu trip on the network. The impact of the growth in demand from 23,614 pcus to 31,026 pcus or around 32% between base year and 2031 on network congestion is clear.

Table 3-1: Without Intervention Network Statistics

Metric	Base year	Without intervention
Average journey time min per pcu	6.67	10.00
Average total delay min per pcu	1.24	3.81
Average distance travelled km per pcu	6.35	6.41
Average Speed kph	57.1	38.6

3.2. Link and Junction Capacity

The network link and junction performance are measured by the volume to capacity (v/c) ratio and highlights those junctions and links on the highway network that are operating below operational capacity (v/c <85%), at operational capacity (v/c between 85% and 95%) and above operational capacity (v/c>95%). For the Junction Arm Volume to Capacity Ratio (%), this measure refers to a junction where at least one turn exceeds 95%.

Figure 3-1 shows the network performance in the Without Intervention case across Banbury and Figure 3.2 shows the NE of Banbury in more detail including Junction 11 of the M40. The output broadly shows that the NE area of Banbury is forecast to experience capacity issues in 2031. In addition, Cherwell Street/Bridge Street Signals also exhibit capacity issues as do parts of the B4100/A4260 Oxford Road.

3.3. Key Junction Performance

Table 3-2 summarises the average delay per pcu (seconds) and average and maximum queuing at key junctions within Banbury compared with the 2014 base year model. The table highlights that two particular links on the network would experience a very high level of delay:

1. The A361 (southbound) approach to Junction 11 of the M40; a delay of over 21 minutes occurs. The delay results in severe queuing and is caused by problems with blocking back on the circulatory section of the grade separated roundabout at J11.
2. Northbound traffic flow using the Ermont Way approach to the A422 Hennef Way/Ermont Way roundabout junction is forecast to experience 10 minutes delay. This is due again to the high level of opposing flow circulating the roundabout.

Potential solutions to these problems are discussed in Chapter 4. In particular, Scenarios 4 to 6 examine mitigation measures for this part of the network.

3.4. Select Link Analysis for Hennef Way/Concord Avenue Roundabout

'Select Link Analysis' provides an understanding of the origins and destinations of trips using a particular link on the road network. Figure 3-3 shows the select link analysis for eastbound traffic turning right from Hennef Way into Concord Avenue. The figure shows that traffic originates almost equally from each of A423 Southam Rd and Ruscote Avenue, It seems that some of the traffic is local, but also coming from further north along the A423. However, the traffic is destined mostly to local destinations such as the town centre and some to further south along the A4260.

Table 3-2: Comparison of Key Junction performance for 2031 Without Intervention versus 2014 base year scenario.

Junction	AM Peak Performance	Link	2031: Without Intervention			2014		
			Ave delay per pcu (seconds)	Ave queue length (pcu)	Max. queue length (pcu)	Ave delay per pcu (seconds)	Ave queue length	Max. queue length
M40 Junction 11	Forecast to operate over capacity on specified links. Lack of capacity results in queuing along slips and at the roundabout. At signals, blocking back occurs causing extra delay.	Off-slip (southbound exit)	195	62	125	20	7	14
		Off-slip (northbound exit)	255	109	184	20	6	13
		A361 (southbound approach)	1280	219	280	15	2	2
Hennef Way (A422)/ Ermont Way	High flows east to west result in significant delay on Ermont Way approach. Forecast to operate over capacity on three specified arms.	Hennef Way (westbound)	30	17	70	5	0	0
		Ermont Way (northbound)	600	57	63	190	23	46
		Hennef Way (eastbound)	180	91	118	24	1	1
Hennef Way (A422)/ Concord Avenue (A4260)	Delay on this link is largely due to the high level of right turning vehicles into Concord Avenue from the A422. Over capacity.	Hennef Way (westbound approach).	185	94	168	32	0	0
Ermont Way/ Middleton Road	Opposing circulating flow at roundabout and single lane entry causes delay.	Ermont Way (southbound approach)	35	25	44	11	0	0
Cherwell Street/ Bridge Street	Traffic flow levels combined with limited junction capacity results in delay. Turning movements into and out of Bridge Street over capacity.	Cherwell Street (northbound approach)	100	13	39	30	5	9
		Bridge Street (westbound approach)	110	20	48	41	7	14
Swan Close Road/ Upper Windsor Street	Traffic queuing on approach. Right turn demand exceeding capacity.	Swan Close Road (westbound approach)	120	16	26	38	5	9
A361 Bloxham road/B4100 Oxford Road	Traffic queuing on approach to junction and operating over capacity	B4100 Oxford Road	44	11	21	27	4	10

Note: This 'Without Intervention' scenario is a theoretical scenario provided for context.

Figure 3-1 Link and Junction Volume to Capacity Output for Banbury 'Without intervention' Scenario

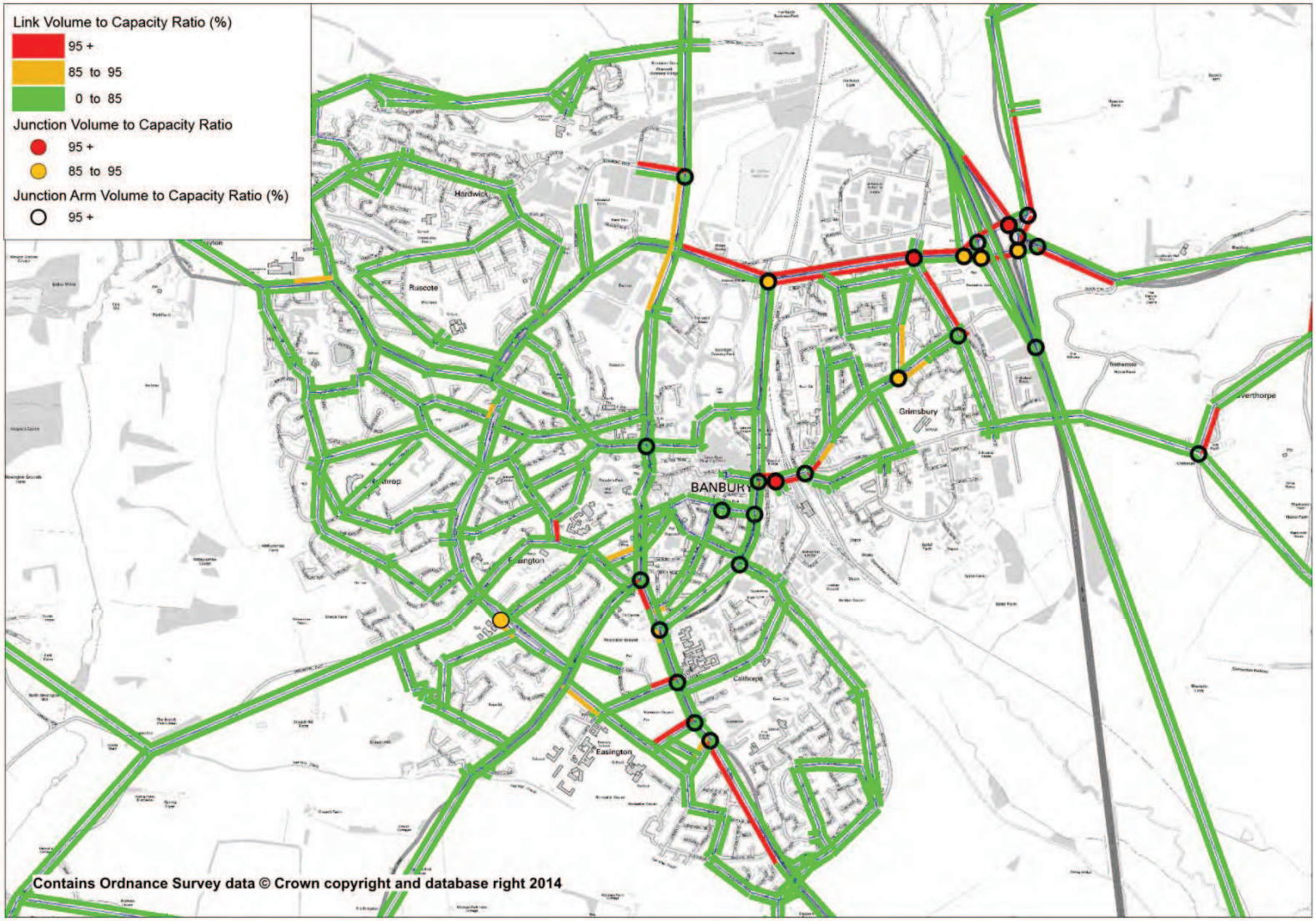


Figure 3-2 Link and Junction Volume to Capacity Output for NE Banbury 'Without intervention' Scenario

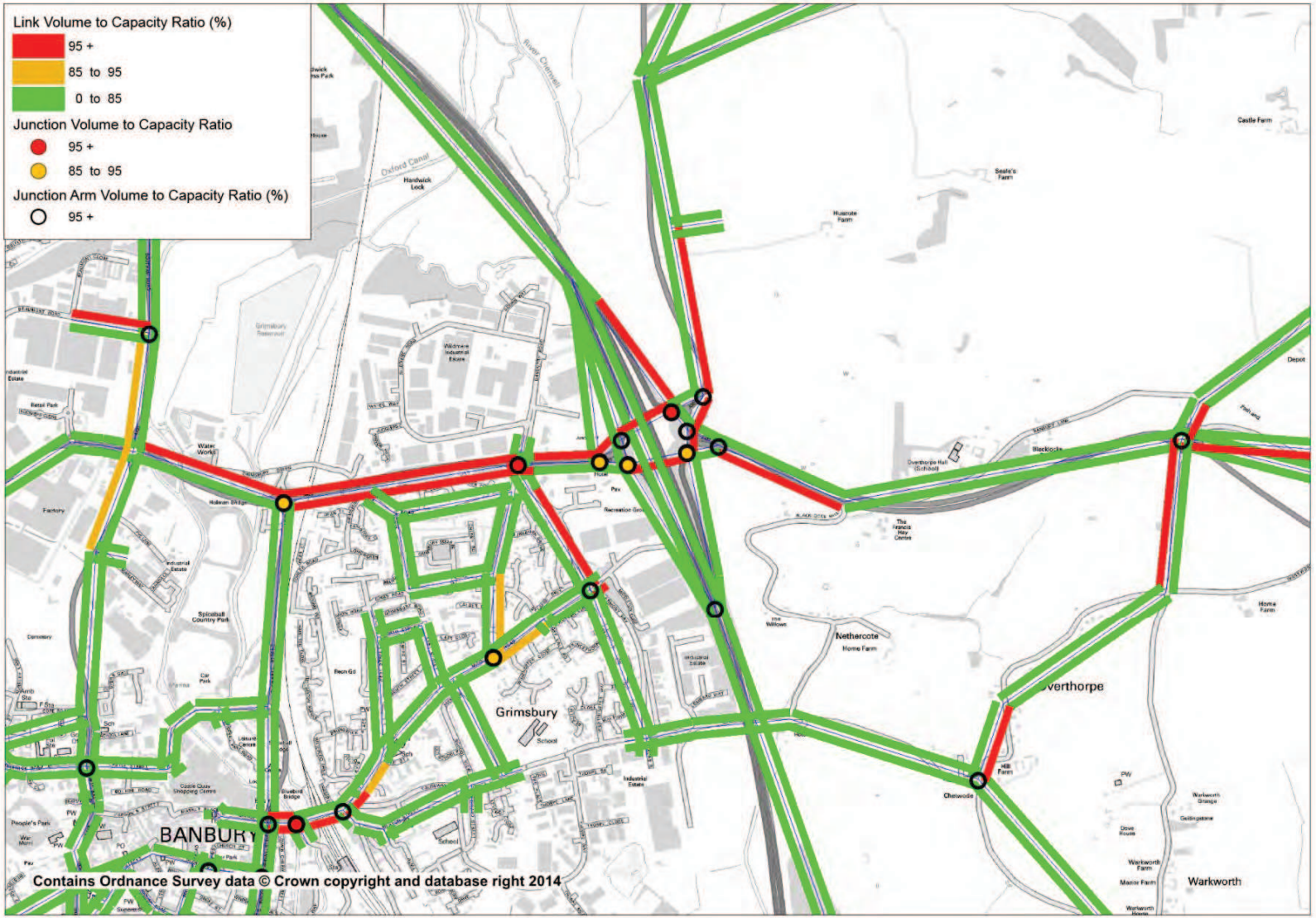
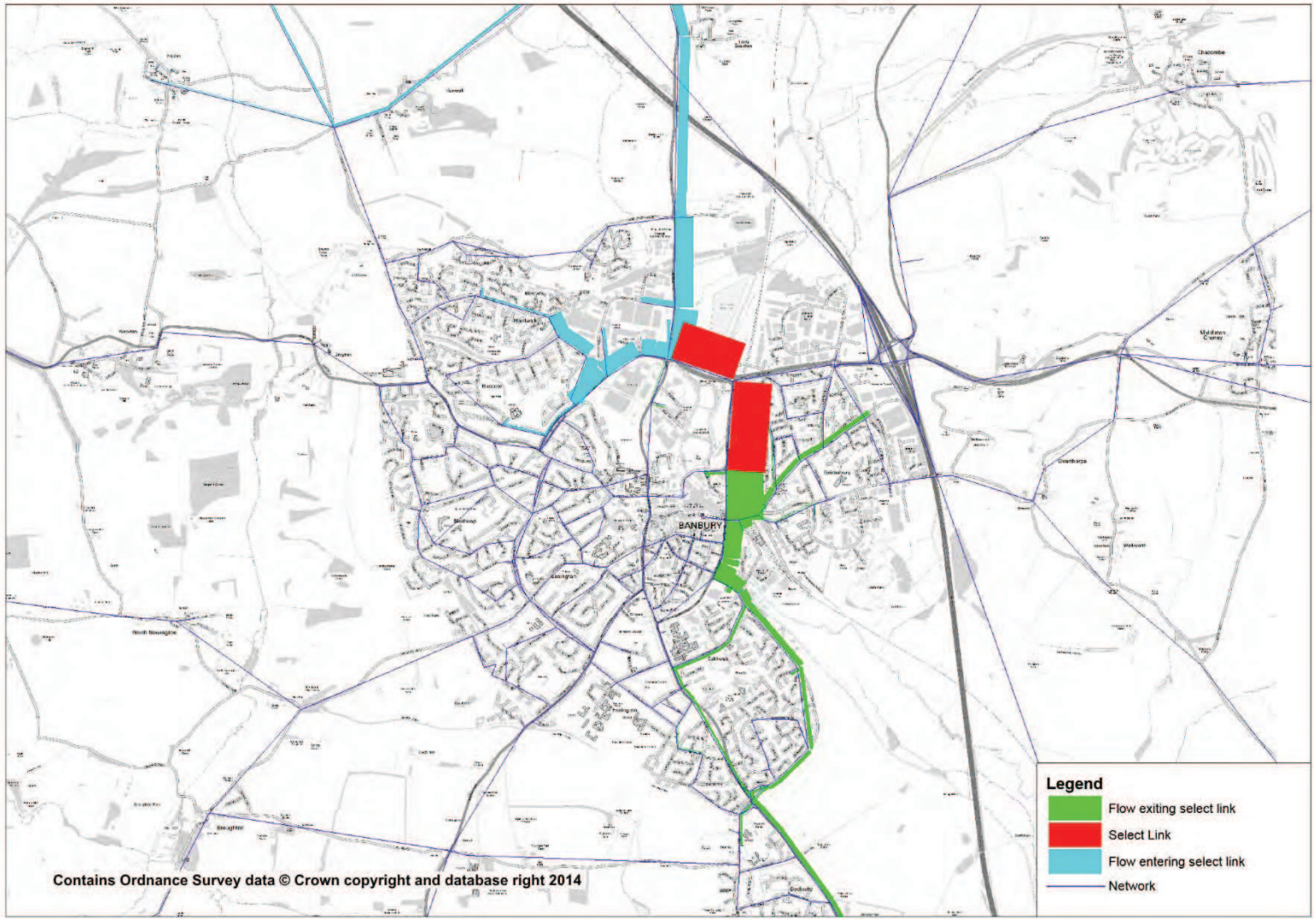


Figure 3-3 Select Link Analysis of eastbound right-turning traffic at the Hennef Way/Concord Avenue roundabout



4. Scenarios 1 to 6: The 'With Intervention' Scenarios

4.1. Scenario 1: New A361 Bloxham Road to A4260 Oxford Road Link Road

4.1.1. Scheme Overview

Scenario 1 involved the modelling of a new link road between the A361 Bloxham Road and White Post Road. The link road would provide access to the road network for traffic entering and exiting new development sites to the south of Salt Way. In addition, the road would also enable existing traffic flow to use this route. At either end of the link road, two roundabouts were coded to represent the junctions with the A361 Bloxham Road and White Post Road. Two additional roundabout junctions are placed along the link road to allow for traffic to and from the southern development sites to connect with the Banbury highway network.

4.1.2. Network Statistics

Network statistics for the Scenario 1 model compared against the 'Without Intervention' scenario is set out in Table 4-1 below. Compared with the previous scenario, there is a small decrease in the average journey time and delay, accompanied by a small increase in the average speed across the network.

Table 4-1: Scenario 1 comparison with 'Without Invention' Network Statistics

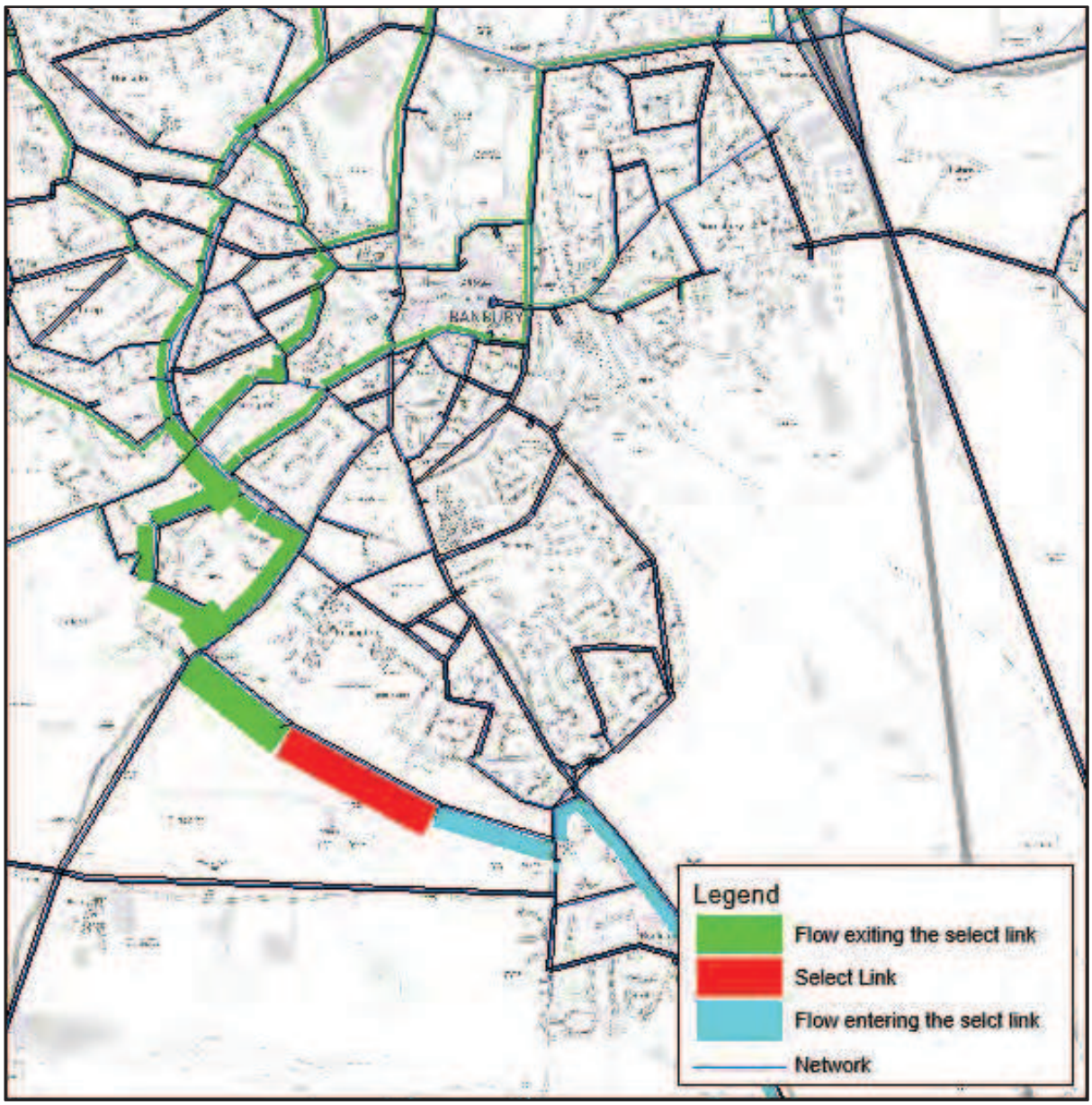
Metric	Scenario 1	Without Intervention	Units
Average journey time	9.82	10.00	Mins/pcu
Average total delay	3.74	3.81	Mins/pcu
Average distance travelled	6.41	6.41	km
Average Speed	39.2	38.6	km/h

4.1.3. Select Link Analysis

Select Link Analysis of westbound traffic flow using the new link road is shown in Figure 4-1. The figure shows that northbound traffic flow in particular, utilises the link road instead of Wykham Lane and Springfield Avenue. Both of these roads are respectively considered unsuitable for large volumes of traffic and the introduction of the link road indicates that traffic would move to using this link to travel between the A361 Bloxham Road and Oxford Road.

The addition of the link road would also lead to less traffic using the corridor between the A4260 Upper Windsor Street Road/B4100 Oxford Road Signals junction and A361 South Bar Street/High Street mini roundabout in both directions. Traffic flow appears instead to re-route via Queensway and onto either the B4035 (then Bath Road) or, to a lesser extent, Kingsway.

Figure 4-1: Select Link Analysis of westbound traffic flow along the proposed Link Road

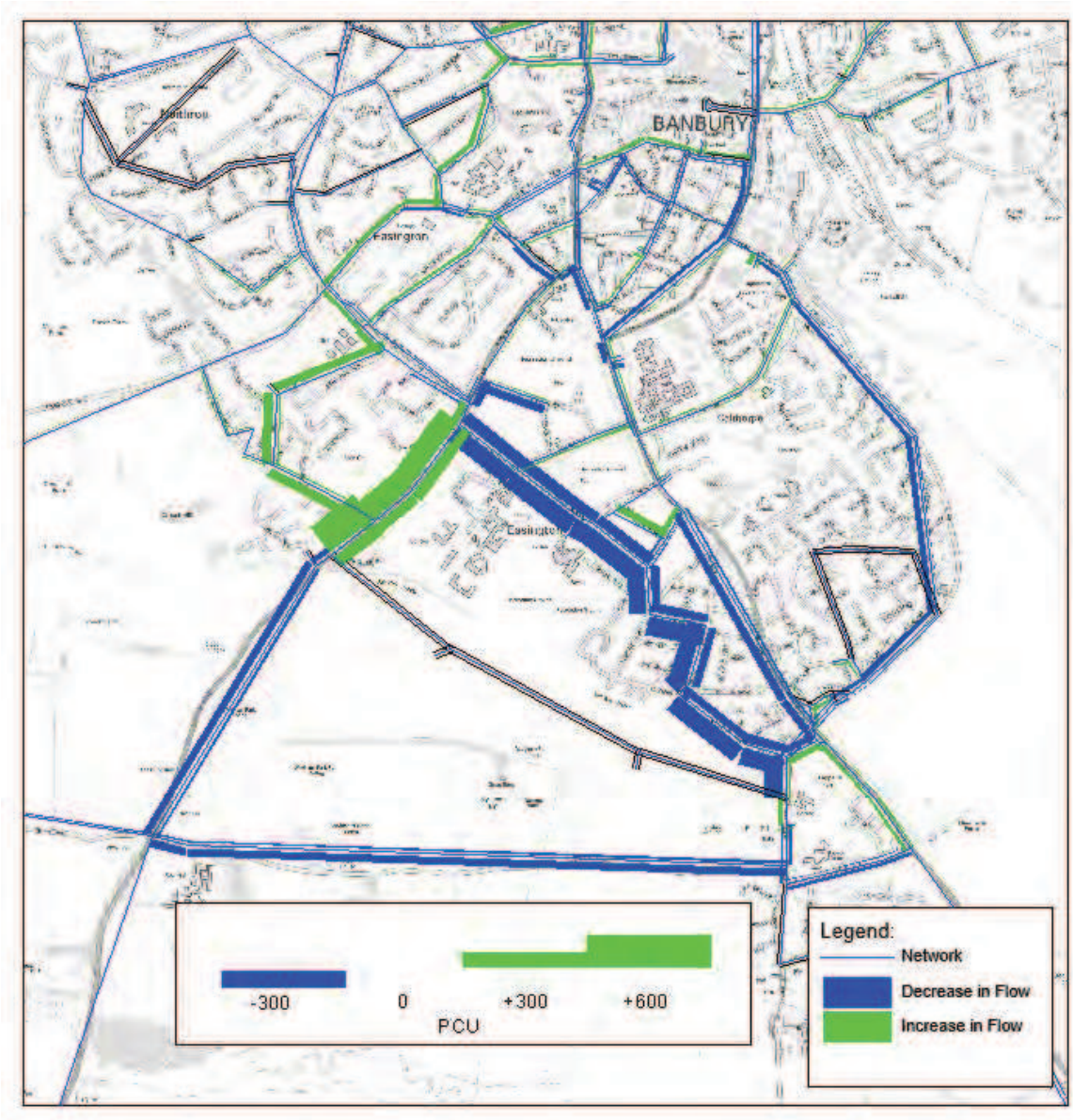


4.1.4. Flow Difference

Change in Traffic Flow between Scenario 1 and the Without Intervention Scenario is shown in Figure 4-2. It should be noted that given the method that SATURN uses to compares changes between two models, the flows along the link road are not shown as it it only exists in Scenario 1.

The addition of the link road would lead to less traffic using the corridor between the A4260 Upper Windsor Street /B4100 Oxford Road Signals junction and A361 South Bar Street/High Street mini roundabout in both directions. Traffic flow appears instead to re-route via Bloxham Rd, Queensway and onto either the B4035 (then Bath Road) or, to a lesser extent, Kingsway.

Figure 4-2: Flow Difference Plot between Scenario 1 and the 'Without Intervention' model



Note that flow difference does not appear on the new link because it was not part of the scenario 0 network

4.1.5. Junction and Link Capacity

Figures 4-3 and 4-4 show the junction and link capacity across the BHM network for Scenario 1. Due to the location of the new link road, there is no noticeable impact on the strategic road network in the North-East of Banbury and the Cherwell Street Corridor. Due to the increase in northbound flow through Queensway and away from the A4260 Oxford as shown previously, it is noted that the capacity issue along part of Oxford Road is relieved (the link up to the junction with Grange Rd decreases from being above theoretical capacity to operating under capacity). However, one junction along Queensway, providing access to Kingsway, is found to move from operating at operational capacity to over capacity.

Figure 4-3: Scenario 1 - Link and Junction Volume to Capacity Output for Banbury

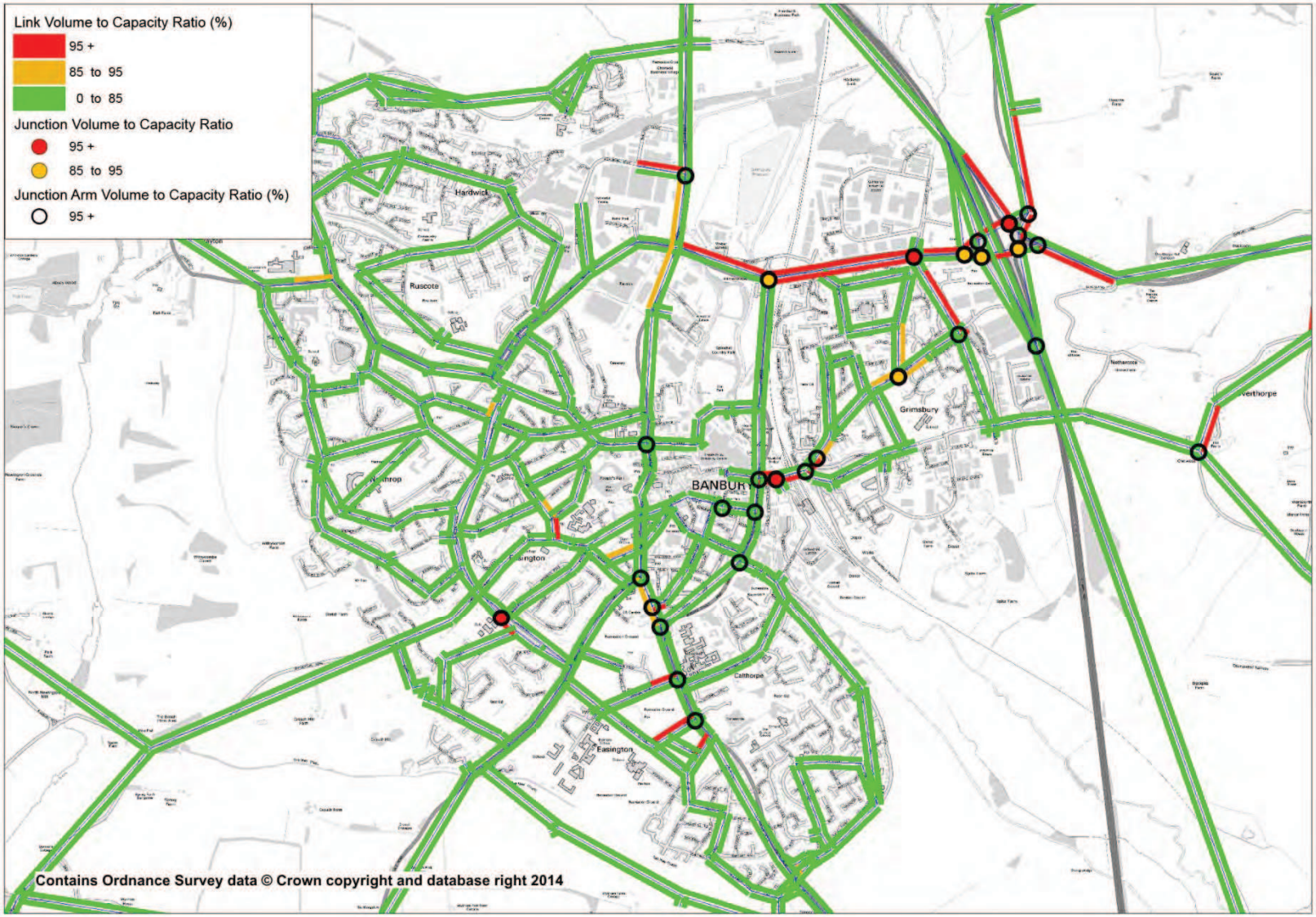
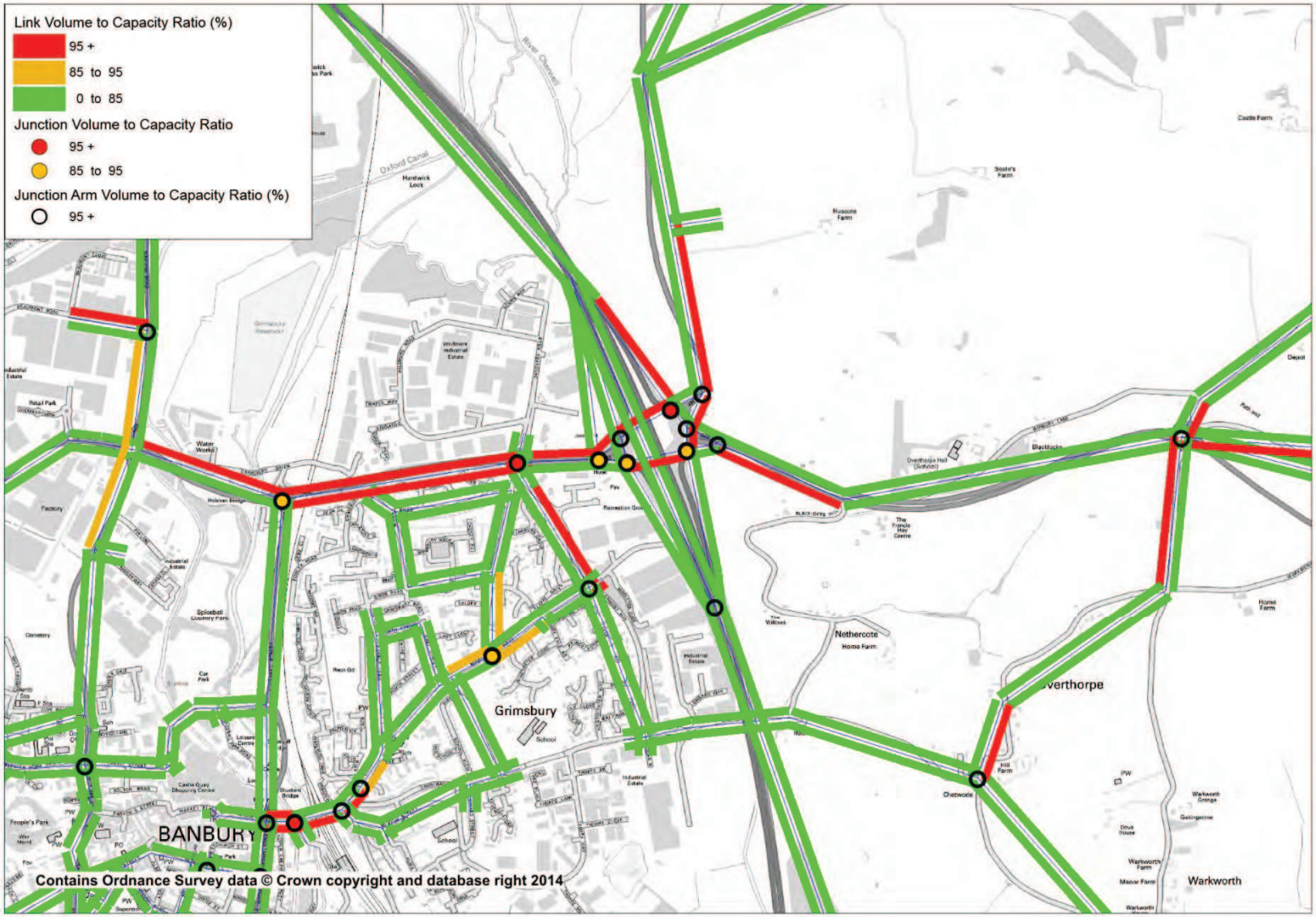


Figure 4-4: Scenario 1 - Link and Junction Volume to Capacity Output for NE Banbury



4.1.6. Changes in Delay

Changes in delay with the new link road in place are shown below in Table 4-2. It should be noted that changes below ten seconds have not been included simply to show the main changes in the network. The measure of delay in the table is per pcu and shows scenario 1 provides relief except for the southbound traffic along the intersection of Emont Way with Middleton Road, Queensway, and the M40 J11.

Table 4-2: Scenario 1 comparison with 'Without Invention' Network Statistics

Junction	Link	2031: Scenario 1	2031: Without Intervention	Difference
		Ave delay per pcu (seconds)	Ave delay per pcu (seconds)	(seconds)
M40 Junction 11	Off-slip (SB))	216	195	21
	Off-slip (NB)	228	255	-27
Hennef Way (A422)/ Concord Avenue (A4260)	Hennef Way (WB)	166	185	-19
Ermont Way/ Middleton Road	Ermont Way (SB)	50	35	15
Swan Close Road/ Upper Windsor Street	Swan Close Road (WB)	90	120	-30
A361 Bloxham Road/B4100 Oxford Road	B4100 Oxford Road	20	44	-24
A361/Springfield Avenue	Springfield Avenue (WB)	26	81	-55
Grange Road/Springfield Avenue	Springfield avenue (EB)	25	53	-28
Bankside/ Hightown Road	Bankside (NB)	57	82	-25
Queensway right turn (towards Kingsway)	Queensway	28	13	15

4.2. Scenario 2: Promotion of Bankside

4.2.1. Scheme Overview

This scenario represents an aim to promote Bankside as a key traffic route by removing the existing traffic calming measures in place along its length. These traffic calming measures currently take the form of physical islands which reduce the road to a one-way 'shuttleway' system at locations along its length. By removing these measures it is hoped that potential journey time savings would encourage traffic to switch from travelling through the town centre, encouraging more use of Lower Cherwell Street. In addition, the following changes were also modelled:

- Installation of signals at the Hightown Road/Bankside junction.
- Signal timing optimisation at Swan Close Road

4.2.2. Network Statistics

Network statistics for the Scenario 2 model compared with Scenario 1 are set out in Table 4-3 below. Compared with the previous scenario, there is again a small decrease in the average journey time and delay accompanied by a slight increase in the average speed across the network.

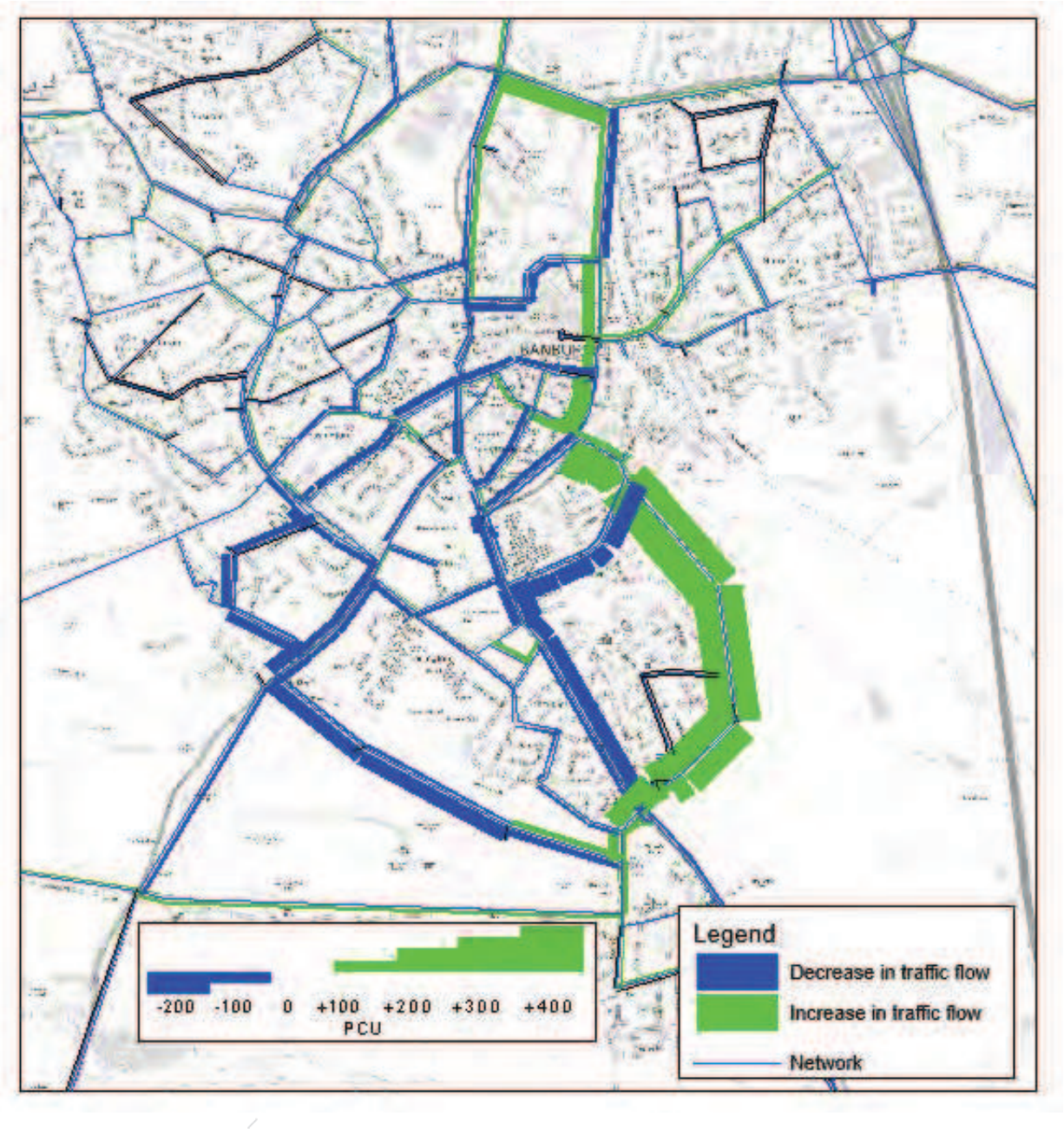
Table 4-3: Scenario 2 comparison with Scenario 1 Network Statistics

Metric	Scenario 2	Scenario 1	Units
Average journey time	9.74	9.82	Mins/pcu
Average total delay	3.69	3.74	Mins/pcu
Average distance travelled	6.41	6.41	km
Average Speed	39.4	39.2	km/h

4.2.3. Flow Difference

Figure 4-5 shows the change in traffic pattern within Banbury between Scenario 2 and Scenario 1. Introduction of the Scenario 2 measures would result in significantly increasing traffic in both directions of Bankside. In Scenario 2, southbound traffic would divert away from the A361 and the A4260 with a preference to use Bankside, resulting in a decrease of traffic within the town centre. Northbound traffic along Bankside continues along Swan Close Road turning right into the Cherwell Street. Changes in southbound traffic flow are not quite as pronounced north of Bankside.

Figure 4-5 Change in Traffic Flow between Scenario 2 and Scenario 1



4.2.4. Changes in Delay

Due to the increase in traffic flow along Bankside, Swan Close Road and the Cherwell Corridor, changes in delay would be expected to occur and these are shown in Table 4-4 below. Overall delay is found to increase northbound along the A4260 Upper Windsor Road/Cherwell Street corridor. However, the removal of traffic calming along Bankside decreases delay to vehicles despite the increased volume of traffic using the link. A cumulative decrease in delay is also recorded along the westbound approach towards the Bridge Street/Cherwell Street signals. Scenario 2 provides relief except for the southbound traffic along Emont Way at its intersection with Middleton Road.

Table 4-4: Changes in average delay per pcu between Scenario 2 and 1

Junction	Link	2031: Scenario 2	2031: Scenario 1	Difference
		Ave delay per pcu (seconds)	Ave delay per pcu (seconds)	(seconds)
M40 Junction 11	Off-slip (SB))	**201**	216	-15
	Off-slip (NB)	199	228	-29
Hennef Way (A422)/ Ermont Way	Ermont Way (NB)	568	589	-21
Ermont Way/ Middleton Road	Ermont Way (SB)	83	50	33
Swan Close Road/ Upper Windsor Street	Swan Close Road (WB)	47	90	-43
A361 Bloxham road/B4100 Oxford Road	A361 Bloxham Road (NB)	147	169	-22
Bankside/ Hightown Road	Bankside (NB)	45	57	-12
Queensway right turn (towards Kingsway)	Queensway	13	28	-15

4.2.5. Junction and Link Capacity

Figures 4-6 and 4-7, show the junction and link capacity across the BHM network for Scenario 2. Due to the location of the new link road, there is no noticeable impact on the strategic road network in NE Banbury nor the Cherwell Street Corridor. The junction along Queensway, providing access to Kingsway, is found to move from operating over operational capacity to operating at capacity.

Figure 4-6: Scenario 2 - Link and Junction Volume to Capacity Output for Banbury

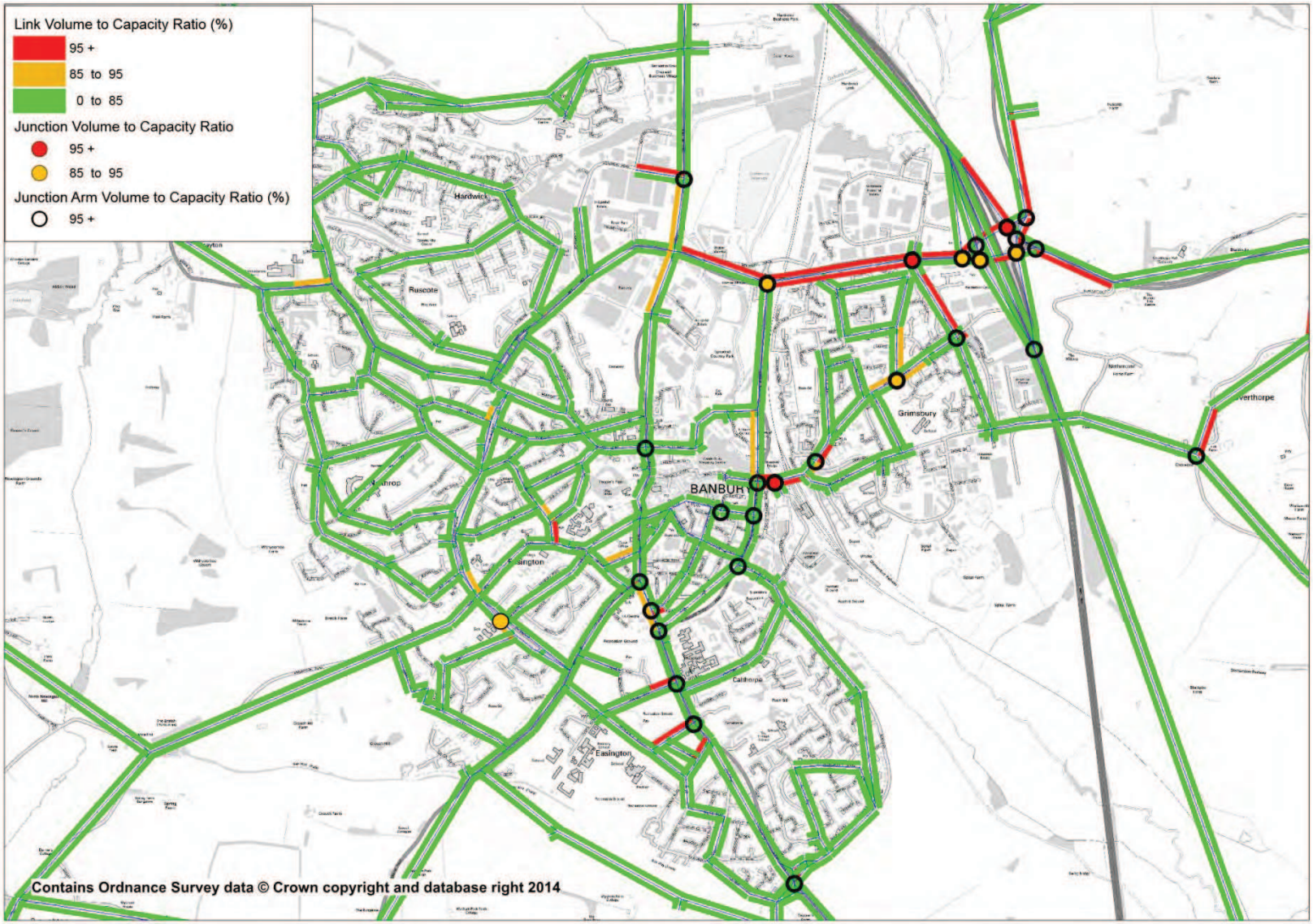
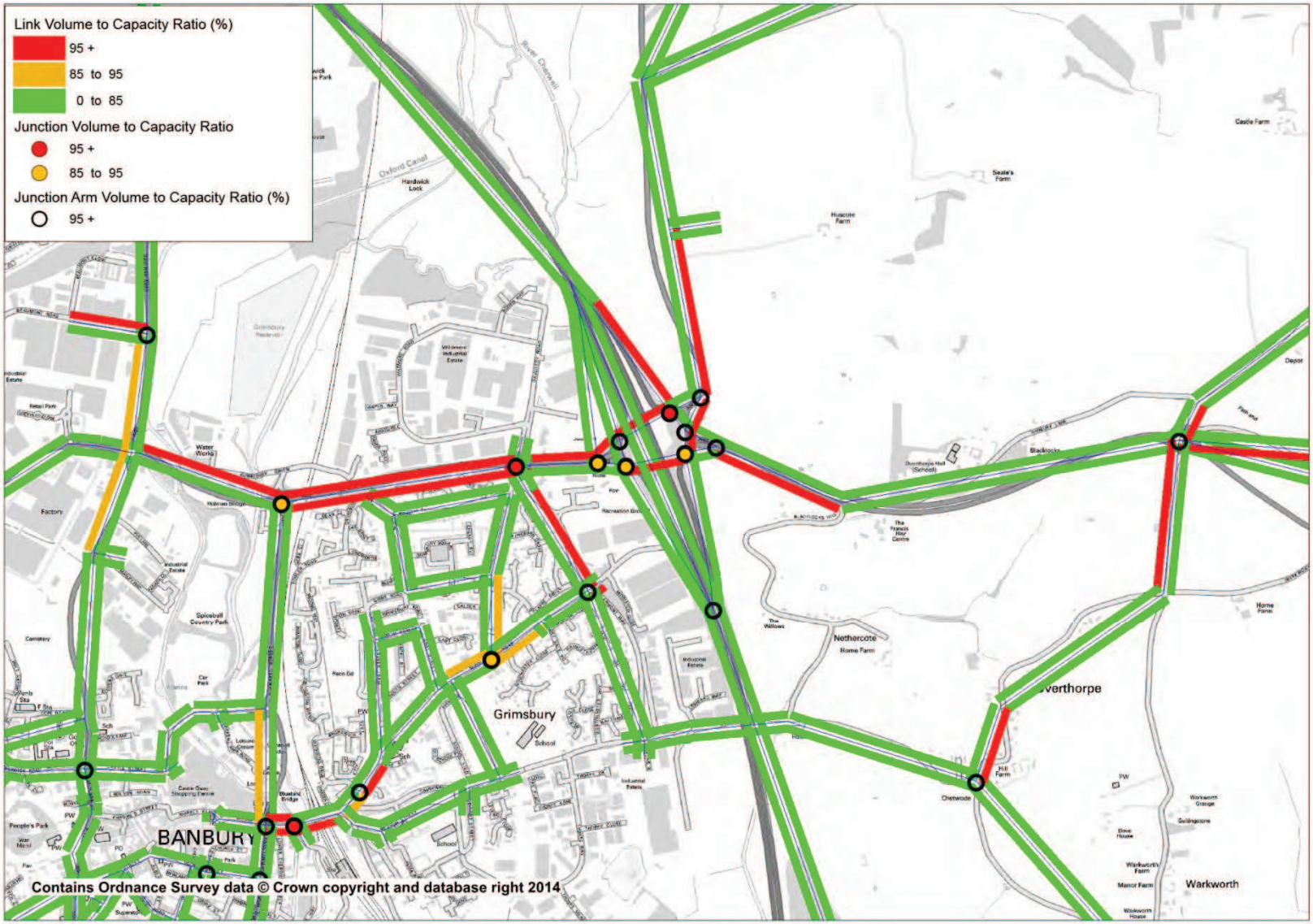


Figure 4-7: Scenario 2 - Link and Junction Volume to Capacity Output for NE Banbury



4.3. Scenario 3: Traffic Calming along the A361 South Bar Street / Horsefair Corridor

4.3.1. Scheme overview

This scenario looked at the potential impacts on the road network by introducing traffic calming along the A361 South Bar Street / Horsefair Corridor. In addition, proposed changes to the layout and signal timings at the Cherwell Street / Bridge Street junction were also introduced into the model as part of this scenario.

4.3.2. Network statistics

Network statistics for the Scenario 3 model compared with Scenario 2 are set out in Table 4-5 below. Compared with the previous scenario, it can be seen that the average journey time increases as does delay, with a resultant decrease in the average speed of trips. The reason for this is likely to be due to the inclusion of traffic calming measures in this scenario along an important corridor.

Table 4-5: Scenario 3 comparison with Scenario 2 Network Statistics

Metric	Scenario 3	Scenario 2	Units
Average journey time	9.94	9.74	Mins/pcu
Average total delay	3.90	3.69	Mins/pcu
Average distance travelled	6.40	6.41	km
Average Speed	38.6	39.4	km/h

4.3.3. Changes in Traffic Flow

Figure 4-8 shows an overview of traffic flow changes between Scenario 3 and Scenario 2. The introduction of traffic calming would lead to an understandable decrease in traffic flow north to south along the A361 South Bar Street / Horsefair corridor. Decreases in northbound flows are also evident along Bankside and Concord Avenue. It appears that this traffic chooses to re-route via the new A361 to White Post Road link road, and Queensway, looping around the traffic calming and also via the B4035 eastbound. North and southbound traffic flows entering the Cherwell Street/Bridge Street Corridor are also noted to increase whist westbound flow decreases.

4.3.4. Junction and Link Capacity

Figures 4-9 and 4-10, show the junction and link capacity across the BHM network for Scenario 3. As with the Without Intervention scenario, the network performance shows that the NE area of Banbury is forecast to experience capacity issues in 2031. In addition, Cherwell Street/Bridge Street Signals also exhibit capacity issues as do parts of the B4100/A4260 Oxford Road.

Figure 4-8 Changes to traffic flows across Banbury between Scenario 3 and Scenario 2

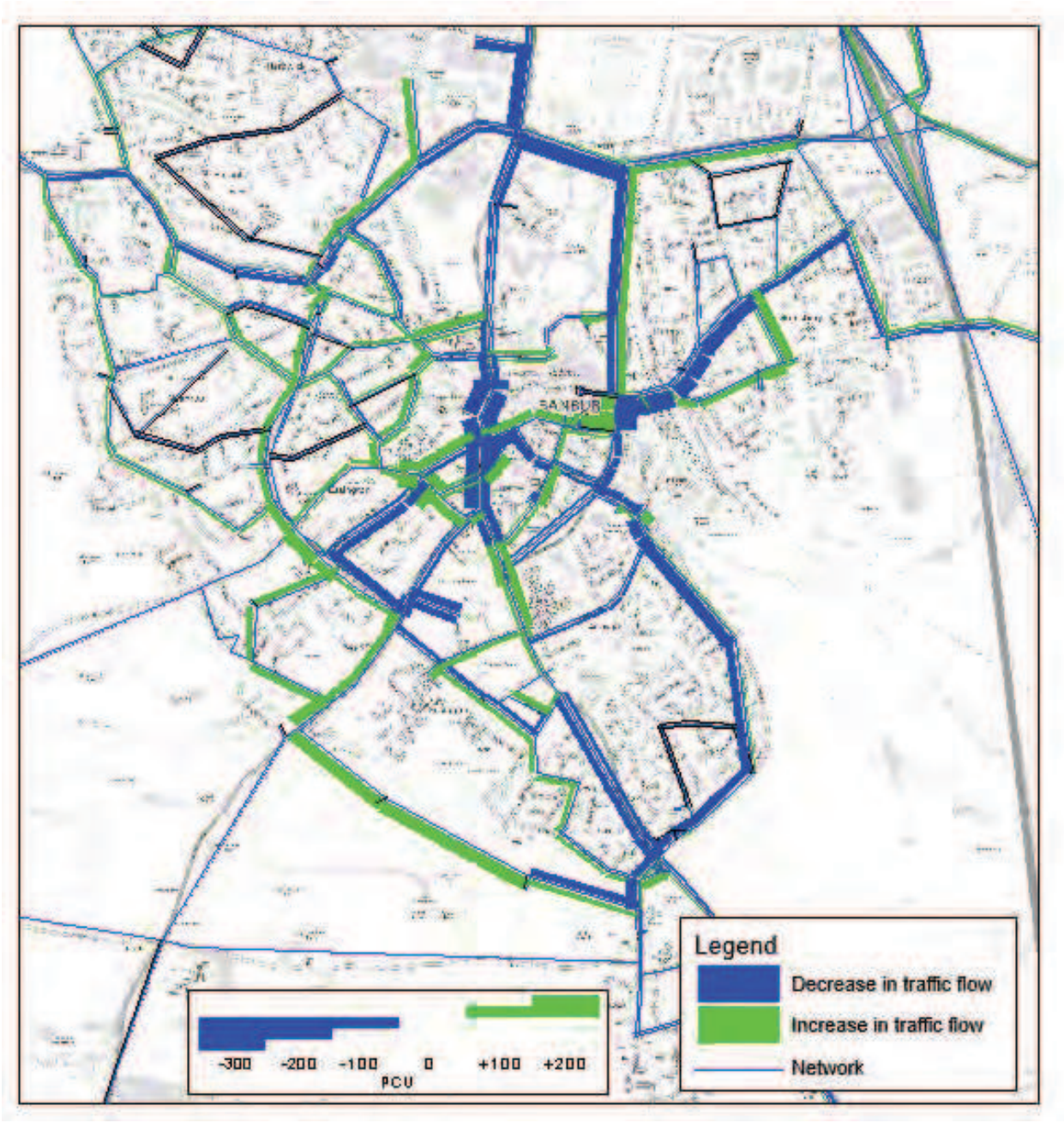


Figure 4-9: Scenario 3 - Link and Junction Volume to Capacity Output for Banbury

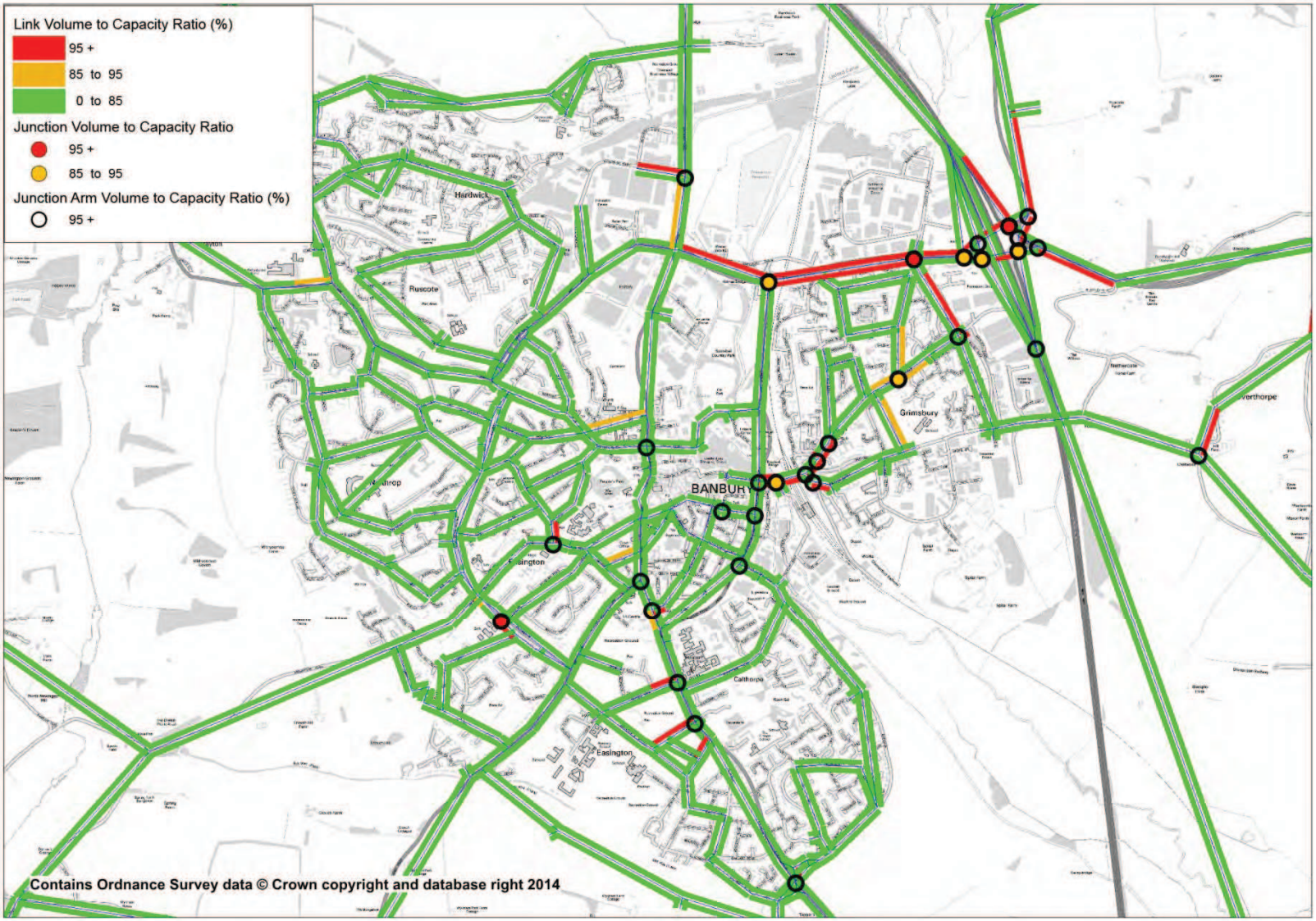
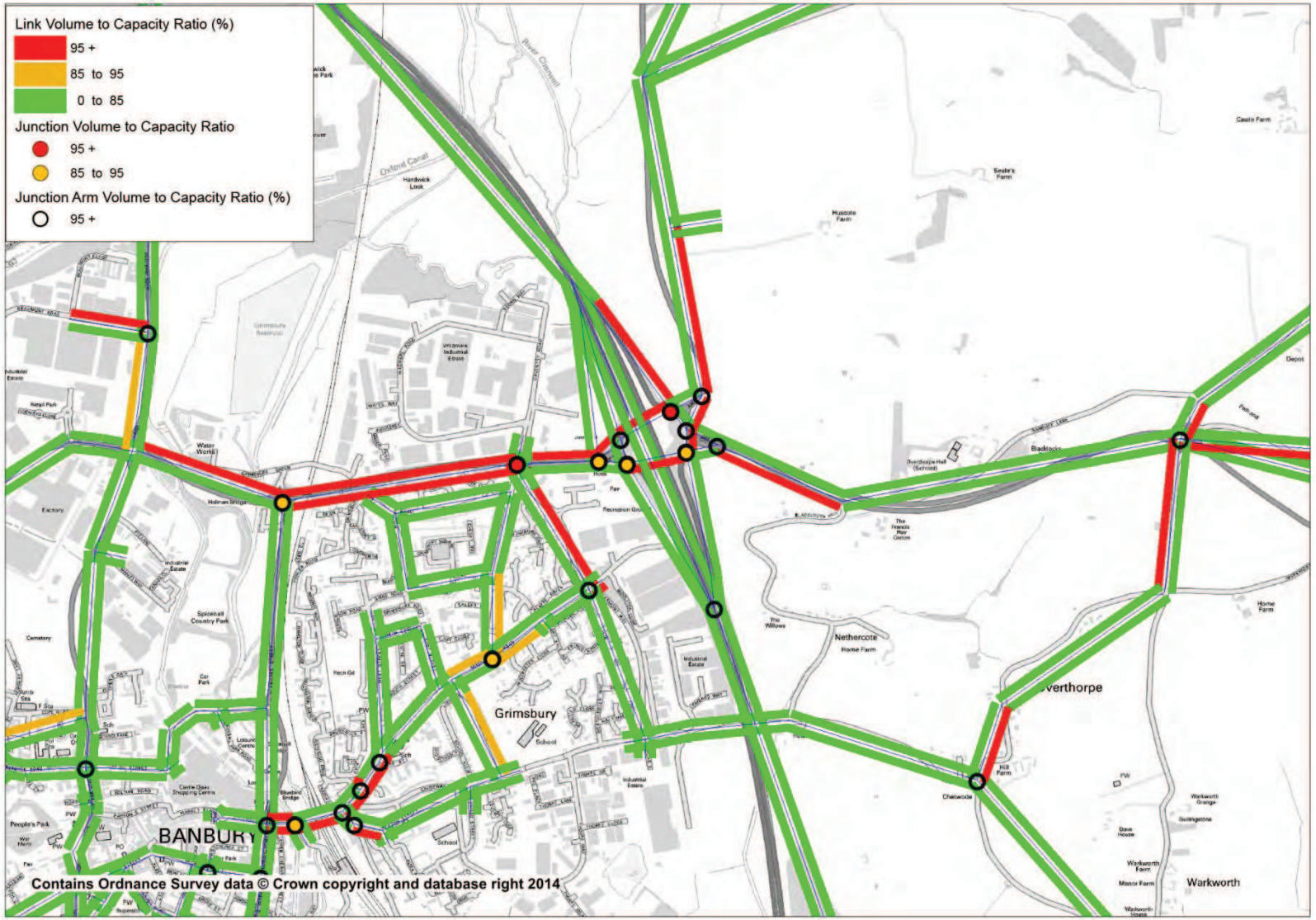


Figure 4-10: Scenario 3 - Link and Junction Volume to Capacity Output for NE Banbury



4.4. Scenario 4: Hennef Way/Ermont Way improvements

This scenario modelled changes made to reconfiguration of the Hennef Way and Ermont Way junction, with the aim of providing improved capacity to this area of the network. These improvements consisted of turning the current roundabout at Hennef Way / Ermont Way into a signalised junction. Increased capacity was also provided at the Ermont Way/ Middleton Road roundabout (at the Ermont Way southbound entry on to the roundabout).

Reconfiguration of the Hennef Way/Concord Avenue to a junction similar to the current Hennef Way/Ermont Way junction would not be deliverable. Instead, signalisation of the Hennef Way/Concord Avenue was considered and tested, but was not found to improve traffic flow on the road network. The main reasons for this are the high level of opposing flows and the lack of available land to improve capacity without significant engineering works. However, a review and modelling of all junctions along Hennef Way in software such as TRANSYT may demonstrate benefits to northern Banbury.

4.4.1. Network Statistics

Network statistics for the Scenario 4 model compared with Scenario 3 are set out in Table 4-6 below. Compared with the previous scenario, it can be seen that the average journey time decreases slightly (by 1.6%) as does delay with a resultant increase in the average speed of trips.

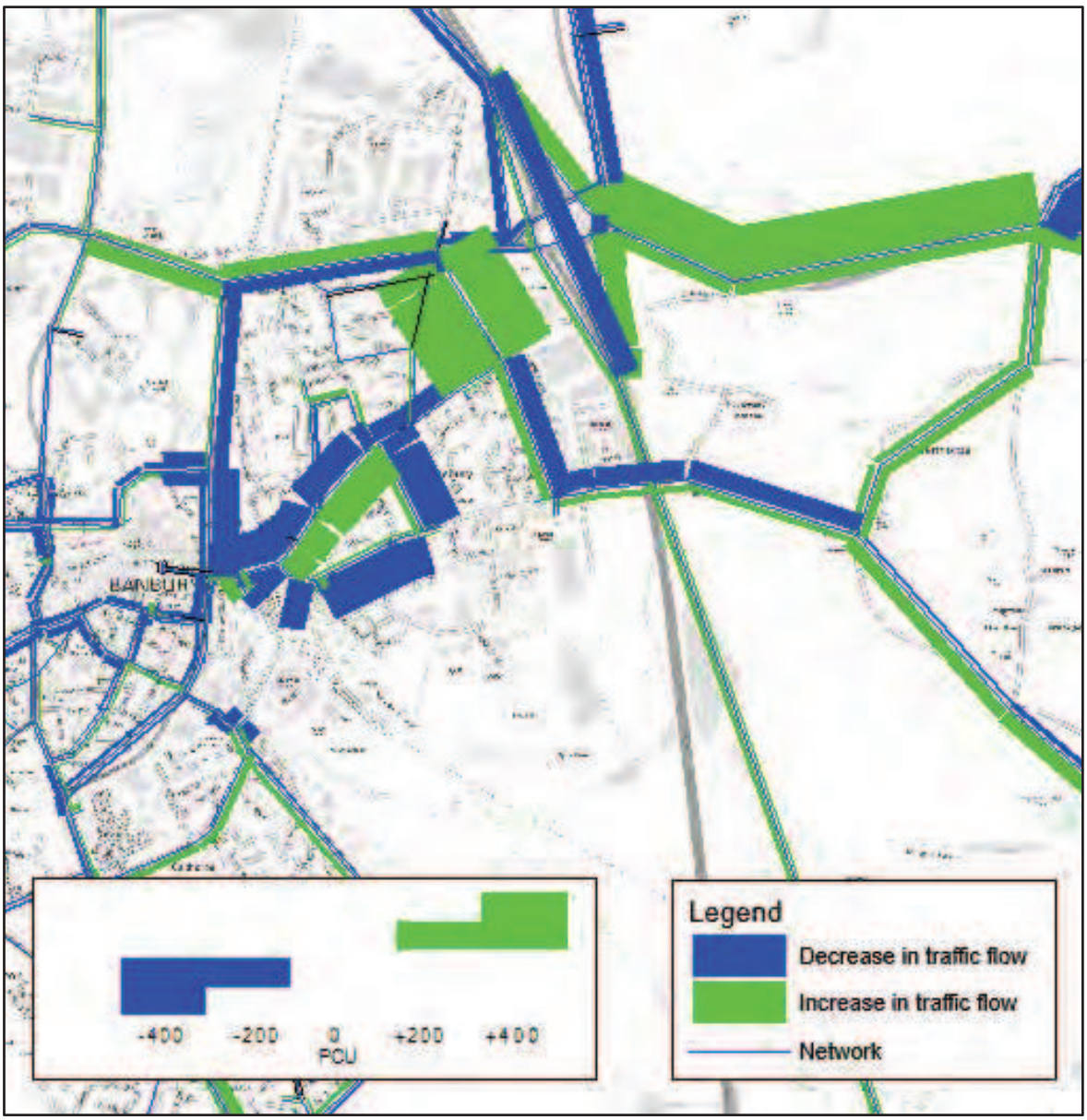
Table 4-6: Scenario 4 comparison with Scenario 3 Network Statistics

Metric	Scenario 4	Scenario 3	Units
Average journey time	9.78	9.94	Mins/pcu
Average total delay	3.74	3.90	Mins/pcu
Average distance travelled	6.43	6.40	km
Average Speed	39.5	38.6	km/h

4.4.2. Changes to traffic flows

The changes in traffic flows caused by the introduction of signals at the Hennef Way/Ermont Way junction and capacity improvements to the Middleton Road / Ermont Way roundabout are shown in Figure 4-11. A significant change in flow occurs in both directions along Ermont Way between the junctions with Hennef Way and Middleton Road. The change in the volume of flow amounts to approximately 480 pcu northbound and 380 southbound along this section of road. However, this change is very 'localised' (i.e. the increases are not mirrored on adjacent links) suggesting that the increases in traffic flow start and end within the local area including the employment area to the south of Ermont Way. This is also supported by a decrease in traffic flow travelling westbound into Hennef Way, and turning left into Concord Avenue before making another left into Middleton Road. It also suggests that queued traffic on Ermont Way has been released and that this traffic was queuing north of Middleton Road.

Figure 4-11 Changes to traffic Flow between Scenario 4 and Scenario 3



4.4.3. Changes to delay and queuing

The changes to delay and queuing with Scenario 4 in place (compared with the Without Intervention Scenario) is shown in Table 4-7 below. The key points to note regarding forecast traffic conditions are that:

- There are improvements on all arms of the M40 J11 in terms of queue length, except the A361 southbound. Delay is also reduced on all arms except A361 (southbound approach). A more detailed review of this junction using software such as TRANSYT may indicate how signal timing optimisation could improve conditions at this location;
- Delays and queues are reduced at Hennef Way (A422)/ Ermont Way, especially on the Ermont Way arm;
- The Hennef Way (A422)/ Concord Avenue (A4260) junction is forecast to get worse as has been alluded to above; and
- Ermont Way/ Middleton Road and Swan Close Road/ Upper Windsor Street are forecast to experience slight reductions in queues and delays whislt Cherwell Street/ Bridge Street is forecast to experience slight increases.

4.4.4. Junction and Link Capacity

Figures 4-12 and 4-13, show the junction and link capacity across the BHM network for Scenario 4. This scenario is focused on improving conditions in NE Banbury and it can be seen that some improvement in the operation capacity of Hennef Way is forecast to be achieved. Further improvements are considered likely if

the junctions were modelled in software such as TRANSYT that could link the traffic signals and create platoons that would result in better network performance. If Figure 4-13 is compared to Figure 4-10, it can be seen that there is reduced congestion on the M40 southbound off slip and the A422 westbound approach to J11. There is also an improvement in congestion for the eastbound traffic on Hennef Way to the Emont Way roundabout,

Table 4-7: Key Junction performance for 2031 Scenario 4 compared with 2031 Without Intervention scenario.

Junction	AM Peak Performance	Link	2031: Scenario 4			2031: Without Intervention		
			Ave delay per pcu (seconds)	Ave queue length (pcu)	Max. queue length (pcu)	Ave delay per pcu (seconds)	Ave queue length	Max. queue length
M40 Junction 11	Severe delay would exist on the A361 southbound approach. However, the delay on the southbound off-slip has decreased back to 2014 levels. The northbound slip road is still experiencing delay though this has reduced from the 2031 base case.	Off-slip (southbound exit)	20	8	16	195	62	125
		Off-slip (northbound exit)	195	83	167	255	109	184
		A361 (southbound approach)	1325	197	201	1280	219	280
Hennef Way (A422)/ Ermont Way	Delay along Ermont Way has decreased from 600 seconds in the 2031 base case though congestion is still evident. Eastbound traffic delay has also improved from 180 to 130 seconds.	Hennef Way (westbound)	25	14	28	30	17	70
		Ermont Way (northbound)	265	51	98	600	57	63
		Hennef Way (eastbound)	130	58	113	180	91	118
Hennef Way (A422)/ Concord Avenue (A4260)	This link would see a large increase in delay from the 2031 base case scenario	Hennef Way (westbound approach).	335	195	237	185	94	168
Ermont Way/ Middleton Road	Delay is still present	Ermont Way (southbound approach)	30	1	1	35	25	44
Cherwell Street/ Bridge Street	Still delay along Bridge Street on the approach to the junction with Cherwell St. The northbound approach has decreased in delay from the 2031 base case.	Cherwell Street (northbound approach)	50	12	19	100	13	39
		Bridge Street (westbound approach)	135	30	57	110	20	48
Swan Close Road/ Upper Windsor Street	Still delay on the Swan Close Road though this has decreased from 120 seconds in the 2031 base year scenario.	Swan Close Road (westbound approach)	86	17	25	120	16	26

Figure 4-12: Scenario 4 - Link and Junction Volume to Capacity Output for Banbury

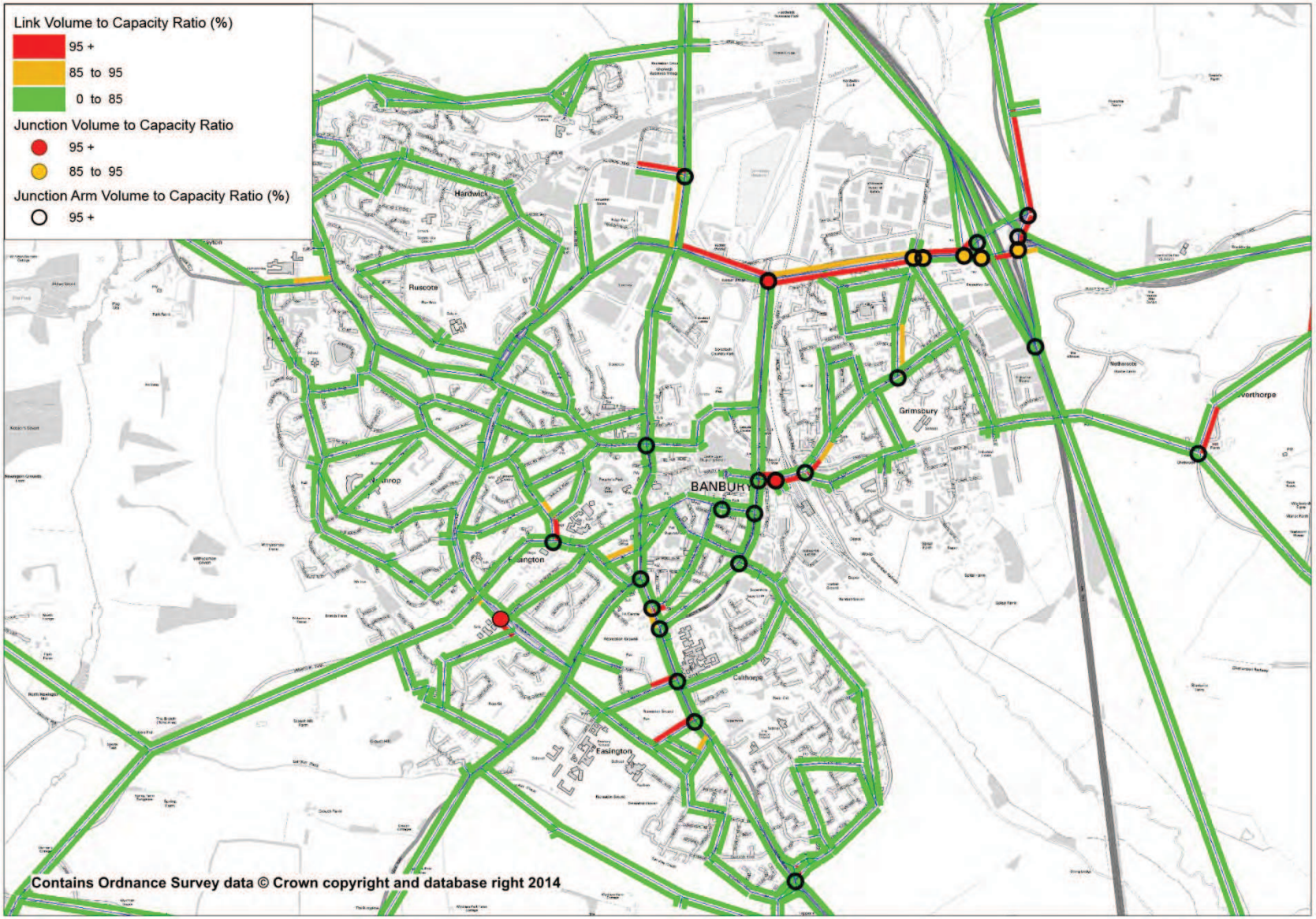
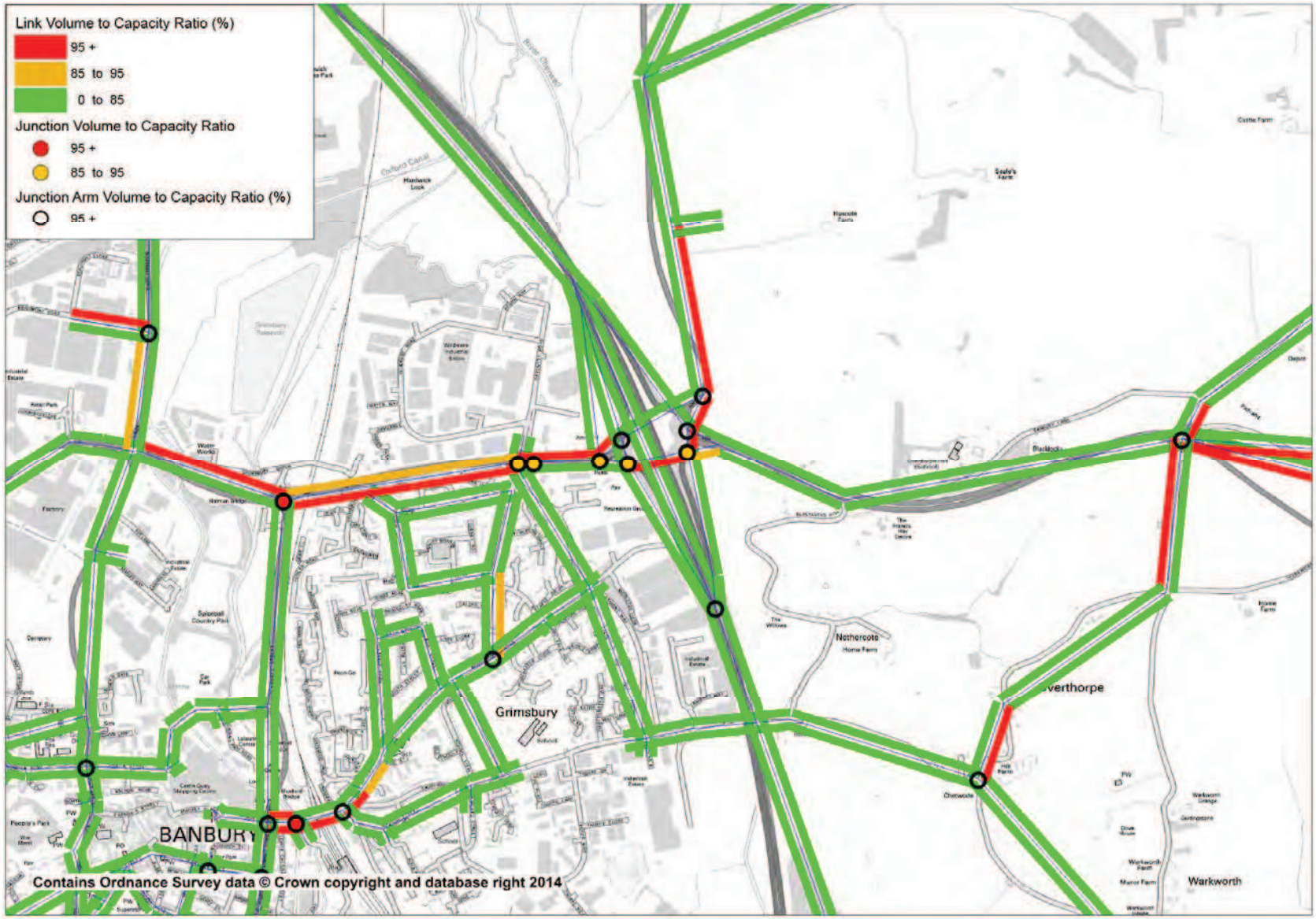


Figure 4-13: Scenario 4 - Link and Junction Volume to Capacity Output for NE Banbury



4.5. Scenario 5: New Link Road between Overthorpe Way and A422

4.5.1. Scheme Overview

The need to consider further options was undertaken in order to seek possible solutions and further reduce delay along Hennef Way and Junction 11 of the M40. Essentially, with Scenario 4, problems remain on the network, particularly as a result of the restricted capacity at the grade seperated roundabout at Junction 11. In particular, blocking back is caused by traffic waiting at signals.

Signal timings at Junction 11 of the M40 were examined and optimised as far as could be achieved within SATURN but due to the levels of opposing flows, the room for achieving extra capacity in this way was found to be too restrictive to achieve any noticeable results.

A possible solution was therefore looked at between Overthorpe Way and the A422 to the east of Junction 11 with the aim of reducing flow through the roundabout and potentially along Hennef Way. The design of the link consisted of a roundabout at the southern end (Overthorpe Way) of the link road with signals along the A422. A roundabout and priority junction option were also tested prior to this but these were not found to achieve any improvements in network performance.

4.5.1. Network Statistics

Network statistics for the Scenario 5 model compared with Scenario 4 are set out in Table 4-8 below. Compared with Scenario 4, the model suggests that the new link road would bring significant benefit to the Banbury road network. Average delay falls by 23.5% whilst the average journey time would decrease by 9.6%. If a similar reduction in average delay is assumed for the PM, with no savings in the Inter Peak, the value of these benefits in 2031 is roughly estimated to be about £5m annually[1] (in 2010 prices and values) compared to Scenario 4.

Table 4-8: Scenario 5 comparison with Scenario 4 Network Statistics

Metric	Scenario 5	Scenario 4	Units
Average journey time	8.84	9.78	Mins/pcu
Average total delay	2.86	3.74	Mins/pcu
Average distance travelled	6.42	6.43	km
Average Speed	43.6	39.5	km/h

4.5.2. Changes to traffic flows

The changes in traffic flows caused by the introduction of the new link road is shown in Figure 4-14 below. This shows that traffic east of the roundabout would use the link road to bypass J11 of the M40 in order to enter and exit Banbury. Traffic flow using Ermont Way to access Hennef way and vice versa would also decrease as a result, relieving delay along this link.

4.5.3. Changes to Delay and Queuing

The changes to delay and queuing with Scenario 5 in place (compared with Scenario 4) are shown in Table 4-10 below. The key points to note regarding forecast traffic conditions are that:

- There are improvements on all arms of the M40 J11 (except the off-slip southbound which sees a very slight increase in queues) in terms of queue length, and delay is also reduced, including a significant reduction on the A361 (southbound approach), resulting in a better performance than Scenario 4;
- Delay and queues are reduced at the Hennef Way (A422)/ Ermont Way junction for the Ermont Way arm and eastbound Hennef Way arm, whilst delays are forecast to increase on the westbound Hennef Way arm, these are of the order of one minute per vehicle ;
- Ermont Way/ Middleton Road is forecast to experience slight reductions in queues and delays whilst Swan Close Road/ Upper Windsor Street is forecast to experience slight increases. Cherwell Street/ Bridge Street is forecast to achieve decreased queuing and delays on the Bridge Street arm whilst the Cherwell Street arm will see an increase in delay.

[1] Assuming standard values of time, purpose split, and vehicle occupancy.

- Delays and queuing at the Hennef Way/ Concord Avenue junctions have increased, and the junction is over capacity.

4.5.4. Junction and Link Capacity

Figures 4-15 and 4-16, show the junction and link capacity across the BHM network for Scenario 5. This scenario is focused on improving conditions in NE Banbury and it can be seen that some improvement has been achieved on the link connecting Overthrope Rd to the A422-B4525 roundabout, but at the expense of higher congestion on the southbound off slip[2] in J11. Further improvements are considered likely if the junctions were modelled in software such as TRANSYT that could link the traffic signals and create platoons that would result in better network performance.

4.5.5. Flow comparison with 2014

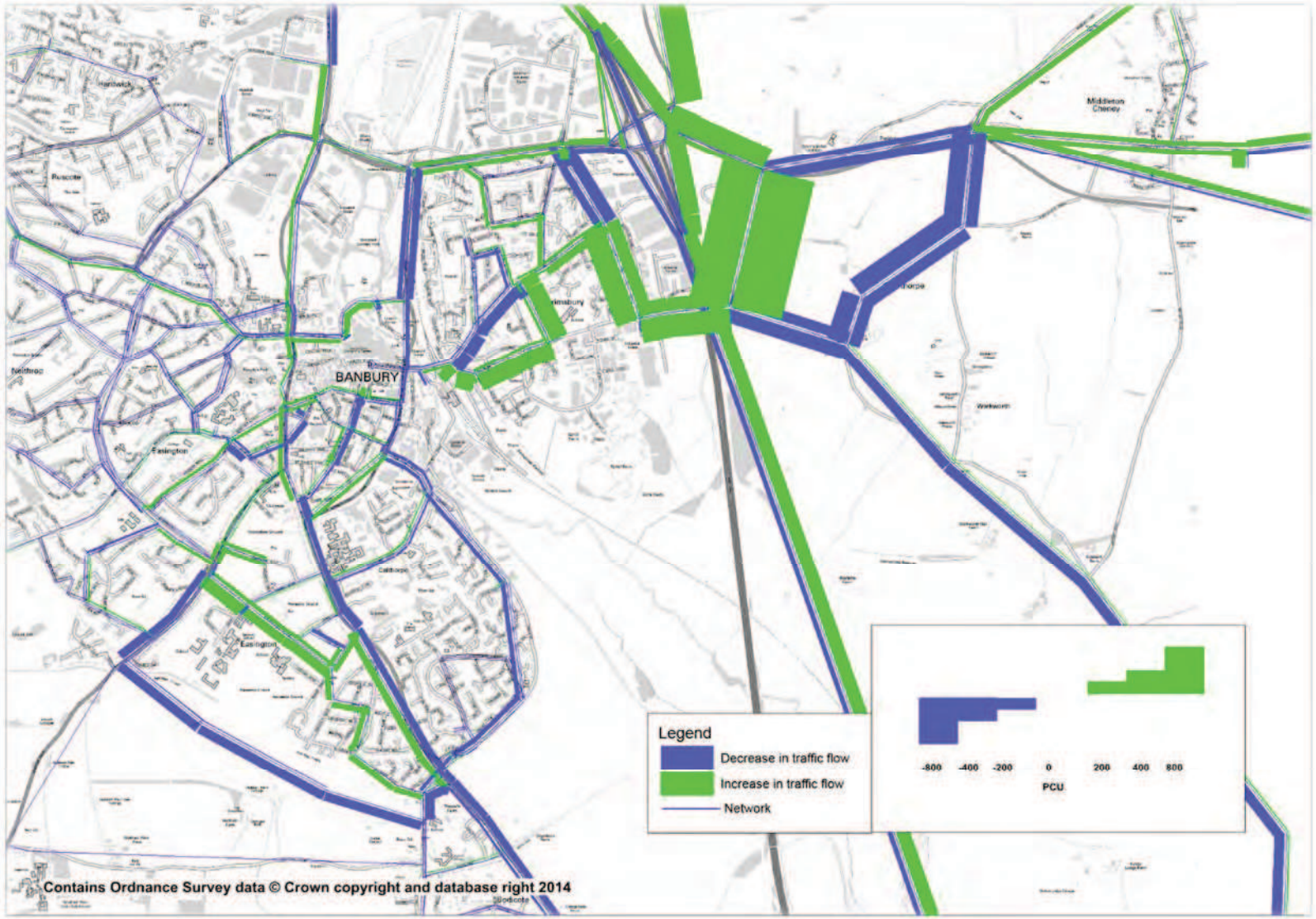
Table 4-9 shows the general increase in traffic flow (pcu) between Scenario 5 and the 2014 base year model, a (weighted) average of 42%.

Table 4-9: Scenario 5 traffic flow comparison with 2014 base year traffic flows

Name	Base year 2014 (pcu)	Scenario 5 (pcu)	Increase (%)
Hennef Way Eastbound	2096	2374	13.3%
Hennef Way Westbound	1483	2372	59.9%
A361 SB (Near M40 J11)	594	1044	75.8%
A4260 Oxford Road Northbound	918	1457	58.7%
A361 NB (Near Easington)	210	265	26.2%
M40 J11 Northbound Off-slip	1348	1658	23.0%
M40 J11 Southbound Off-slip	1349	1615	19.7%
Ermont Way Northbound	488	660	35.2%
Ermont Way Southbound	560	730	30.4%
Concord Avenue Southbound	639	1073	67.9%
Bridge Street Westbound	652	915	40.3%
Bankside Northbound	208	649	212.0%
B4100 Northbound	690	1077	56.1%
Swan Close Rd Northboound	470	734	56.2%

[2] The link crosses the 95% flow to capacity threshold in the figure although the impact on delay and queues is minimal

Figure 4-14 Changes to traffic Flow between Scenario 5 and Scenario 4



NOTE: The link shown east of M40 Junction 11 is indicative. It is not intended to represent the route or location of the road, but represents a connection between A422 (east) and Overthorpe Road that has been modelled in BHM.

Table 4-10: Key Junction performance for 2031 Scenario 5 compared with 2031 Scenario 4.

Junction	AM Peak Performance	2031: Without Intervention	2031: Scenario 5			2031: Scenario 4		
			Ave delay per pcu (seconds)	Ave queue length (pcu)	Max. queue length (pcu)	Ave delay per pcu (seconds)	Ave queue length	Max. queue length
M40 Junction 11	Substantial fall in delay at A361 southbound approach (85%). Large fall in delay on northbound off-slip by 47%.	Off-slip (southbound exit)	21	10	18	20	8	16
		Off-slip (northbound exit)	103	44	88	195	83	167
		A361 (southbound approach)	163	46	48	1325	197	201
Hennef Way (A422)/ Ermont Way	Increase in delay westbound by half a minute. Ermont Way sees a very sharp decrease in delay of nearly 2.5 minutes (55%)	Hennef Way (westbound)	63	38	63	25	14	28
		Ermont Way (northbound)	119	21	30	265	51	98
		Hennef Way (eastbound)	79	27	53	130	58	113
Hennef Way (A422)/ Concord Avenue (A4260)	Severe delay and queuing on this link.	Hennef Way (westbound approach).	381	226	303	335	195	237
Ermont Way/ Middleton Road	Small decrease in delay on southbound approach at junction	Ermont Way (southbound approach)	22	1	1	30	1	1
Cherwell Street/ Bridge Street	Delay on northbound approach along Cherwell Street nearly doubles in value though delay along Bridge Street is reduced by nearly 20%.	Cherwell Street (northbound approach)	96	11	18	50	12	19
		Bridge Street (westbound approach)	109	30	56	135	30	57
Swan Close Road/ Upper Windsor Street	Delay increase by just under 42% or just over half a minute.	Swan Close Road (westbound approach)	122	16	30	86	17	25

Scenario includes: Promotion of Bankside; Traffic calming along A361 South Barr Street/ Horsefair corridor; Bridge Street/ Cherwell Street improvements; A361 to A4260 Link Road; Hennef Way/ Ermont Way improvements; Ermont Way/ Middleton Road improvements.

Figure 4-15: Scenario 5 - Link and Junction Volume to Capacity Output for Banbury

NOTE: The link shown east of M40 Junction 11 is indicative. It is not intended to represent the route or location of the road, but represents a connection between A422 (east) and Overthorpe Road that has been modelled in BHM.

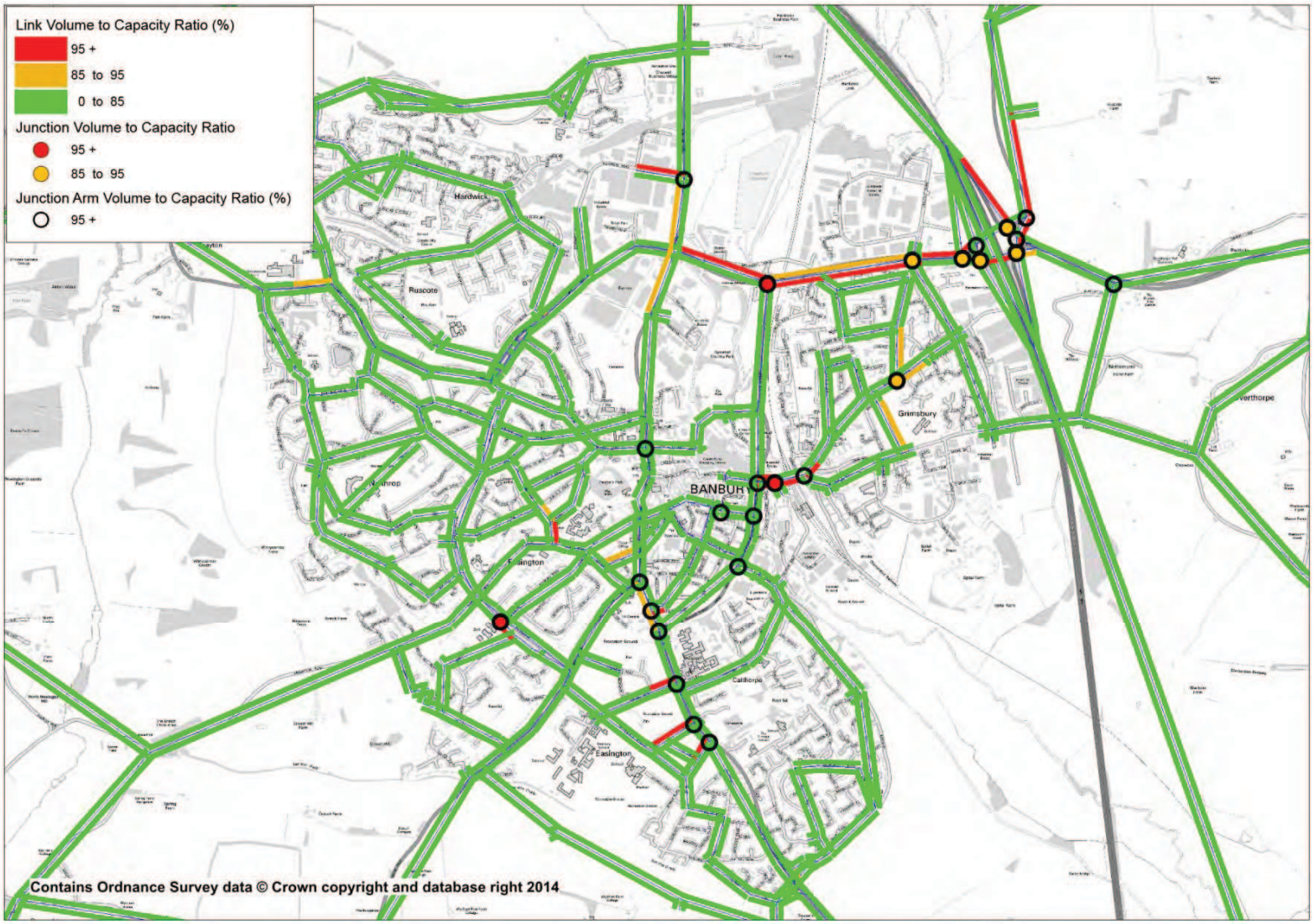
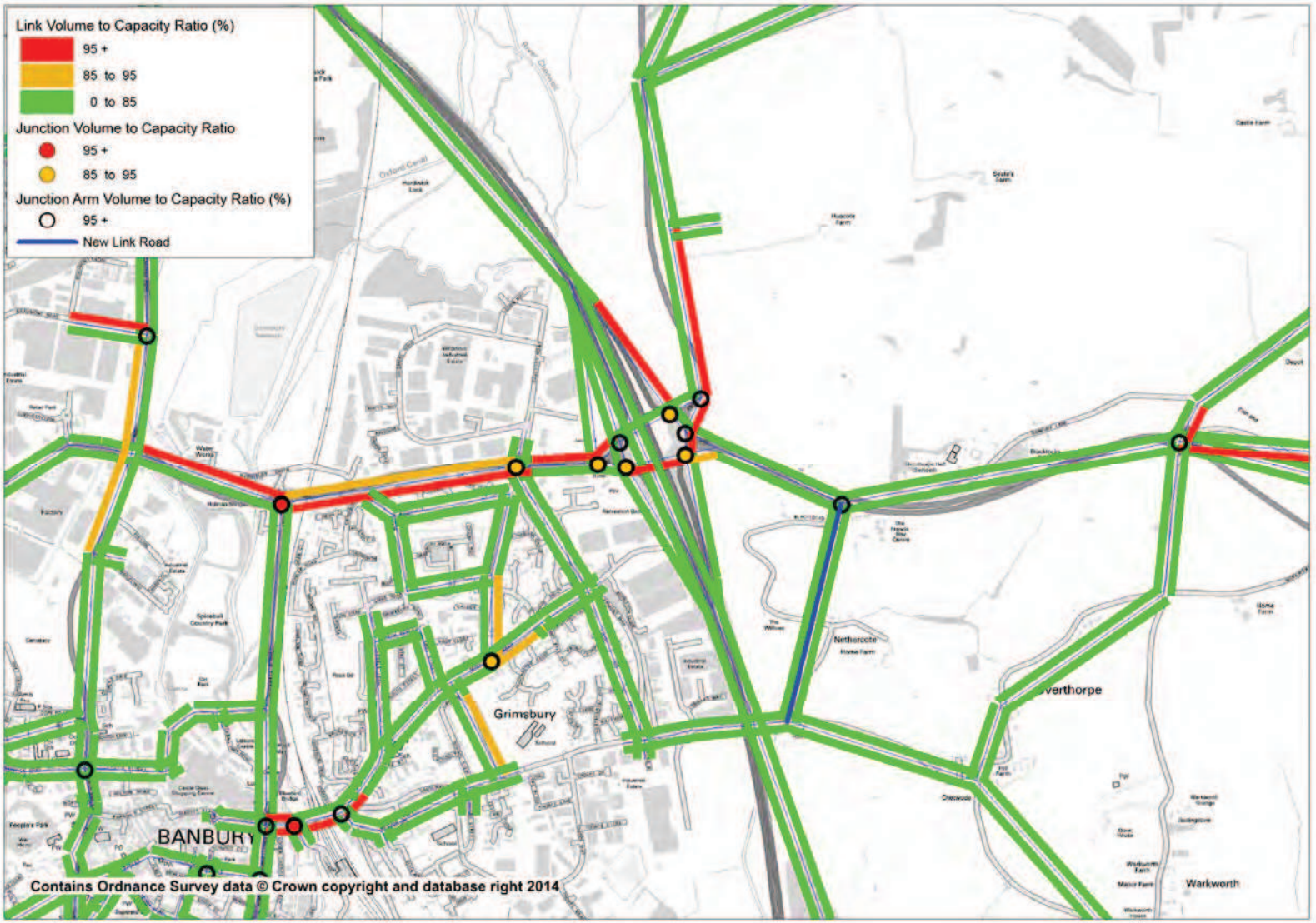


Figure 4-16: Scenario 5 - Link and Junction Volume to Capacity Output for NE Banbury

NOTE: The link shown east of M40 Junction 11 is indicative. It is not intended to represent the route or location of the road, but represents a connection between A422 (east) and Overthorpe Road that has been modelled in BHM.



4.6. Scenario 6: Bankside / Ermont Way Link Road

This scenario considers a possible new south east link road located between Bankside and the Ermont Way/Overthorpe Road roundabout with the schemes of the first four scenarios in place. The new link was modelled in the form of a single two-way carriageway. The new link road junction with Bankside was modelled as a new roundabout and the existing Ermont Way/Overthorpe Road roundabout was slightly modified to increase capacity i.e. two lanes at the stop line rather the existing single lane.

The aim of putting this link road in place is to relieve congestion along Hennef Way and within the town centre, by providing an alternative route between the south of Banbury and employment areas in Banbury, particularly those West of M40, and North East of Junction 11.

4.6.1. Network Statistics

Network statistics for the Scenario 6 model compared with Scenario 4 are set out in Table 4-11 below. Compared with the Scenario 4, the average journey time decreases by 4.3%, average delay decreases by nearly 10% and the average speed increases by 4.8%. This suggests that the link road would bring a significant level of benefit to the road network. If a similar reduction in average delay is assumed for the PM, with no savings in the Inter Peak, the value of these benefits in 2031 is roughly estimated to be about £2.5m annually[3] (in 2010 prices and values) compared to Scenario 4.

Table 4-11: Scenario 6 comparison with Scenario 4 Network Statistics

Metric	Scenario 6	Scenario 4	Units
Average journey time	9.36	9.78	Mins/pcu
Average total delay	3.37	3.74	Mins/pcu
Average distance travelled	6.46	6.43	km
Average Speed	41.4	39.5	km/h

4.6.2. Flow Difference

The flow difference to Scenario 4, caused by the introduction of the Bankside/Ermont Way link road are depicted in Figure 4-17 below, which shows considerable relief to the town centre and the A422 east of J11, with Bankside and Emont Way attracting more traffic.

4.6.3. Changes to Delay and Queuing

The changes to delay and queuing with Scenario 6 in place (compared with Scenario 4) is shown in Table 4-13 below. The key points to note regarding forecast traffic conditions are:

- M40 J11 is forecast to experience a slight total increase in delay and queues compared with Scenario 4;
- Delays and queues are reduced at the Hennef Way (A422)/ Ermont Way and Hennef Way /Concord Ave junctions;
- Ermont Way/ Middleton Road is forecast to experience a slight increase in queues and delays whislt Swan Close Road/ Upper Windsor Street and Cherwell Street/ Bridge Street are forecast to experience slight decreases.

4.6.4. Junction and Link Capacity

Figures 4-14 and 4-15, show the junction and link capacity across the BHM network for Scenario 6. This scenario is focused on improving conditions in NE Banbury and it can be seen that some improvement in the operation capacity of Hennef Way is forecast to be achieved. Further improvements are considered likely if the junctions are modelled in software such as TRANSYT .

4.6.5. Flow comparison with 2014

Table 4-12 shows the comparison in model flows between Scenario 6 and the 2014 base year, a (weighted) increase in flow of 35%

[3] Assuming standard values of time, purpose split, and vehicle occupancy

Table 4-12: Scenario 6 traffic flow comparison with 2014 base year traffic flows

Name	Base year 2014 (pcu)	Scenario 6 (pcu)	Increase (%)
Hennef Way Eastbound	2096	2279	8.7%
Hennef Way Westbound	1483	2308	55.6%
A361 SB (Near M40 J11)	594	633	6.6%
A4260 Oxford Road Northbound	918	1520	65.6%
A361 NB (Near Easington)	210	239	13.8%
M40 J11 Northbound Off-slip	1348	1701	26.2%
M40 J11 Southbound Off-slip	1349	1119	-17.0%
Ermont Way Northbound	488	652	33.6%
Ermont Way Southbound	560	948	69.3%
Concord Avenue Southbound	639	995	55.7%
Bridge Street Westbound	652	683	4.8%
Bankside Northbound	208	850	308.7%
B4100 Northbound	690	1037	50.3%
Swan Close Rd Northboound	470	799	70.0%

Figure 4-17: Flow difference between Scenario 6 and Scenario 4

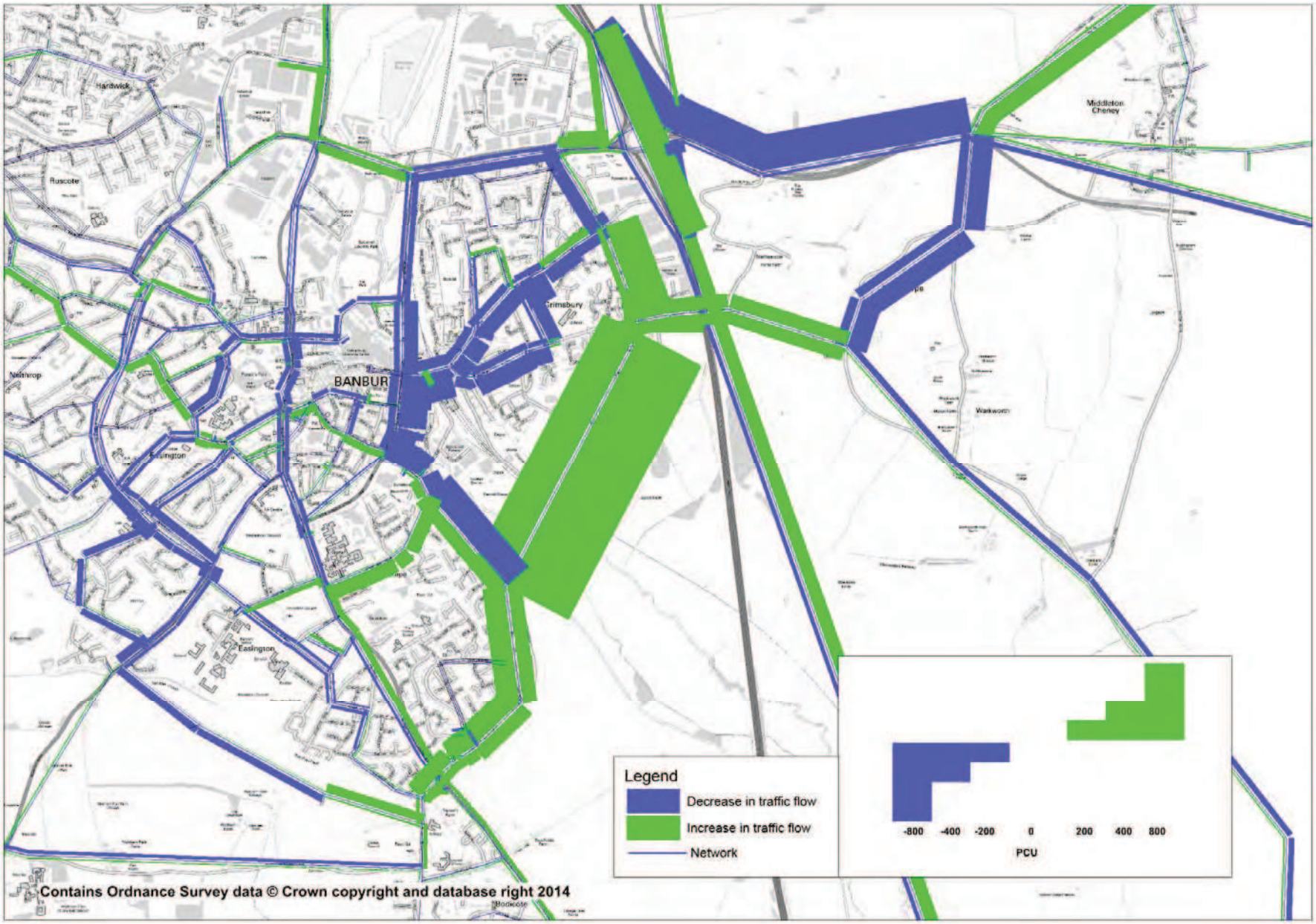


Table 4-13: Key Junction performance for 2031 Scenario 6 (compared with Scenario 4)

Junction	AM Peak Performance	Link	2031: Scenario 6			2031: Scenario 4		
			Ave delay per pcu (seconds)	Ave queue length (pcu)	Max. queue length (pcu)	Ave delay per pcu (seconds)	Ave queue length	Max. queue length
M40 Junction 11	Delay on the southbound exit road increases sharply with the link road in place. The northbound off-slip exit and the A361 remain relatively unchanged with the link road in place (compared with Scen. 4).	Off-slip (southbound exit)	205	63	71	20	8	16
		Off-slip (northbound exit)	202	86	153	195	83	167
		A361 (southbound approach)	1236	204	248	1325	197	201
Hennef Way (A422)/ Ermont Way	Delay reduces on Ermont Way which sees a fall in delay of 64%. This is half the delay recorded in 2014. Hennef Way (eastbound) sees a fall of 58%.	Hennef Way (westbound)	25	13	30	25	14	28
		Ermont Way (northbound)	95	18	58	265	51	98
		Hennef Way (eastbound)	54	14	27	130	58	113
Hennef Way (A422)/ Concord Avenue (A4260)	The link road is the only measure to reduce delay along this link compared with the without intervention case.. Compared with Scenario 4, delay falls by 57%.	Hennef Way (westbound approach).	144	62	79	335	195	237
Ermont Way/ Middleton Road	The addition of the link road causes delay to rise by just over a minute.	Ermont Way (southbound approach)	96	18	28	30	1	1
Cherwell Street/ Bridge Street	Again, this measure achieves the lowest delay. The Cherwell St approach has delay cut by 66%. The Bridge St approach has delay cut by 59%.	Cherwell Street (northbound approach)	16	4	8	50	12	19
		Bridge Street (westbound approach)	55	9	18	135	30	57
Swan Close Road/ Upper Windsor Street	Compared with scenario 4, delay falls by 57%, again the lowest level of delay for any scenario	Swan Close Road (westbound approach)	37	6	12	86	17	25

Scenario includes: Promotion of Bankside; Traffic calming along A361 South Barr Street/ Horsefair corridor; Bridge Street/ Cherwell Street improvements; A361 to A4260 Link Road; Hennef Way/ Ermont Way improvements; Ermont Way/ Middleton Road improvements.

Figure 4-18: Scenario 6 - Link and Junction Volume to Capacity Output for Banbury

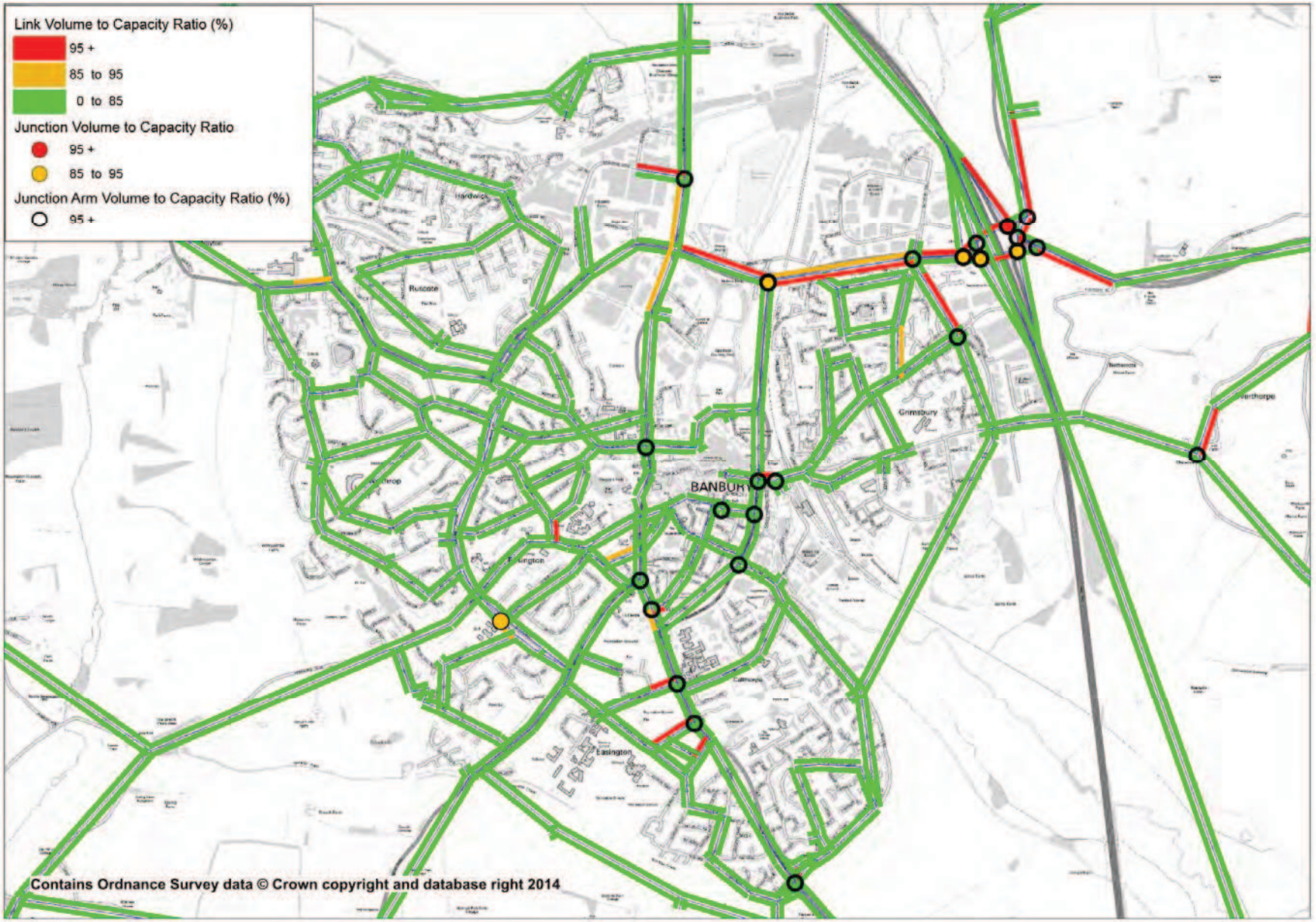
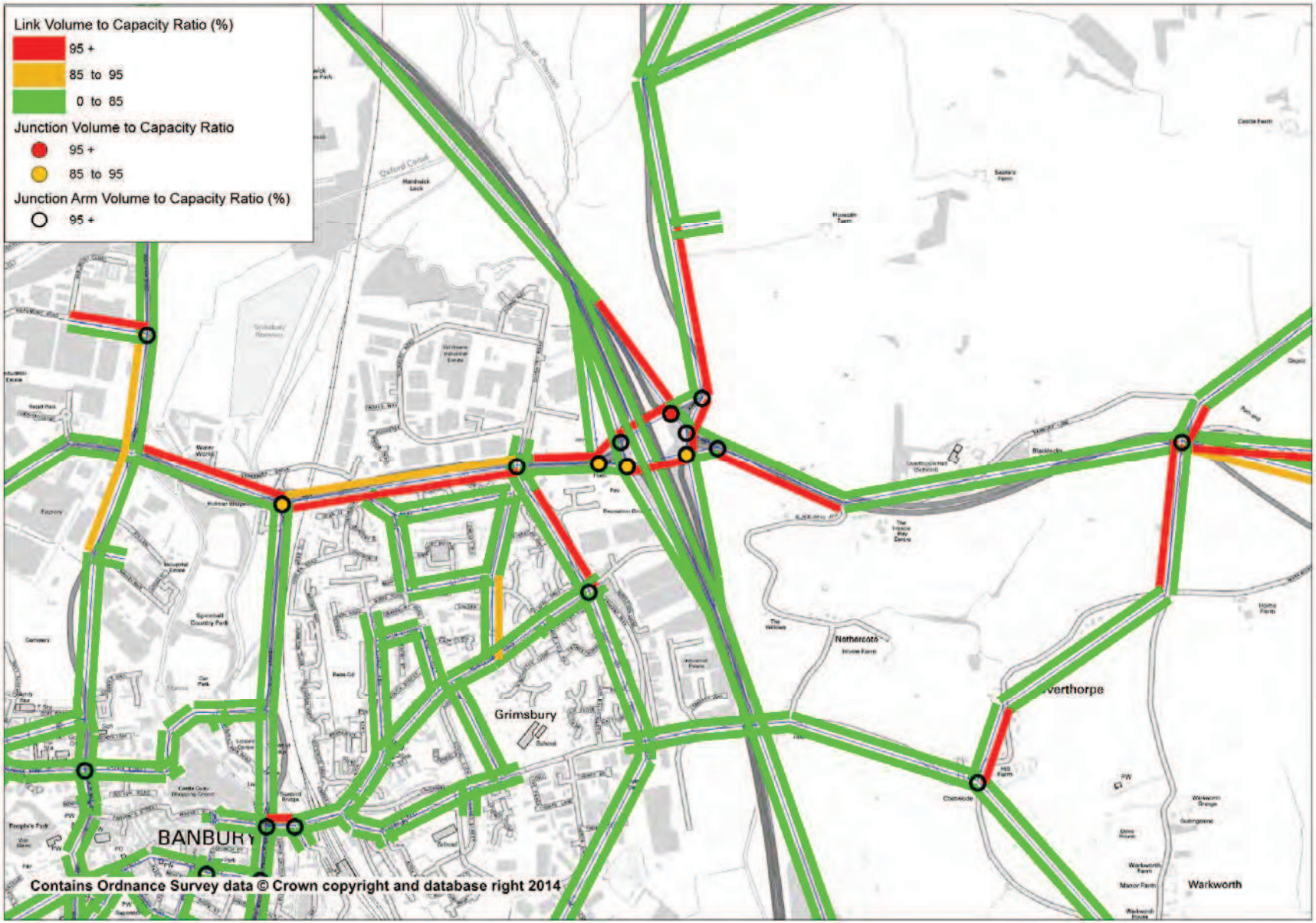


Figure 4-19: Scenario 6 - Link and Junction Volume to Capacity Output for NE Banbury



5. Summary

The results from the 2031 forecast year model indicates that many parts of the strategic network would face congestion in 2031 without any interventions in particular, J11 of the M40 and Hennef Way would face capacity issues. This outcome is to be expected given the forecast growth in trips of around 32% between base year and 2031.

A series of incremental infrastructure improvements to support Local Plan modifications were introduced. These changes were modelled across scenarios 1 to 4 and included the following interventions:

- Scenario 1 – addition of a new link road between the A361 Bloxham Road and White Post Road;
- Scenario 2 – a further addition of measures for the promotion of Bankside;
- Scenario 3 – a further addition of traffic calming along the A361 South Bar Street/ Horsefair corridor; and
- Scenario 4 – adds the signalisation of the Hennef Way/Ermont Way junction plus associated changes to the Middleton Road/Ermont Way roundabout.

Test results generally showed improvements to overall network performance, other than Scenario 3. However, even with the introduction of Scenario 4 mitigation in place, problems still exist on the network, most notably at:

- Junction 11 of the M40;
- Hennef Way/Concord Avenue junction and to a lesser extent the Hennef Way/Ermont Way junction;
- Bridge Street/Cherwell Street junction

Therefore, a new link road east of J11, between Overthorpe Way and the A422 was tested in Scenario 5. Results indicated that the highway network would experience a significant benefit with the link road in place (compared to Scenario 4). Specific impacts with the link road in place include:

- Improving the performance of Junction 11 M40, including a significant improvement in A361 southbound queuing and delays;
- Reducing delays and queuing at Hennef Way/ Ermont Way for the Hennef Way eastbound and Ermont Way arms. But, delays are increased on Hennef Way westbound; but
- Increasing delays and queuing at Hennef Way/ Concord Avenue, which is over capacity.

A rough estimate of the value of time saving benefits compared to Scenario 4, in 2031 would amount approximately to £5m per annum in 2010 prices and values. A second south east link road was also tested between Bankside and Ermont Way/Overthorpe Road (in Scenario 6). This also showed a significant benefit to the performance of Hennef Way junctions, and Swan Close Road/ Upper Windsor Street and Cherwell Street/ Bridge Street junctions, though increased delays and queuing at J11. A rough estimate of the value of time saving benefits compared to Scenario 4, in 2031 would amount to around £2.5m per annum, in 2010 prices and values.

Further work required:

- Undertake additional traffic modelling to:
  - Enable a more in-depth assessment of potential engineering/ signal solutions for junctions along Hennef Way. [TRANSYT modelling of Henenf way links/ junctions]. This may identify how refinements to signal timings could bring additional network improvements;
  - Explore the impact of an additional M40 junction south of Banbury; and
  - Provide more clarity around the timing of new infrastructure required, taking into consideration the phasing of development. An interim forecast year between 2014 and 2031, potentially 2021, will be tested.
- The feasibility for provision of a link road east of Junction 11 needs to be further explored; and
- Further development of the Area Strategy for Banbury, taking into account the up-to-date evidence base e.g. highway modelling outputs, 2011 Census Travel-to-Work data; the emerging Banbury Masterplan; responses from recent consultations etc., and the need for an increased focus on sustainable transport solutions.

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OXFORDSHIRE COUNTY COUNCIL

Bicester Transport Modelling

Peripheral Routes Assessment Technical Note
Cherwell Local Plan Main Modifications to Growth for Bicester

WYG
Executive Park
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Anstey
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LE7 7GR

Final
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Contents

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Figures

1 Introduction

BACKGROUND

1.1 WYG were commissioned by Oxfordshire County Council to complete a quantitative assessment of the five options for peripheral route improvements at Bicester. The results were presented in the report: Bicester Peripheral Route Assessment Report (A084107-02 Rev3 Jan14). OCC have since commissioned WYG to provide information from the Bicester SATURN model to assess the impact of the increased growth proposals being considered for the Local Plan Main Modifications. The headline traffic impact and broad brush economic assessment of the development and link options is required to enable County Council officers to feedback to Cherwell District Council on whether there are any transport reasons why the growth should not happen at this speed and, if it is to happen, what would be the highway network impacts of this level of growth, what improvements will be required to the peripheral routes to keep these functioning in the intended way, and would this level of growth trigger the need for a new link road. Initial results were included in the report: Cherwell Local Plan Revised Growth for Bicester Peripheral Routes Assessment Technical Note (A084107-07 rev2 Aug14). This report updates the assessment using the final numbers for the Main Modifications to the Local Plan.

2 Revised Development Details

2.1 Cherwell District Council submitted its Local Plan in January this year which included 16,750 new homes. The Local Plan Examination was suspended as the Inspector ruled that the Plan should have taken into account Cherwell's unmet need as identified through the Strategic Market Housing Assessment, which should allow for 22,800 new homes. The District Council therefore needs to assess how to deliver the additional 6,000 homes within the District, including the transport impact of this growth within Modifications to the Local Plan. These results are required to be presented to the Inspector in order to meet the deadlines for consultation and approvals prior to the Examination re-opening in December 2014.

2.2 Bicester is likely to take an additional 2,000 homes by increasing the rate of delivery at North West Bicester, small increases in the development at South West Bicester and tripling the size of housing growth at South East Bicester. In addition there are proposals for increased employment growth.

2.3 Due to the nature and location of the Upper Heyford development, assessment is being carried out using the Central Oxfordshire Transport Model in order to fully assess its impact over the wider area. As such, it will be included in this report as part of the sensitivity testing only.

2.4 Details of the housing and employment sites to be tested are included in **Table 1** below:

Table 1: Final Housing and Employment Figures for the Main Modifications to the Local Plan

Plan Period Total Supply 2011 - 2031	Housing	Employment	
	Dwellings	Hectares (unless otherwise stated)	Jobs Estimate
NW Bicester (Bicester 1)	3293	10	3000
Graven Hill (Bicester 2)	2100	26	2000
SW Bicester Phase 1 (Bicester 3)	1742	-	-
SW Bicester Phase 2 (Bicester 3)	726	-	-
Bic Business Park (Bicester 4)	-	29.5	6000
Bicester Gateway (Bicester 10)	-	18	3500
Land at NE Bicester (Bicester 11)	-	15	1000
SE Bicester (Bicester 12)	1500	40	3000
Gavray Drive (Bicester 13)	300	-	-
Talisman Road (approved site)	125	-	-
Upper Heyford	2361	120,000 sqm	1500

3 Network and Matrix Development

3.1 Saturn networks and matrices were updated from the existing 2012 Bicester Saturn model in order to provide traffic forecasts for the North West Bicester Eco Development. Further model runs were required by the Highways Agency in order to provide traffic forecasts for the M40 Junction 9 in a number of forecast scenarios. Details of this work are included in the report: Bicester M40J9 Scenarios Technical Note (A084107-05 May14).

3.2 The matrices produced for the NW Bicester development were updated to include the revised development assumptions detailed in **Table 1**. These matrices did not include the figures outlined for Upper Heyford. However, additional matrices including the Upper Heyford development were constructed to allow a sensitivity test of the route options to be assessed to be carried out.

3.3 The matrices were assigned to the networks produced for the NW Bicester assessments with the amendment of the addition of zone connectors for the Upper Heyford Development. The infrastructure changes included to update the network from the 2012 base are given below:

i. Vendee Drive (the south west link road);

ii. M40 Junction 9 phase 1;

iii. Town centre access improvements;

iv. Changes implemented as part of the town centre redevelopment;

v. Traffic calming and 30mph speed limit on Middleton Stoney Road;

vi. Changes at the Pingle Drive junction, A41 / Oxford Road (ESSO) junction and along the A41 corridor (as part of the mitigation measures from Tesco's move and Bicester Village phase 4);

vii. Park & ride entrance / exit at the junction of Vendee Drive and the A41;

viii. A4095 / B4100 junction alterations(as part of NW Bicester exemplar site);

ix. Alterations to the A41 / London Road (Rodney House) junction(as part of Graven Hill mitigation);

x. M40 Junction 9 phase 2.

xi. Development access and infrastructure associated with North West Bicester (BICESTER 1), Graven Hill (BICESTER 2), South West Bicester phase 2 (BICESTER 3), Bicester Business Park (BICESTER 4), Town centre redevelopment phase 2 (BICESTER 6), RAF Bicester (BICESTER 8), Bicester Gateway (BICESTER 10), North East Bicester Business Park (BICESTER 11) including the care home and business park adjacent to this site with existing planning permission and South East Bicester (BICESTER 12);

xii. London Road crossing closed permanently to through traffic[1];

xiii. Charbridge Lane level crossing replaced by an overbridge;

xiv. Inclusion of the M40 Junction 10 pinch point scheme; and

xv. Results from an Arcady junction assessment for the A4095/ B4100 Banbury Road roundabout junction were input into the SATURN network in order to accurately reflect traffic conditions at the junction.

3.4 Minor amendments were also made in the networks to the traffic signal timings at M40 junction 9 and M40 Junction 10 in reaction to the revised traffic flows through these junctions. Matrices and networks were produced for the AM and PM peak periods. Assignments were carried out using the above matrices to provide the reference case options for comparing the peripheral routes scenarios.

3.5 The networks were updated to include the three route options to be tested: Route 1b, Route 2c and Route 3 as detailed in the Bicester Peripheral Route Assessment Report.

3.6 Where the NW Bicester development has been included in more detail since the initial peripheral routes assessments, Route 1b would now cross the development. This would not be a desirable route. As such, based on discussion with OCC, the southern tie in of Route 1b has been realigned to the west of the NW Bicester development on the B4030 rather than connecting into the A4095 Howes Lane/Middleton Stoney Road Roundabout. A network plot showing the realigned route is given in **Figure 1**.

[1] The worst case scenario has therefore been modelled i.e. full closure of the crossing.

3.7 The modelled scenarios (for each peak period) are therefore:

Main Scenarios:

1. 2031 Final Main Modification Local Plan Growth;
2. 2031 Final Main Modification Local Plan Growth with Route 1b;
3. 2031 Final Main Modification Local Plan Growth with Route 2c;
4. 2031 Final Main Modification Local Plan Growth with Route 3;

Additional Sensitivity Testing Scenarios (See Section 7):

5. 2031 Final Main Modification Local Plan Growth including Upper Heyford;
6. 2031 Final Main Modification Local Plan Growth with Route 1b including Upper Heyford;
7. 2031 Final Main Modification Local Plan Growth with Route 2c including Upper Heyford; and
8. 2031 Final Main Modification Local Plan Growth with Route 3 including Upper Heyford.

4 Forecast Growth Implications

4.1 As discussed above, the local plan growth represents a significant increase in housing and employment in the Bicester area. As such, it is recognised that this will have a corresponding increase in person trips once the developments are in place.

4.2 **Table 2** below gives the modelled Saturn network summary statistics for the AM and PM peak hours for the 2012 base model and Scenario 1: 2031 Final Main Modification Local Plan Growth.

Table 2: AM Peak Model Network Summary Statistics

Peak Hour:	**AM**		**PM**	
Option:	**2012**	**Scenario 1 No New Link Road**	**2012**	**Scenario 1 No New Link Road**
Trip Matrix Total (PCU)	24930	32817	26150	36136
Total Travel Time (PCU Hrs)	3,085	3,939	3,164	4,761
Total Travel Distance (PCU Kms)	237,565	268,447	243,630	294,787
Average Speed (Kph)	77.0	68.1	77.0	61.9
Over Capacity Queues PCU (Hrs)	220	369	186	688

4.3 As can be clearly seen from **Table 2**, there are significant increases in number of trips in Scenario 1. This leads to an increase in total travel time, total travel distance and over capacity queues and a decrease in average speed.

4.3.1 Comparisons have been made for the demand flow differences between the 2012 base model and Scenario 1 for each peak. These comparisons show a general increase in traffic across the modelled area with Scenario 1. Some decreases in traffic are also seen are due to rerouting of vehicles in response to changes in the network such as starvation of vehicles to downstream

junctions where congestion has increased or changes in the road network e.g. the closure of the London Road level crossing.

4.4 The number of links and turns at junctions with Volume over Capacity (V/C) ratios of 85% or over and 100% or over are summarised in the **Table 3** below for 2012 and Scenario 1.

Table 3: **No of Modelled Links and Turns with V/C 85% or Over & 100% or Over**

Option		85%		100%	
		Link	Turns	Link	Turns
AM	2012	15	20	7	13
	Scenario 1 No New Link Road	48	83	18	43
PM	2012	19	22	9	15
	Scenario 1 No New Link Road	72	125	37	84

4.5 As would be expected, the increased number of PCU trips in the network leads to an increase in the number of links and turns that become congested in Scenario 1.

4.6 The inclusion of the North West Bicester development leads to no junction or links flagged as over 85% (and hence 100%) on the western corridor in Scenario 1. The exception to this is the junction of A4095 Lords Lane/B4100 Banbury Road. This junction is being investigated separately as part of the North West Bicester Transport Assessment and, as such, no improvements to this junction have currently been included in the models.

4.7 The over capacity links and turns at junctions within the Bicester area itself are therefore on the southern, northern and eastern corridors around the town. It would not be prudent to try to enhance central areas of Bicester town in order to improve congestion conditions for vehicular traffic as this would likely lead to an additional increase in traffic through areas where a decrease in traffic is considered more desirable. Therefore, further study into possible improvements to the southern, northern and eastern corridors such as Boundary Way can be considered advisable.

5 Model Comparisons

5.1 This section details the results of the comparisons between the potential peripheral route link options being assessed. **Tables 4 and 5** give the summary network statistics for each option by peak period.

Table 4: **AM Peak Model Network Summary Statistics**

Option:	**2012**	**Scenario 1 No New Link Road**	**Scenario 2 R1b**	**Scenario 3 R2c**	**Scenario 4 R3**
Total Travel Time (PCU Hrs)	3,085	3,939	3,891	3,800	3,726
Total Travel Distance (PCU Kms)	237,565	268,447	268,661	266,905	267,033
Average Speed (Kph)	77.0	68.1	69.0	70.2	71.7
Over Capacity Queues PCU (Hrs)	220	369	334	267	204

Table 5: **PM Peak Model Network Summary Statistics**

Option:	**2012**	**Scenario 1 No New Link Road**	**Scenario 2 R1b**	**Scenario 3 R2c**	**Scenario 4 R3**
Total Travel Time (PCU Hrs)	3,164	4,761	4,693	4,725	4,461
Total Travel Distance (PCU Kms)	243,630	294,787	295,168	293,150	293,732
Average Speed (Kph)	77.0	61.9	62.9	62.0	65.8
Over Capacity Queues PCU (Hrs)	186	688	629	696	440

5.2 As can be seen from **Tables 4 and 5** above, the main modification to the local plan growth with no route option is generally the worst performing option in terms of both over capacity queuing, average speed and travel time. As discussed in the previous section, this is a significant increase over the 2012 levels.

5.3 Of the Peripheral Route options, Route 3 for both peaks performs best in these same three areas.

5.4 Route 2c has the lowest total travel distance of the peripheral routes options.

5.5 **Tables 6 and 7** give link flows in PCUs on key links across the network for each of the main scenarios:

Table 6: **AM Peak Modelled Scenario Link Demand Flows (PCUs)**

Link	Scenario:	Scenario 1 No New Link Road	Scenario 2 R1b	Scenario 3 R2c	Scenario 4 R3
A41 Between M40 and Wendlebury Road	NEB	2056	2084	2489	2577
	SWB	890	867	962	1180
Vendee Drive	NWB	245	202	282	270
	SEB	202	202	294	256
Middleton Stoney Road (East of Vendee Drive)	EB	641	568	512	382
	WB	491	472	478	502
NW Bicester Development Link Road	NEB	418	382	264	242
	SWB	454	384	421	400
A4095 (West of Banbury Road)	EB	637	570	489	427
	WB	412	406	388	361
A4095 (West of A4421)	EB	969	826	903	886
	WB	814	469	742	669
A4421 Skimmingdish Lane	SEB	1598	1577	1572	1569
	WB	622	614	560	531
A4421 Wretchwick Way	NEB	541	503	621	585
	SWB	499	469	507	507
A41 (East of Oxford Road)	EB	2089	2059	1514	1358
	WB	1948	1926	1142	1321
Kings End	NB	1012	963	1305	1410
	SB	1072	1081	1063	1052
Field Street	NB	1300	1239	1368	1357
	SB	1000	985	966	961
Banbury Road (North of Field Street)	NB	340	349	337	336
	SB	314	323	328	305
Buckingham Road (North of Field Street)	NB	964	893	1035	1027
	SB	690	666	642	662
Route 1b North West Link (South of Bucknell Rd)	NEB	NA	296	NA	NA
	SWB	NA	237	NA	NA
Route 2c (South of Graven Hill)	EB	NA	NA	670	NA
	WB	NA	NA	732	NA
Route 3 (South of Graven Hill)	EB	NA	NA	NA	1043
	WB	NA	NA	NA	768

Table 7: **PM Peak Modelled Scenario Link Demand Flows (PCUs)**

Link	Scenario:	Scenario 1 No New Link Road	Scenario 2 R1b	Scenario 3 R2c	Scenario 4 R3
A41 Between M40 and Wendlebury Road	NEB	1288	1263	1574	1590
	SWB	2170	2152	2358	2307
Vendee Drive	NWB	569	588	780	786
	SEB	428	435	961	672
Middleton Stoney Road (East of Vendee Drive)	EB	1106	1037	1025	1007
	WB	546	517	574	514
NW Bicester Development Link Road	NEB	657	531	425	409
	SWB	362	338	384	312
A4095 (West of Banbury Road)	EB	621	414	400	397
	WB	438	481	382	340
A4095 (West of A4421)	EB	445	175	333	334
	WB	1511	1558	1415	1397
A4421 Skimmingdish Lane	SEB	996	984	842	829
	WB	1635	1633	1501	1501
A4421 Wretchwick Way	NEB	723	670	670	639
	SWB	458	474	595	585
A41 (East of Oxford Road)	EB	2127	2078	1122	1242
	WB	1973	1938	1176	1091
Kings End	NB	1131	1040	1527	1470
	SB	1132	1109	1061	1069
Field Street	NB	1369	1333	1396	1372
	SB	1259	1163	946	1034
Banbury Road (North of Field Street)	NB	653	606	657	652
	SB	449	495	450	463
Buckingham Road (North of Field Street)	NB	943	902	941	922
	SB	1037	844	699	773
Route 1b North West Link (South of Bucknell Rd)	NEB	NA	341	NA	NA
	SWB	NA	198	NA	NA
Route 2c (South of Graven Hill)	EB	NA	NA	1023	NA
	WB	NA	NA	685	NA
Route 3 (South of Graven Hill)	EB	NA	NA	NA	959
	WB	NA	NA	NA	874

5.6 The demand flow differences between scenarios for each peripheral route option have been studied. In all cases, these show a general decrease in traffic within the Bicester urban area doe to rerouting of traffic onto the peripheral route included.

5.7 Routes 2c and 3 give significant reductions on the A41 (East of Oxford Road). Routes 2c and 3 give the largest increases on Kings End northbound, although the southbound flows on this link remains largely static in all options.

5.8 Field Street remains largely unchanged in all options. This is likely due to the vehicles using this link having a trip end near to the link thus limiting the routing alternatives.

5.9 The number of links and turns at junctions with Volume over Capacity (V/C) ratios of 85% or over and 100% or over are given in **Tables 8 and 9** below for each scenario. A green shaded cell indicates the best performing option:

Table 8: **No of Modelled Links and Turns with V/C 85% or Over & 100% or Over (AM Peak)**

Option	85%		100%	
	Link	Turns	Link	Turns
2012	15	20	7	13
Scenario 1 No New Link Road	48	83	18	43
Scenario 2 R1b	47	78	19	45
Scenario 3 R2c	47	82	18	45
Scenario 4 R3	42	72	17	37

Table 9: **No of Modelled Links and Turns with V/C 85% or Over & 100% or Over (PM Peak)**

Option	85%		100%	
	Link	Turns	Link	Turns
2012	19	22	9	15
Scenario 1 No New Link Road	72	125	37	84
Scenario 2 R1b	62	113	32	75
Scenario 3 R2c	62	117	32	75
Scenario 4 R3	63	110	33	77

5.10 As can be seen from **Tables 8 and 9**, Route 3 performs the best in the AM peak across all scenarios having the least amount of links and junctions over 85% & 100% V/C for all scenarios. For the PM peak Routes 1b and 2c perform better although the increase between routes 1b/2c and 3 is small.

5.11 The above tables illustrate that, although the peripheral route options help to mitigate some of the congestion caused by the increase in growth, they do not solve all of the problems. Therefore, it is considered advisable that additional assessment is made of mitigation measures that could be feasible in order to further reduce the predicted levels of congestion.

6 Economic Assessment

6.1 The Transport User Benefit Appraisal program, TUBA, (version 1.9.2) has been used to estimate the benefits derived from a scheme in terms of time and vehicle operating cost savings. TUBA assesses the whole life costs and benefits of transport schemes using matrices of costs, in terms of distance and time, and trips from the transport model. The program calculates user benefits and changes in revenues and produces indicators of a project worth.

TUBA Inputs

6.2 There are three main inputs to the TUBA process:

- Economic parameters
- Scheme specific control data
- Matrix data from the traffic model

Economic Parameters

6.3 In accordance with WebTAG guidance, the standard TUBA economics file has been used. This file provides details of tax rates, Values Of Time (VOT) and Vehicle Operating Cost (VOC) parameters and growth forecasts for VOT and VOC.

Scheme Specific Control Data

6.4 The control data file used by TUBA is scheme specific and defines the appraisal period, sets out the scheme costs, provides details of model specific data (e.g. time slices and user classes) and defines the annualisation factors (i.e. to convert model time periods to their annual equivalent).

6.5 For the purposes of the TUBA assessment the current year has been taken as 2014 and, with an opening year of 2017, the horizon year is 2076, thus providing a 60 year assessment period in accordance with WebTAG guidance (TAG Unit 3.5.2). A second year of 2031 is also defined within TUBA for assessment. However, as only one modelled 'year' scenario is available from the SATURN model but TUBA requires a minimum of two modelled years, the same model outputs have been used for both of the scheme appraisal years (2017 and 2031) input to TUBA. This means there is an assumption that all growth and infrastructure occurs, and is complete, by the first assessment year of 2017 and stays the same until 2031. This means that

the economic assessment could be potentially over or underestimating the benefits of any scheme dependant on when the infrastructure or the development growth would actually occur. Were the scheme completed before some of the proposed developments, it could likely operate within capacity more easily and hence provide additional benefits to the network. However, few trips in the network without the development could mean lower levels of benefits as there would be fewer trips in the network to benefit from the presence of the scheme. As such, it must be reiterated that these assessments are for comparative assessments between the route options only.

6.6 The time periods from the transport model were:

i) 0800 – 0900 (AM peak); and

ii) 1700 – 1800 (PM peak).

6.7 A simplistic approach for the calculation of annualisation factors has been taken where the factors are assumed to be the number of weekdays in a year (253) for each peak period.

6.8 The total annual hours assessed therefore are 506 (out of an annual total of 8760 hours). This is considered to be a robust assessment as no benefits from the peak shoulders, interpeak, off peak or weekend periods are being claimed. It is recommended that further assessment of the hours to be assessed should be made in order to refine these factors post the model revalidation work based on survey data.

6.9 The following vehicle mode types have been used in the TUBA assessment:

- Cars
- Light Goods Vehicles (LGV)
- Medium Goods Vehicles (OGV1); and
- Heavy Goods (OGV2)

6.10 Although only 2 vehicle classes were available from the model ('Lights' and 'Heavies'), it was deemed appropriate to split the model outputs into the four classes for assessment with TUBA. As such the 'Lights' vehicle class is assumed to consist of 90% car and 10% light goods vehicles and the 'Heavies' vehicle class is assumed to consist of 60% OGV1 and 40% OGV2. The percentage splits have been based on classified counts collected as part of the model revalidation work. This allows TUBA to take account of different vehicle type impacts in the

assessment. Separate vehicle matrices for each class or factors derived from count information as a minimum should be used for the post model revalidation economic assessments.

6.11 All scheme costs have been entered as Factor Costs to allow TUBA to convert to Market Prices.

6.12 All scheme costs have been assumed to occur in 2016.

6.13 The Retail Price Index (RPI) value of 246.8 has been used in all assessments. This is equivalent to the December 2012 figure which was the latest available at the time of carrying out the assessments.

6.14 All costs have been assumed to be attributable to TUBA Mode 1 (i.e. Private Mode).

6.15 Costs for construction were not available for input to the TUBA assessments. Therefore, a generic figure of £1,000 has been assumed for all options as a proxy for real values. As such, the resultant Present Value Costs (PVC) from the TUBA assessment should not be used. Furthermore, as the Benefit Cost Ratio (BCR) uses the PVC in its calculation, the BCR should also be disregarded in the assessment. Only the Present Value Benefits should be used for analysis of the results and as only one modelled year is available for input to the TUBA, the PVB should only be used to provide a ranking of the options compared to the reference case.

Matrix Data from the Transport Model

6.16 Forecast flows from the Bicester route scenario models, as detailed in the previous sections have been used in the economic assessments.

6.17 Trip Matrices have been skimmed from the SATURN assignments for each vehicle type ('Lights' and 'Heavies') for the revised Main Modifications to the Local Plan growth matrices.

6.18 Each model has then been skimmed to produce time and distance matrices by origin destination pair. In accordance with TUBA guidance, a factor of 0.00028 has been used to convert the time matrices from seconds to hours and a factor of 0.001 has been used to convert the distance matrices from metres to kilometres.

6.19 The following TUBA assessments have been carried out with the no peripheral route scenario (Main Modifications = MM) being taken as the reference case for all assessments:

- MM versus MM +R1b

- MM versus MM +R2c
- MM versus MM +R3

6.20 Checks have been carried out to ensure the correct matrices have been input into the TUBA assessment process.

TUBA Results

6.21 Again, it should be noted that the Benefit Cost Ratio cannot be used directly as no costs for construction have been supplied. Furthermore, as only one modelled year is available, the Present Value Benefits (PVB) can only be used as an indicator as to whether the scheme to be tested is an improvement over the reference case and *the absolute value should not be used*.

6.22 Final Main Modification additional growth versus Route 1b: Route 1b shows a positive PVB and can be considered an improvement in terms of travel time for vehicular journeys when compared to no peripheral route.

6.23 Final Main Modification additional growth versus Route 2c: Route 2c shows a positive PVB and can be considered an improvement in terms of travel time for vehicular journeys when compared to no peripheral route. The quantity of the PVB indicates more of a positive benefit than that shown by Route 1b versus no peripheral route.

6.24 Final Main Modification additional growth versus Route 3: Route 3 shows a positive PVB and can be considered an improvement in terms of travel time for vehicular journeys when compared to no peripheral route. The quantity of the PVB indicates more of a positive benefit than that shown by Route 1b or Route 2c versus no peripheral route.

Order of Ranking

6.25 In summary, the routes increase in benefit compared to no peripheral route in the following order:

- Route 1b
- Route 2c
- Route 3

Least benefit

↓

Most benefit

6.26 This is consistent with the conclusions of the previous peripheral route assessments.

7 Assessments Including Upper Heyford

7.1 **Tables 10 and 11** summarise statistics for the Main Modification to the Local Plan scenarios but include the Upper Heyford Development. As stated previously, Upper Heyford is being assessed in more detail using the Central Oxfordshire Transport Model in order to fully assess its impact over the wider area. These assessments are to confirm that the inclusion of Upper Heyford does not materially affect the assessment of the peripheral routes as detailed in the previous sections. The assessments have been carried out without inclusion of any associated Upper Heyford mitigation and hence can be considered a worst case scenario.

Table 10: AM Peak Model Network Summary Statistics (With Upper Heyford)

Option:	2012	Scenario 5 No New Link Road	Scenario 6 R1b	Scenario 7 R2c	Scenario 8 R3
Total Travel Time (PCU Hrs)	3,085	5,427	5,269	5,104	5,094
Total Travel Distance (PCU Kms)	237,565	311,816	311,815	310,813	310,813
Average Speed (Kph)	77.0	57.5	59.2	59.7	61.0
Over Capacity Queues PCU (Hrs)	220	998	879	830	735

Table 11: PM Peak Model Network Summary Statistics (With Upper Heyford)

Option:	2012	Scenario 5 No New Link Road	Scenario 6 R1b	Scenario 7 R2c	Scenario 8 R3
Total Travel Time (PCU Hrs)	3,164	5,625	5,589	5,590	5,288
Total Travel Distance (PCU Kms)	243,630	318,085	318,554	316,115	316,698
Average Speed (Kph)	77.0	56.5	57.0	56.5	59.9
Over Capacity Queues PCU (Hrs)	186	1096	1085	1109	816

7.2 Of the Peripheral Route options, Route 3 again performs best for total travel time, average speed and over capacity queues with Upper Heyford included.

7.3 Again, Route 2c has the lowest total travel distance for all but the AM with Upper Heyford scenario where Route 2c and 3 both have the lowest.

7.4 **Tables 12 and 13** summarise the link flows in PCUs on key links across the networks for each of the main scenarios including the proposed Upper Heyford development.

Table 12: AM Peak Modelled Scenario Link Flows: With Upper Heyford Demand (PCUs)

Link	Scenario:	Scenario 5 No New Link Road	Scenario 6 R1b	Scenario 7 R2c	Scenario 8 R3
A41 Between M40 and Wendlebury Road	NEB	2111	2109	2525	2855
	SWB	1260	1181	1436	1649
Vendee Drive	NWB	284	289	371	389
	SEB	189	186	321	315
Middleton Stoney Road (East of Vendee Drive)	EB	1030	914	774	581
	WB	802	756	719	732
NW Bicester Development Link Road	NEB	557	528	365	327
	SWB	554	509	479	467
A4095 (West of Banbury Road)	EB	878	748	809	747
	WB	386	463	337	271
A4095 (West of A4421)	EB	1360	996	1135	1046
	WB	1096	757	948	889
A4421 Skimmingdish Lane	SEB	1796	1806	1731	1659
	WB	757	705	541	540
A4421 Wretchwick Way	NEB	509	511	601	528
	SWB	539	465	413	431
A41 (East of Oxford Road)	EB	2395	2302	1742	1584
	WB	2274	2135	1409	1403
Kings End	NB	994	949	1284	1420
	SB	1174	1157	1137	1154
Field Street	NB	1430	1301	1463	1433
	SB	1357	1332	1361	1256
Banbury Road (North of Field Street)	NB	381	394	358	379
	SB	588	568	611	514
Buckingham Road (North of Field Street)	NB	1028	885	1043	1072
	SB	748	742	688	759
Route 1b North West Link (South of Bucknell Rd)	NEB	NA	235	NA	NA
	SWB	NA	168	NA	NA
Route 2c (South of Graven Hill)	EB	NA	NA	980	NA
	WB	NA	NA	917	NA
Route 3 (South of Graven Hill)	EB	NA	NA	NA	1385
	WB	NA	NA	NA	1083

Table 13: PM Peak Modelled Scenario Link Flows: With Upper Heyford Demand (PCUs)

Link	Scenario:	Scenario 5 No New Link Road	Scenario 6 R1b	Scenario 7 R2c	Scenario 8 R3
A41 Between M40 and Wendlebury Road	NEB	1359	1429	1603	1612
	SWB	2597	2883	2845	2531
Vendee Drive	NWB	617	494	762	791
	SEB	385	426	1237	699
Middleton Stoney Road (East of Vendee Drive)	EB	1151	1064	987	968
	WB	853	830	889	726
NW Bicester Development Link Road	NEB	592	471	388	382
	SWB	457	419	623	346
A4095 (West of Banbury Road)	EB	635	380	513	481
	WB	438	552	500	288
A4095 (West of A4421)	EB	440	166	311	292
	WB	1584	1753	1491	1451
A4421 Skimmingdish Lane	SEB	971	1025	829	825
	WB	1980	1940	1752	1748
A4421 Wretchwick Way	NEB	798	746	722	631
	SWB	364	357	526	571
A41 (East of Oxford Road)	EB	2131	2039	1074	1244
	WB	2385	2278	1497	1516
Kings End	NB	1093	1058	1506	1435
	SB	1279	1250	1159	1193
Field Street	NB	1271	1332	1414	1382
	SB	1308	1314	1145	1267
Banbury Road (North of Field Street)	NB	726	730	850	780
	SB	419	544	462	499
Buckingham Road (North of Field Street)	NB	861	895	876	865
	SB	1204	1063	995	1031
Route 1b North West Link (South of Bucknell Rd)	NEB	NA	242	NA	NA
	SWB	NA	200	NA	NA
Route 2c (South of Graven Hill)	EB	NA	NA	1063	NA
	WB	NA	NA	823	NA
Route 3 (South of Graven Hill)	EB	NA	NA	NA	901
	WB	NA	NA	NA	1037

7.5 Again, reductions are seen on links within the Bicester urban area for all scenarios which include a peripheral route due to rerouting of traffic onto the new links.

7.6 Routes 2c and 3 give significant reductions on the A41 (East of Oxford Road). Routes 2c and 3 give the largest increases on Kings End northbound although the southbound flows on this link remains largely static in all options.

7.7 Field Street remains largely unchanged in all options. This is likely due to the vehicles using this link having a trip end near to the link limiting the routing alternatives.

7.8 These results are consistent with Scenarios 1-4.

7.9 The number of links and turns at junctions with Volume over Capacity (V/C) ratios of 85% or over and 100% or over are given in **Tables 14 and 15** for each scenario. A green shaded cell indicates the best performing option:

Table 14: No of Modelled Links and Turns with V/C 85% or Over & 100% or Over (AM Peak with Upper Heyford)

Option	85%		100%	
	Link	Turns	Link	Turns
2012	15	20	7	13
Scenario 5 No New Link Road	94	189	51	130
Scenario 6 R1b	89	169	43	107
Scenario 7 R2c	93	172	43	111
Scenario 8 R3	88	165	42	101

Table 15: No of Modelled Links and Turns with V/C 85% or Over & 100% or Over (PM Peak with Upper Heyford)

Option	85%		100%	
	Link	Turns	Link	Turns
2012	19	22	9	15
Scenario 5 No New Link Road	94	182	55	133
Scenario 6 R1b	88	157	45	102
Scenario 7 R2c	82	163	45	110
Scenario 8 R3	87	161	45	109

7.10 As can be seen from **Tables 14 and 15**, Route 3 again performs the best in the AM peak across all scenarios having the least amount of links and junctions over 85% and over and 100% and over V/C for all scenarios. For the PM peak Routes 1b and 2c perform better.

7.11 Route 1b performs comparatively better in the with Upper Heyford scenarios. This is likely due to the proximity of the R1b scheme to both the Upper Heyford and NW Bicester developments.

7.12 Overall it is considered that these results are consistent with Scenarios 1-4 (No Upper Heyford).

8 Conclusions

8.1 The inclusion of the predicted growth for the Bicester area results in significant increases in over capacity queuing, average speed and total travel time from the 2012 base.

8.2 Of the peripheral routes, Route 3 generally performs best in all areas for both peak periods for overall network statistics. Route 3 performs best for the AM peak period for volume over capacity ratios. Routes 1b and 2c perform best for the PM peak period for volume over capacity ratios although the differences are marginal.

8.3 TUBA indicates that the routes increase in benefit compared to no peripheral route in the following order:

- Route 1b — Least benefit
- Route 2c — ↓
- Route 3 — Most benefit

8.4 The inclusion of the proposed Upper Heyford development as a sensitivity test does not materially change the results of the peripheral route assessments.

8.5 Although the peripheral route options help to mitigate some of the congestion caused by the increase in growth, they do not solve all of the problems.

8.6 Further assessment of mitigation measures that could be feasible for the southern, eastern and northern corridors would be considered advisable to support the peripheral route option assessments.

Technical note

Project:	Cherwell Local Plan Modifications	**To:**	Oxfordshire County Council
Subject:	Upper Heyford Technical Note	**From:**	Graham Bown
Date:	8th October 2014	**cc:**	

This document and its contents have been prepared and are intended solely for Oxfordshire County Council's information and use in relation to testing the impacts of development at Upper Heyford on the wider network around the proposed site using strategic modelling tools. OCC have made the following points in reference to this Technical Note:

- *The report is a working document investigating 'ideas' and not proposals.*
- *The report does not reflect a view agreed to by OCC and the mitigation package has not been agreed as a preferred option.*
- *The report is not definitive, not exhaustive and does not infer that OCC are giving tacit approval.*
- *The report does not indicate OCC's view towards a response relating to a planning application.*
- *The mitigation package contained within the report is not the only mitigation package being investigated and no comparison with other mitigation scenarios has been made.*
- *The report does not indicate whether mitigation is deliverable.*

Atkins Limited assumes no responsibility to any other party in respect of or arising out of or in connection with this document and/or its contents.

1. Introduction

Cherwell District Council is consulting on modifications to the Submission Cherwell Local Plan including modified Policies Maps and an update to a Sustainability Appraisal. The documents are published for consultation from Friday 22 August 2014 to Friday 3 October 2014 prior to submission to the Secretary of State for Communities and Local Government.

The public Examination hearings into the Submission Local Plan were suspended on 4 June 2014 for six months. This was to enable the Council to put forward proposed modifications to the Plan involving increased new housing delivery over the plan period to meet the full, up to date, objectively assessed needs of the district, as required by the National Planning Policy Framework (NPPF) and based on the Oxfordshire Strategic Housing Market Assessment 2014 (SHMA).

These Main Modifications are now available for public comment for a period of six weeks before they are formally submitted to the Secretary of State and the public Examination of the Local Plan re-commences. A number of minor modifications are also being made available for viewing at the same time. Comments made must relate to proposed modifications only. Cherwell district council is not consulting on other aspects of the Plan.

Atkins have already provided transport modelling advice for OCC on this subject, but now the final figures for the modifications have been released and some scenarios need to be re-run and also some additional outputs are required. This brief commissions Atkins to undertake the transport modelling work required towards this task. The work will use the Oxfordshire Strategic Model in combination with understanding the trip distribution into and out of the Cherwell district/modelled area.

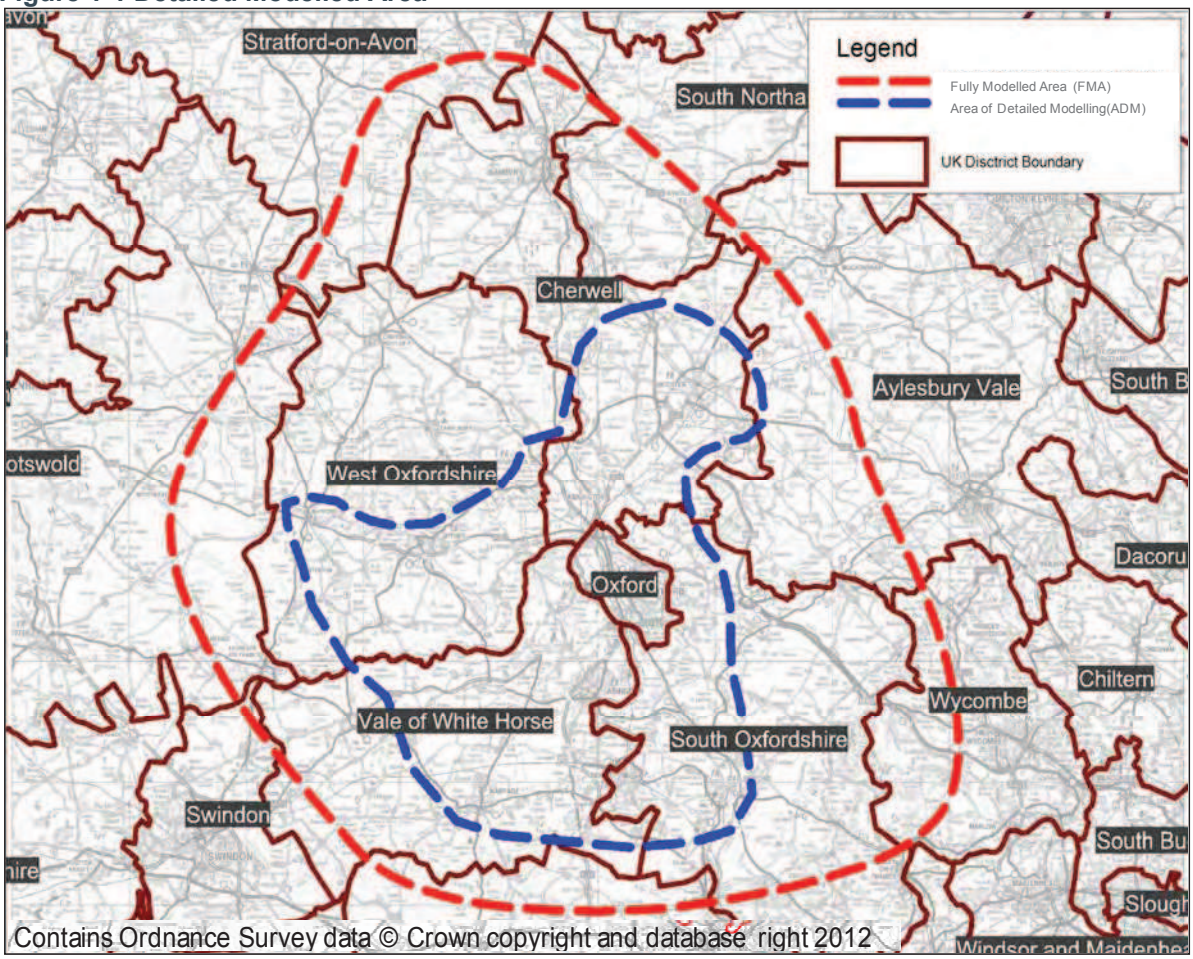
1.1. Model System

The work is based on the new Oxfordshire Strategic Model (OSM). The base model has recently been completed and early forecasts for 2031 have been finalised. The OSM covers the strategic links in Oxfordshire and has a detailed modelled area and fully modelled area shown in Figure 1-1.

The detailed modelled area reflects the extent to which transport demand data has been collected and includes a representation of all movements to, from and within the county. Within the detailed modelled area all strategic highway links will be included although not all junctions will be simulated. The fully modelled area reflects the extent of calibration and validation data used in model development and therefore reflects the area in which the model's performance is known.

Cherwell straddles the detailed modelled area, with Bicester and Upper Heyford being within the detailed modelled area but Banbury outside it. This means that Banbury does not have the same level of model development as Bicester and as a result does not have the same level of certainty regarding traffic forecasts in the area. The impact of changes in transport demand in Banbury should only be considered as indicative. However, a stand-alone highway model for Banbury has been developed, and the impacts of changes in transport demand in Banbury are therefore reported in a separate Technical Report for Banbury.

Figure 1-1 Detailed Modelled Area



The modelling work has been undertaken using a validated 2013 base year demand model and 2031 forecast year scenarios as follows and are described in more detail in following sections:

- 2013 Base Year
- Scenario 1 - 2031 Local Plan with Local Plan transport mitigation
- Scenario 3 - 2031 Local Plan with Local Plan transport mitigation plus Local Plan Modifications and the Modifications transport mitigation BUT excluding Upper Heyford development and associated mitigations
- Scenario 4 - 2031 Local Plan with Local Plan transport mitigation plus Local Plan Modifications and the Modifications transport mitigation including Upper Heyford development BUT excluding Upper Heyford associated mitigations
- Scenario 5 - 2031 Local Plan with Local Plan transport mitigation plus Local Plan Modifications and Modifications transport mitigation including Upper Heyford development and Upper Heyford associated mitigations

Note Scenario 2 is not reported in this Technical Note.

A forecast year scenario has two elements: transport demand (trips by mode and time) and transport supply (the networks). Transport demand is formed from a reference case, known as a **Reference Forecast**. Transport supply reflects the existing networks and all certain changes up to the forecast year of 2031. A **Reference Forecast** is a term specific to setting up a forecast with a variable demand model and is an

intermediate step to producing the Forecast Scenario. It uses the growth in trip ends over the forecasting period, but does not take into account changes in travel cost.

The **Forecast Scenario** reflects changes to the Reference Forecast brought about by the changes in network costs and is an iterative process within the demand model which can change trip frequency, time, mode and destination. The iterations stop once a satisfactory level of convergence is reached (reflecting stability in the process) and the Forecast Scenario demand is created and its final assignment forms the model outputs.

An understanding of this process enables the results to be interpreted with more clarity. Any difference between the **Reference Forecast** and the **Forecast Scenario** will be a result of travel costs suppressing travel demand in cases where Reference Forecast > Forecast Scenario (or facilitating travel in the reverse). This is best viewed over a 12 hour period rather than specific modelled hours to account for changes in the time, mode and destination of the trip. Any final differences between the **Reference Forecast** and the **Forecast Scenario when time of day and mode are taken into account** are therefore due to trip frequency. Note that model output is vehicles for cars and people for public transport passengers.

To aid model convergence and reflect a general trend towards peak spreading (the process whereby the broadening of traffic flow profiles in peak periods in congested urban networks as traffic demand increases) the demand model assumes a flat peak period (7am to 10am and 4pm to 7pm), creating a rush-three hour rather than single rush-hour. The impact would be to slightly reduce demand between 8am and 9am and between 5pm and 6pm as more traffic would travel after the peak hour (analysis shows that flows before the 'peak hour' are similar in magnitude to the 'peak hour'). The benefit of this is improved model convergence.

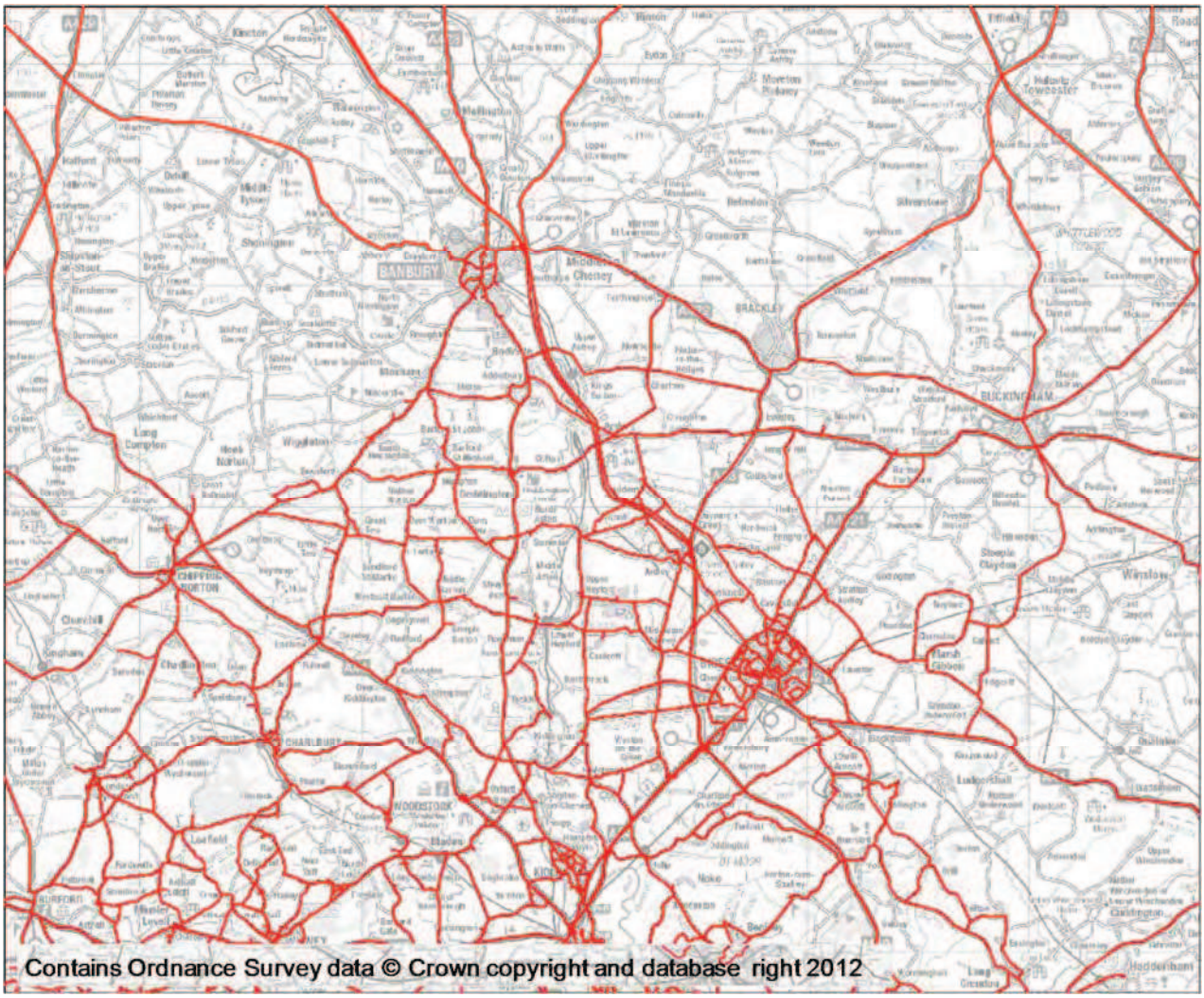
Technical note

2. Base Year 2013

Cherwell district's strategic transport network includes Bicester and Upper Heyford being within the detailed modelled area but Banbury located outside of it. As stated previously, the impact of changes in transport demand in Banbury, as assessed using the Banbury Local Highway Model, are reported in a separate Technical Report.

The strategic highway network coded in Cherwell area is presented in Figure 2-1 below.

Figure 2-1 Cherwell Highway Network



2.1. Base Year Demand

Table 2-1 to Table 2-4 summarise the aggregated demand for the **Base Year** for Cherwell District and for the full OSM model. In Cherwell approximately 223000 person movements are made during the 12 hour period from 7am to 7pm, with approximately 5% of motorised journeys (excluding walking and cycling) taking place by public transport.

Table 2-1 Base Year demand for Cherwell (AM period)

Mode	Cherwell District		Entire model
	Origin	Destination	Origin/Destination
Car (vehicles)	41382	40358	236631
Bus (people)	3565	1733	30406
Rail (people)	1884	763	9302

Table 2-2 Base Year demand for Cherwell (IP period)

Mode	Cherwell District		Entire model
	Origin	Destination	Origin/Destination
Car (vehicles)	70922	71421	413268
Bus (people)	3503	3731	49298
Rail (people)	1461	1546	9824

Table 2-3 Base Year demand for Cherwell (PM period)

Mode	Cherwell District		Entire model
	Origin	Destination	Origin/Destination
Car (vehicles)	55719	56382	316028
Bus (people)	1389	2868	30314
Rail (people)	1125	1917	11112

Table 2-4 Base Year demand for Cherwell (12 hour)

Mode	Cherwell District		Entire model
	Origin	Destination	Origin/Destination
Car (vehicles)	168023	168161	965928
Bus (people)	8456	8332	110019
Rail (people)	4471	4226	30238
TOTAL (people)	222956	222760	1347667

2.2. Highway Network

This section describes the network performance in the Cherwell District and on the links and junctions around the site. The overall Cherwell District network statistics for the model simulation area are shown below in Table 2-5.

Table 2-5 Base Year Network Statistics – Cherwell District

Time	Metric	Results	Unit
Moring Peak Hour	Total Time	9555.5	Pcu Hr
	Delay	921	Pcu Hr
	Total distance	689783.0	Pcu KM
	Speed	72.2	KM/h
Inter Peak Hour	Total Time	6826.4	Pcu Hr

Time	Metric	Results	Unit
	Delay	421.7	Pcu Hr
	Total distance	539370.6	Pcu KM
	Speed	79.0	KM/h
Evening Peak Hour	Total Time	11057.2	Pcu Hr
	Delay	1631	Pcu Hr
	Total distance	745919.4	Pcu KM
	Speed	67.5	KM/h

A description of the network performance for the base year focusing upon the key corridors (Figure 2-2) in the Upper Heyford area is shown in Table 2-6 for the morning and evening peaks. The assessment is organised in to routes and focuses primarily on the link performance in to key junctions along the route and also provides further detail relating specifically to junction performance where that differs to the link performance.

Figure 2-3 and Figure 2-4 show the network link and junction performance are measured by the volume to capacity (v/c) ratio and highlights those links on the highway network that are operating below operational capacity (v/c <85%), at operational capacity (v/c between 85% and 95%) and those that are exceeding operational capacity (v/c >95%).

Figure 2-2 Upper Heyford Area of Assessment

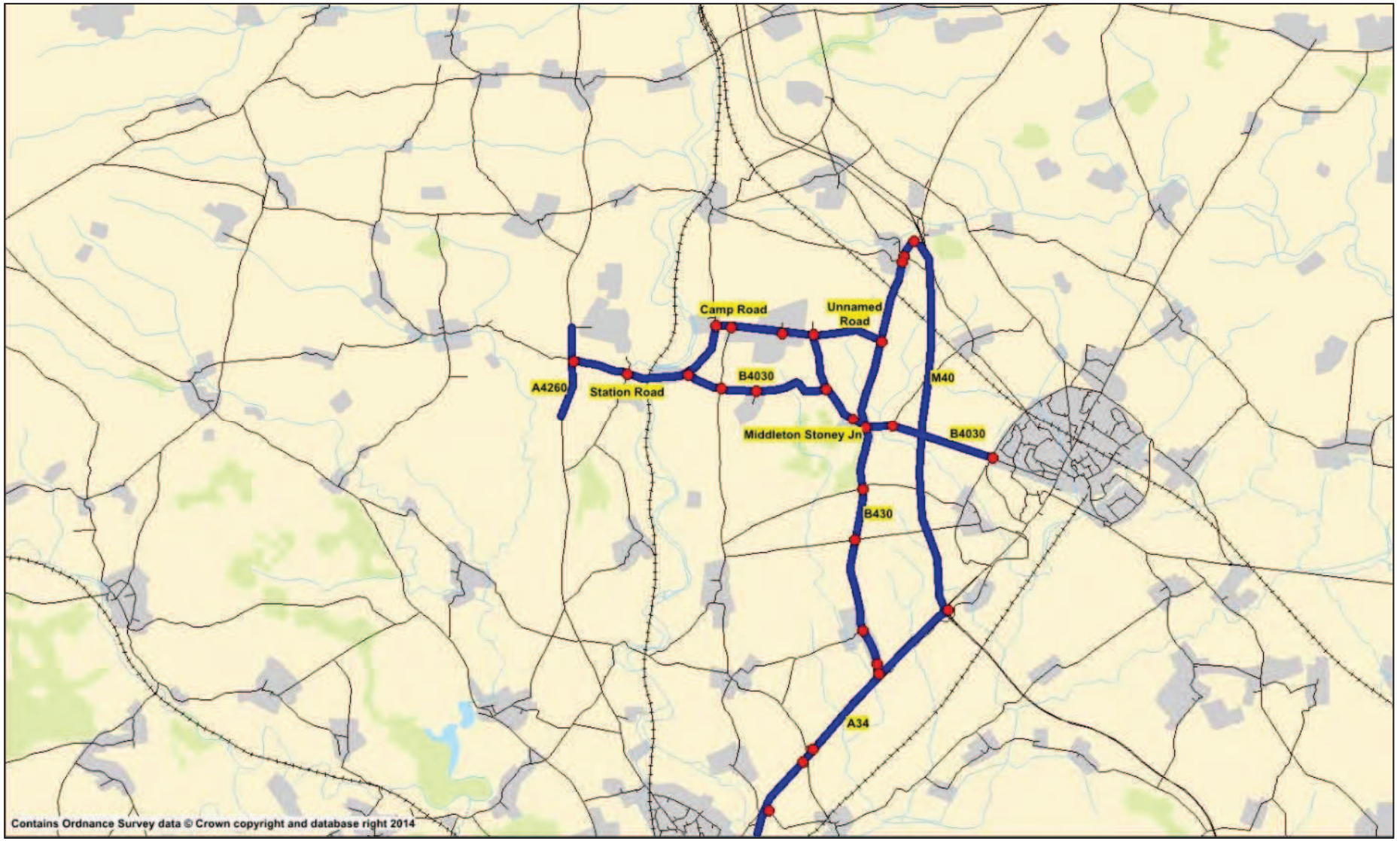


Table 2-6 Base Year (2013) network performance assessment

Link	Junction	Morning peak hour	Evening peak hour
Camp Road Station Rd to B4030	Camp Road and Station Road Junction	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.
	Camp Road and Unnamed Road Junction	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.
	Camp Road and B4030 Junction	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.
Unnamed Road between Camp Road and B430	Unnamed Road and B430 Junction	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.
	Camp Road and Unnamed Road Junction	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.
Station Road Camp Road to B4030	Station Road and B4030 Junction	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.
	Camp Road and Station Road Junction	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.
B4030 Bicester to A4260	B4030 and A4095 Howes Lane Junction	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.

Link	Junction	Morning peak hour	Evening peak hour
	Middleton Stoney Junction	Overall the performance of this junction is below capacity. However 5 turns perform over capacity. With reference to the links entering this junction, the eastbound link performs over capacity; the westbound link performs over capacity;	Overall the performance of this junction is below capacity. However 1 turn performs at capacity and 2 turns perform over capacity. With reference to the links entering this junction, the eastbound link performs at capacity; the westbound link performs over capacity;
	Camp Road and B4030 Junction	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.
	Station Road and B4030 Junction	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.
	Rousham	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.
	Holt Junction (B4030 and A4260)	Overall the performance of this junction is below capacity. However 3 turns perform over capacity. With reference to the links entering this junction, the southbound link performs over capacity;	Overall the performance of this junction is below capacity. However 1 turn performs at capacity and 2 turns perform over capacity. With reference to the links entering this junction, the northbound link performs over capacity;
B430 Ardley to A34	B430 and Ardley Road Junction	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.
	Unnamed Road and B430 Junction	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.

Link	Junction	Morning peak hour	Evening peak hour
	Middleton Stoney Junction	Overall the performance of this junction is below capacity. However 5 turns perform over capacity. With reference to the links entering this junction, the eastbound link performs over capacity; the westbound link performs over capacity;	Overall the performance of this junction is below capacity. However 1 turn performs at capacity and 2 turns perform over capacity. With reference to the links entering this junction, the eastbound link performs at capacity; the westbound link performs over capacity;
	B430 and A4095 Junction	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.
	A34 Junction	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.
M40 J9	M40 Slips	All the links perform below capacity.	All the links perform below capacity.
	Circulation	The circulatory carriageway exceeds capacity.	The circulatory carriageway exceeds capacity.
M40 J10	M40 Slips	All the links perform below capacity.	All the links perform below capacity.
	B430 Roundabout	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.
	A43 Roundabout	Overall the performance of this junction is below capacity. With reference to the links entering this junction, the southbound link performs at capacity;	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.
A34	Link only	Section between the B4027 and B430 is below capacity in both northbound and southbound directions.	Section between the B4027 and B430 is below capacity in both northbound and southbound directions.

Figure 2-3 Base Year (2013) network performance (Morning Peak Hour)

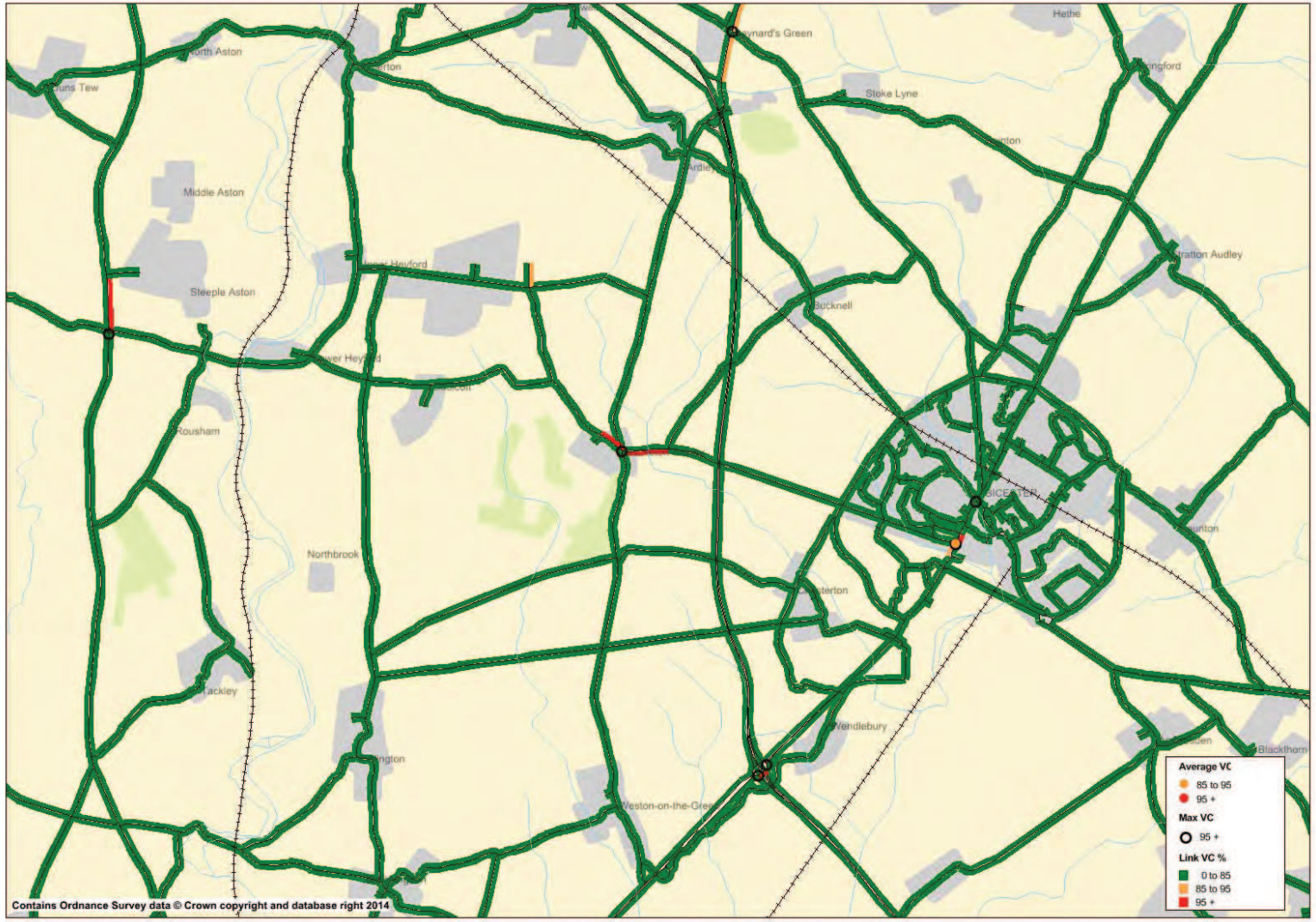
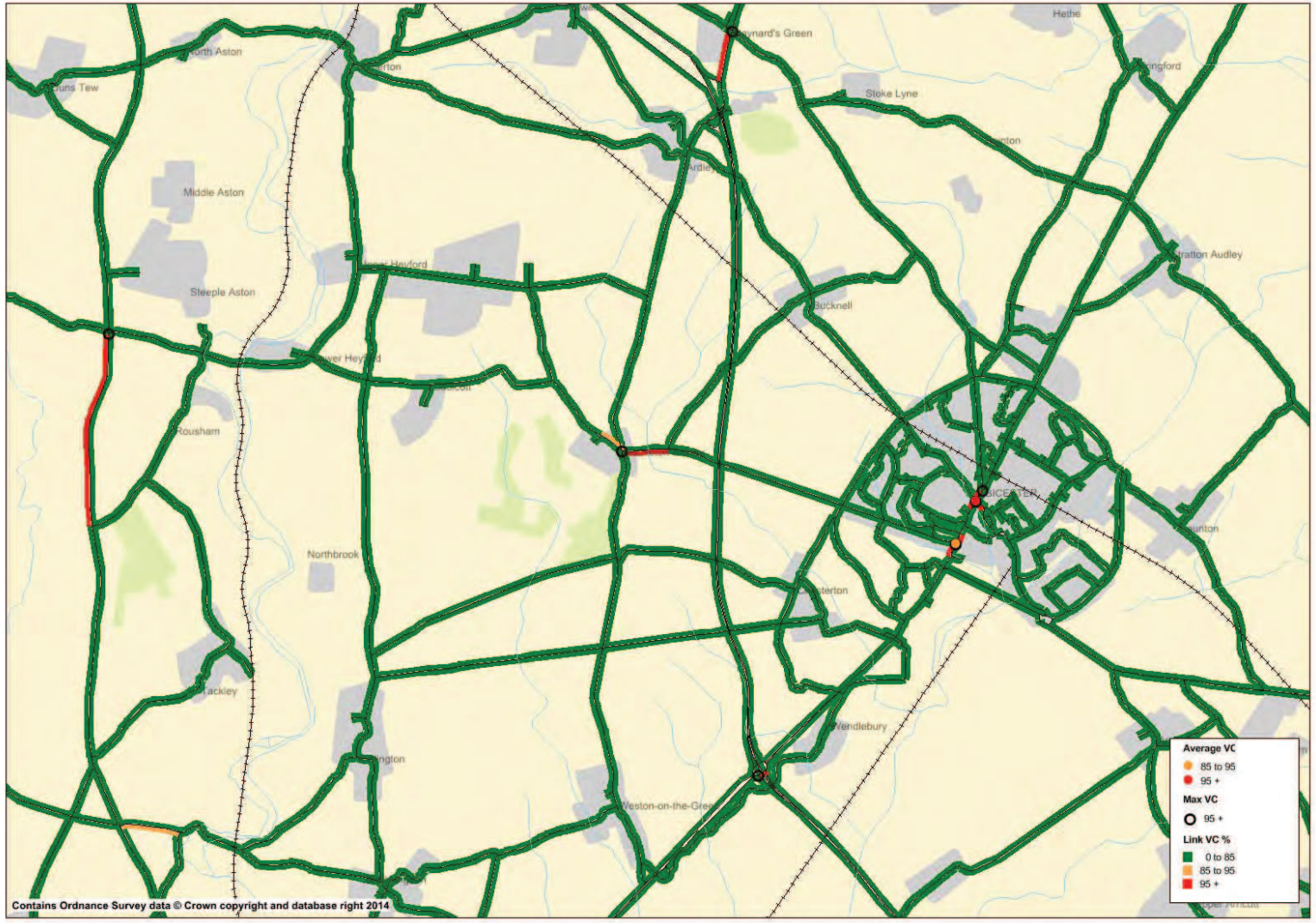


Figure 2-4 Base Year (2013) network performance (Evening Peak Hour)



2.3. Public Transport Network

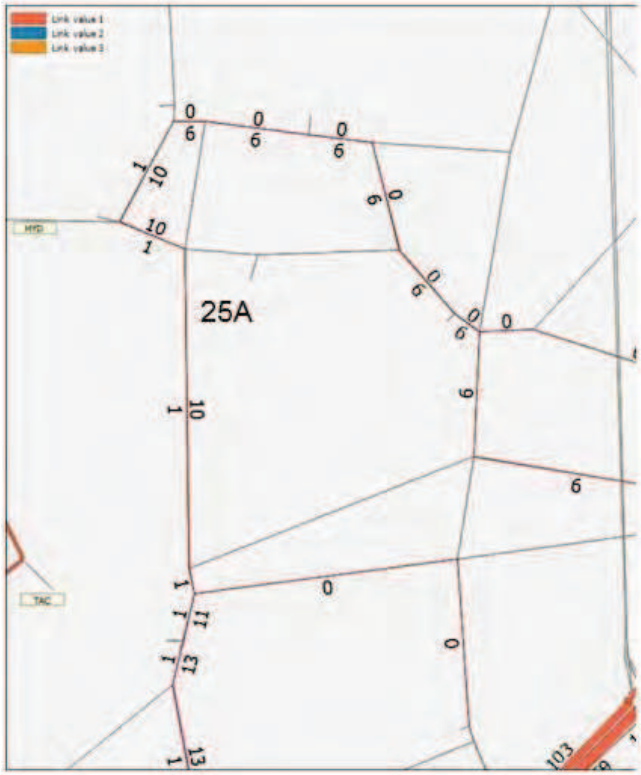
In the following figures are presented the loads, in both directions, for the bus service that operates in Upper Heyford (25A) and is the main public transport serving the development site. In the Base Year, this service has the headways presented in the table below, which explains the low patronage, together with the fact that there is a low density of houses and jobs in the area.

Table 2-7 Interval between services for bus line 25A

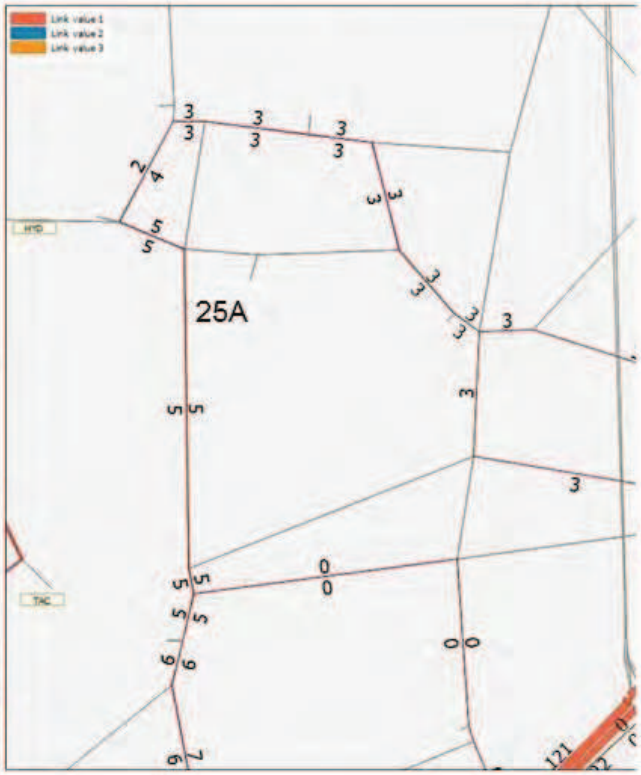
Direction	AM	IP	PM
Bicester - Oxford	45	60	30
Oxford - Bicester	120	60	30

Figure 2-5 Loads on the public transport services around Upper Heyford in the Base Year

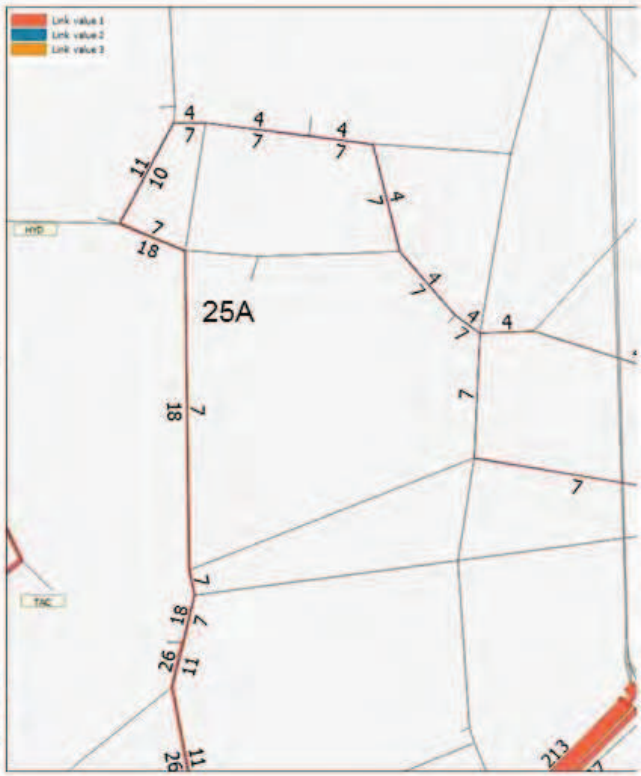
AM peak hour



IP average hour



PM peak hour



3. Local Plan and Local Plan Mitigations (Scenario 1)

3.1. Assumptions

The first model scenario represents Local Plan demand as submitted in January 2014 for Cherwell and at various other times for the other Districts in Oxfordshire. Table 3-1 summarises the land use inputs for Cherwell local plan.

Table 3-1 Land Use Inputs – Local Plan

Type	District and site	House	Jobs
Residential	Graven Hill	1900	
Residential	NW Bicester Phase 1 and 2	1793	
Residential	South East Bicester	400	
Residential	SW Bicester Phase 1 and 2	2241	
Residential	Bankside Phase 1 and 2	1492	
Residential	Canalside	950	
Residential	Southam Road	600	
Residential	W of Bretch Hill	400	
Residential	N of Hanwell Fields	500	
Residential	Upper Heyford	761	
Commercial	NW Bicester Phase 1 and 2		1800
Commercial	Graven Hill		2070
Commercial	Bicester Business Park		3850
Commercial	Bicester Gateway		900
Commercial	NE Bicester business park		1092
Commercial	SE Bicester business park		2000
Commercial	Land W of M40		1951
Commercial	Upper Heyford		1500
TOTAL		**11037**	**15163**

The highway and public transport schemes coded in as per the local plan are presented in Table 3-2 and Table 3-3 below.

Table 3-2 Highway Schemes included in Local Plan Run (2031)

Highway Scheme	Include in 2031 model?
A34 Milton Interchange Hamburger	Yes
A34 Chilton Northern Slip Roads	Yes
Relief to Manor Bridge (Science Bridge)	Yes
Foxhall Bridge Widening	Yes
Access to Harwell Section 1 (B4493 –A417)	Yes
Access to Harwell Section 2 (Hagbourne Hill)	Yes
Grove Northern link Rd	Yes
Wantage Eastern Link Road	Yes
Rowstock Roundabout improvements	Yes
Featherbed/Steventon Lights junction and on-line improvements	Yes
Didcot Northern Perimeter Road (NPR) 3 and associated junctions	Yes

Highway Scheme	Include in 2031 model?
Valley Park spine road (A4130 – B4493)	Yes
Links through Valley Park to Science Bridge	Yes
A4130 new signalled T-junctions to development EZ	Yes
Great Western Park (GWP) and signalised access junctions	Yes
Coding to reflect traffic management measures in villages (Harwell)	Yes
Milton Park LDO mitigation schemes on Milton Park Road	Yes
Harwell Oxford all access points junction improvements	Yes
Jubilee roundabout scheme	Yes
A415 Ducklington Lane/Station Lane junction improvement	Yes
Down's Road/A40 new junction	Yes
West Facing Slips at Shores Green	Yes
South West Bicester Link Road	Yes
Town centre changes	Yes
Bucknell Road/A4095 Howes Lane new priority junction	Yes
M40 J9 Phase 2	Yes
M40 J10	Yes
Oxford Road / Pingle Drive junction	Yes
A41 / Neunkirchen Way roundabout (Rodney House)	Yes
Kennington Roundabout Improvements	Yes
Hinksey Hill	Yes
Frideswide Square including changes to Beckett Street	Yes
Headington roundabout/London Road bus lane improvements	Yes
Transform Oxford Approach Roads, West Way Botley Road Junction	Yes
Barton Transport Assessment, A40	Yes
Upper Heyford improvement	Yes
A41 Oxford Road / Boundary Way roundabout	Yes
Pingle Drive Access	Yes
Bus priority on A41 corridor	No – scheme not defined
Park and Ride Southwest of Bicester	No – scheme not defined
Widening of A41	No – scheme not defined

Table 3-3 Public Transport Schemes included in Local Plan Run (2031)

Location	Scheme description	Include in 2031 model?
West Witney	To be served by extension of service S1 from Thorney Leys two times per hour, through the site and thus onwards to Carterton. This in addition to the existing 2 buses per hour via Curbridge	Yes
Barton West	assume 3 buses per hour across the A40 to the John Radcliffe, as extension of service x13 Abingdon-City Centre JR	Yes
Bankside	2 new buses per hour to Banbury via Bankside plus enhancement of service s4 between Deddington and Banbury via main road	Yes
Crabhill	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)	Yes

Location	Scheme description	Include in 2031 model?
NW Bicester	Services will increase in frequency as site builds out. Site will require separate services east and west of the railway For 1793 dwellings (one third of build out) assume 4 new buses per hour to Bicester Town Centre and Bicester Town station	Yes
Graven Hill/SW Bicester	"Graven Hill, assume 2 buses per hour to western side, plus enhanced service s5 two times per hour to eastern side, operating Arncott-Ambrosden-diversion into part of Graven Hill-Bicester Town Centre - possibly on to Oxford" "South West Bicester, 4 new buses per hour to Bicester Town Centre and station, plus s5 service to Oxford, 2 per hour through the site ideally or certainly via Middleton Stoney Road, then 4 per hour along the A41 (Accessed at Bicester Village stop, new Business Park stop and at Park and Ride)"	Yes
NE Didcot	"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"	Yes
Valley Park	"Valley Park, 2 buses per hour Didcot-Wantage Road-Valley Park-Milton Park plus 2 buses per hour Didcot - main road - Valley Park – Harwell"	Yes
Great Western Park	"Great Western Park, same pattern as at Valley Park, 4 per hour to Didcot Town Centre, 2 to Milton Park, 2 to Harwell"	Yes
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.	Yes
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.	Yes
Upper Heyford	Create a new service between Upper Heyford and Bicester with a frequency of 1 bph for all time periods.	Yes

3.2. Impact of Local Plan at Cherwell

3.2.1. Demand Model

Table 3-4 to Table 3-7 summarise the **Reference Forecast** and the **Forecast Scenario** demand for the Upper Heyford area for the Local Plan with Local Plan mitigations scenario. In Upper Heyford in the Local Plan scenario approximately 6000 person movements are made during the 12 hour period from 7am to 7pm, with approximately 7% of motorised journeys (excluding walking and cycling) taking place by public transport in both the reference case and the Forecast Scenario.

Table 3-4 Forecast demand at Upper Heyford in Local Plan Scenario (AM period)

	Forecast Scenario		Reference Scenario		Difference	
Mode	Origin	Destination	Origin	Destination	Origin	Destination
Car (vehicles)	1084	1373	1081	1412	3	-39
Bus (people)	23	127	23	119	0	7
Rail (people)	30	201	30	157	0	44

Table 3-5 Forecast demand at Upper Heyford in Local Plan Scenario (IP period)

	Forecast Scenario		Reference Scenario		Difference	
Mode	Origin	Destination	Origin	Destination	Origin	Destination
Car (vehicles)	1980	1954	1947	1948	34	6
Bus (people)	57	29	66	53	-9	-23
Rail (people)	76	62	80	55	-3	7

Table 3-6 Forecast demand at Upper Heyford in Local Plan Scenario (PM period)

	Forecast Scenario		Reference Scenario		Difference	
Mode	Origin	Destination	Origin	Destination	Origin	Destination
Car (vehicles)	1417	991	1446	1025	-29	-34
Bus (people)	71	10	99	21	-28	-10
Rail (people)	182	34	136	28	46	6

Table 3-7 Forecast demand at Upper Heyford in Local Plan Scenario (12 hour)

	Forecast Scenario		Reference Scenario		Difference	
Mode	Origin	Destination	Origin	Destination	Origin	Destination
Car (vehicles)	4481	4318	4473	4385	8	-67
Bus (people)	150	166	188	193	-38	-27
Rail (people)	288	297	246	240	43	57
Total (people)	6040	5860	6025	5914	15	-54

3.2.2. Highway Network

This section describes the network performance around the site on the links and junctions shown in Figure 2-2. The overall network statistics for the Cherwell District are shown below in Table 3-8. Delay is forecast to double between 2013 and 2031 and speeds drop by approximately 10% in the peak hours.

Table 3-8 Local Plan Network Statistics – Cherwell District

Time	Metric	Results	Unit
Morning Peak Hour	Total Time	13308	Pcu Hr
	Delay	1875	Pcu Hr

Time	Metric	Results	Unit
	Total distance	876294	Pcu KM
	Speed	65.85	KM/h
Inter Peak Hour	Total Time	10720	Pcu Hr
	Delay	879	Pcu Hr
	Total distance	794200	Pcu KM
	Speed	74.09	KM/h
Evening Peak Hour	Total Time	15892	Pcu Hr
	Delay	3306	Pcu Hr
	Total distance	955402	Pcu KM
	Speed	60.12	KM/h

The network performance assessment for the Local Plan with Local Plan mitigation is shown below in Table 3-9 whilst Figure 3-1 and Figure 3-2 show this for the morning and evening peak hours respectively. The assessment is organised in to routes and focuses primarily on the link performance in to key junctions along the route and also provides further detail relating specifically to junction performance where that differs to the link performance.

The network link and junction performance are measured by the volume to capacity (v/c) ratio and highlights those links on the highway network that are operating below operational capacity (v/c <85%), at operational capacity (v/c between 85% and 95%) and those that are exceeding operational capacity (v/c >95%).

The junction performance described below refers to results from a forecast of the strategic highway model and it is possible that detailed junction modelling software would not only be able to optimise signalised junction performance, but also produce marginally different junction performance results.

Table 3-9 Local Plan – Network Performance Assessment

Link	Junction	Morning peak hour	Evening peak hour
Camp Road Station Rd to B4030	Camp Road and Station Road Junction	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.
	Camp Road and Unnamed Road Junction	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.
	Camp Road and B4030 Junction	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.

Link	Junction	Morning peak hour	Evening peak hour
Unnamed Road between Camp Road and B430	Unnamed Road and B430 Junction	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.
	Camp Road and Unnamed Road Junction	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.
Station Road Camp Road to B4030	Station Road and B4030 Junction	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.
	Camp Road and Station Road Junction	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.
B4030 Bicester to A4260	B4030 and A4095 Howes Lane Junction	Overall the performance of this junction is below capacity. With reference to the links entering this junction, the northbound link performs at capacity;	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.
	Middleton Stoney Junction	Overall the performance of this junction is below capacity. However 6 turns perform over capacity. With reference to the links entering this junction, the eastbound link performs over capacity; the westbound link performs over capacity;	Overall the performance of this junction is below capacity. However 8 turns perform over capacity. With reference to the links entering this junction, the northbound link performs over capacity; the eastbound link performs over capacity; the westbound link performs over capacity;
	Camp Road and B4030 Junction	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links	Overall the performance of this junction is below capacity. With reference to the links

Link	Junction	Morning peak hour	Evening peak hour
		perform below capacity.	entering this junction, all links perform below capacity.
	Station Road and B4030 Junction	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.
	Rousham	Overall the performance of this junction is below capacity. However 3 turns perform over capacity. With reference to the links entering this junction, the westbound link performs over capacity;	Overall the performance of this junction is below capacity. However 3 turns perform over capacity. With reference to the links entering this junction, the westbound link performs over capacity;
	Holt Junction (B4030 and A4260)	Overall the performance of this junction is below capacity. However 6 turns perform over capacity. With reference to the links entering this junction, the eastbound link performs over capacity; the southbound link performs over capacity;	Overall the performance of this junction is at capacity. However 8 turns perform over capacity. With reference to the links entering this junction, the northbound link performs over capacity; the eastbound link performs over capacity; the southbound link performs over capacity;
B430 Ardley to A34	B430 and Ardley Road Junction	Overall the performance of this junction is below capacity. However 2 turns perform at capacity and 1 turn performs over capacity. With reference to the links entering this junction, the eastbound link performs at capacity; the westbound link performs over capacity;	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.
	Unnamed Road and B430 Junction	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.

Link	Junction	Morning peak hour	Evening peak hour
	Middleton Stoney Junction	Overall the performance of this junction is below capacity. However 6 turns perform over capacity. With reference to the links entering this junction, the eastbound link performs over capacity; the westbound link performs over capacity;	Overall the performance of this junction is below capacity. However 8 turns perform over capacity. With reference to the links entering this junction, the northbound link performs over capacity; the eastbound link performs over capacity; the westbound link performs over capacity;
	B430 and A4095 Junction	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.
	A34 Junction	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.
M40 J9	M40 Slips	The M40 southbound and the A41 southbound off slips are at capacity.	The A41 southbound off slip exceeds capacity.
	Circulation	The circulatory carriageway exceeds capacity.	The circulatory carriageway is over capacity.
M40 J10	M40 Slips	The southbound on slip is at capacity. The link between the northern roundabout and the new signalised junction is over capacity.	The northbound off slip exceeds capacity. The link between the northern roundabout and the new signalised junction is over capacity.
	B430 Roundabout	Overall the performance of this junction is below capacity. However 2 turns perform at capacity. With reference to the links entering this junction, the northbound link performs at capacity;	Overall the performance of this junction is at capacity. However 2 turns perform at capacity and 2 turns perform over capacity. With reference to the links entering this junction, the northbound link performs over capacity; the westbound link performs over capacity;

Link	Junction	Morning peak hour	Evening peak hour
	A43 Roundabout	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.
A34	Link only	Section between the B4027 and B430 is at capacity in both northbound and southbound directions.	Section between the B4027 and B430 is at capacity in northbound direction.

Figure 3-1 Impacts of Local Plan (2031 Morning Peak Hour)

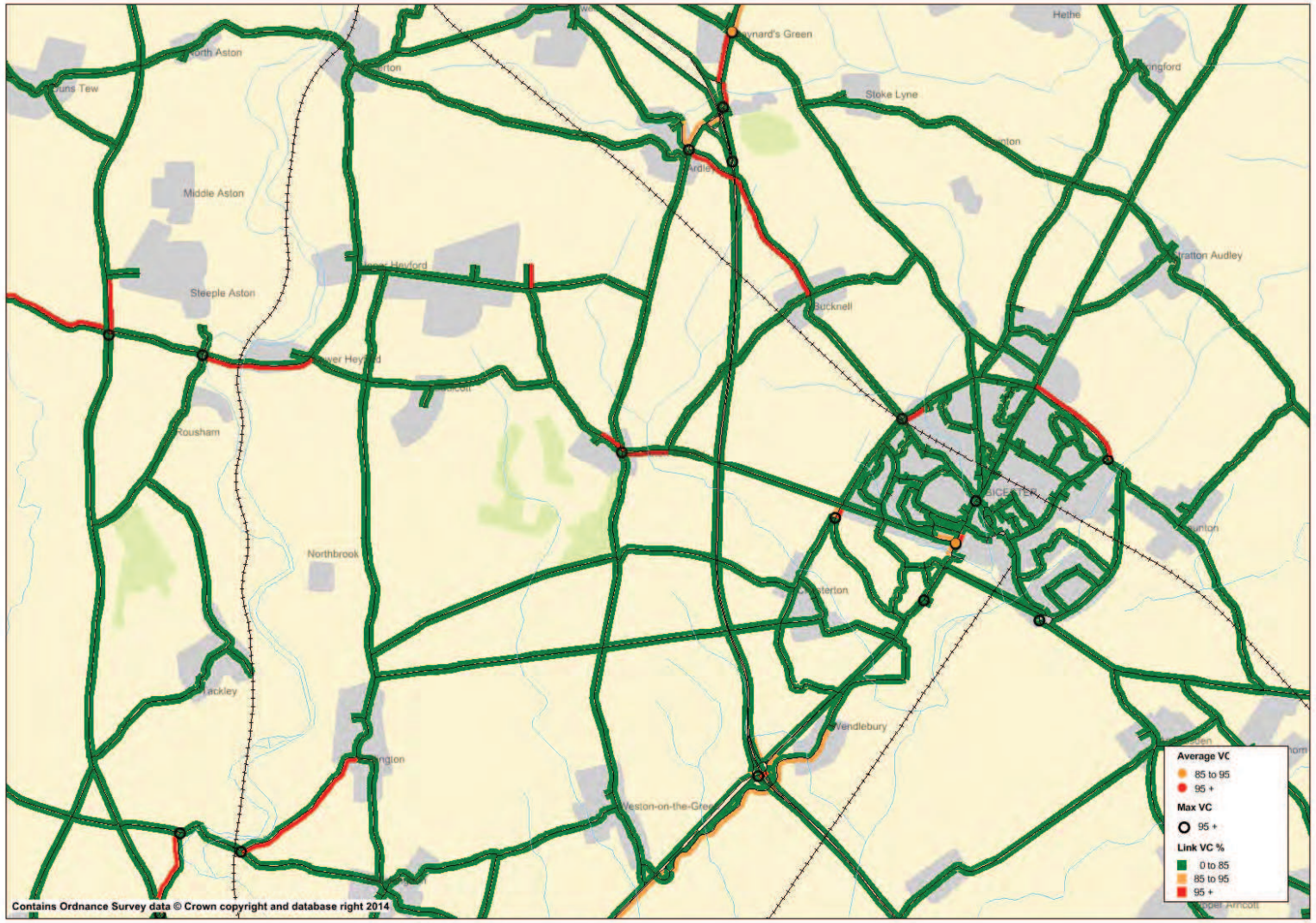
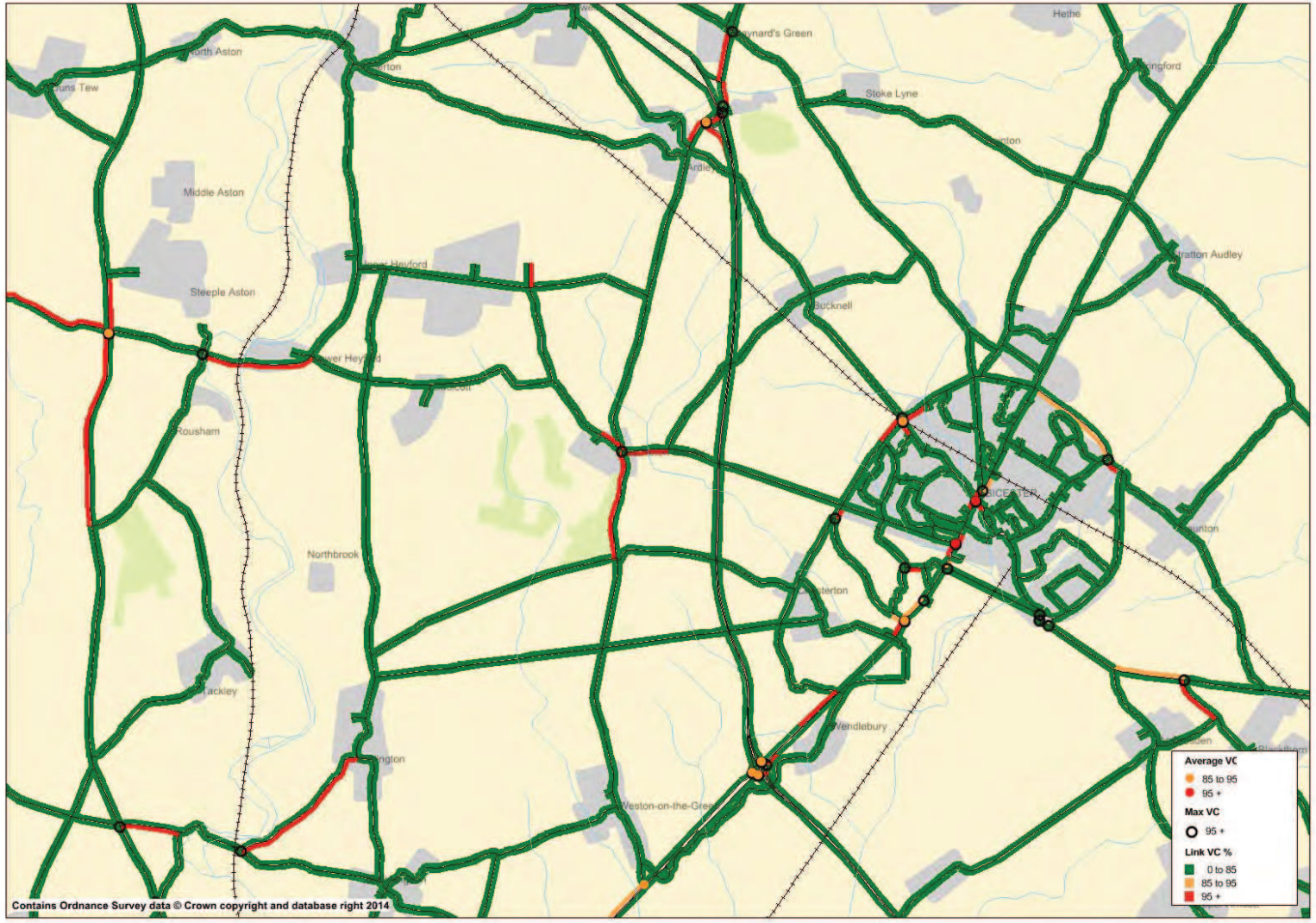


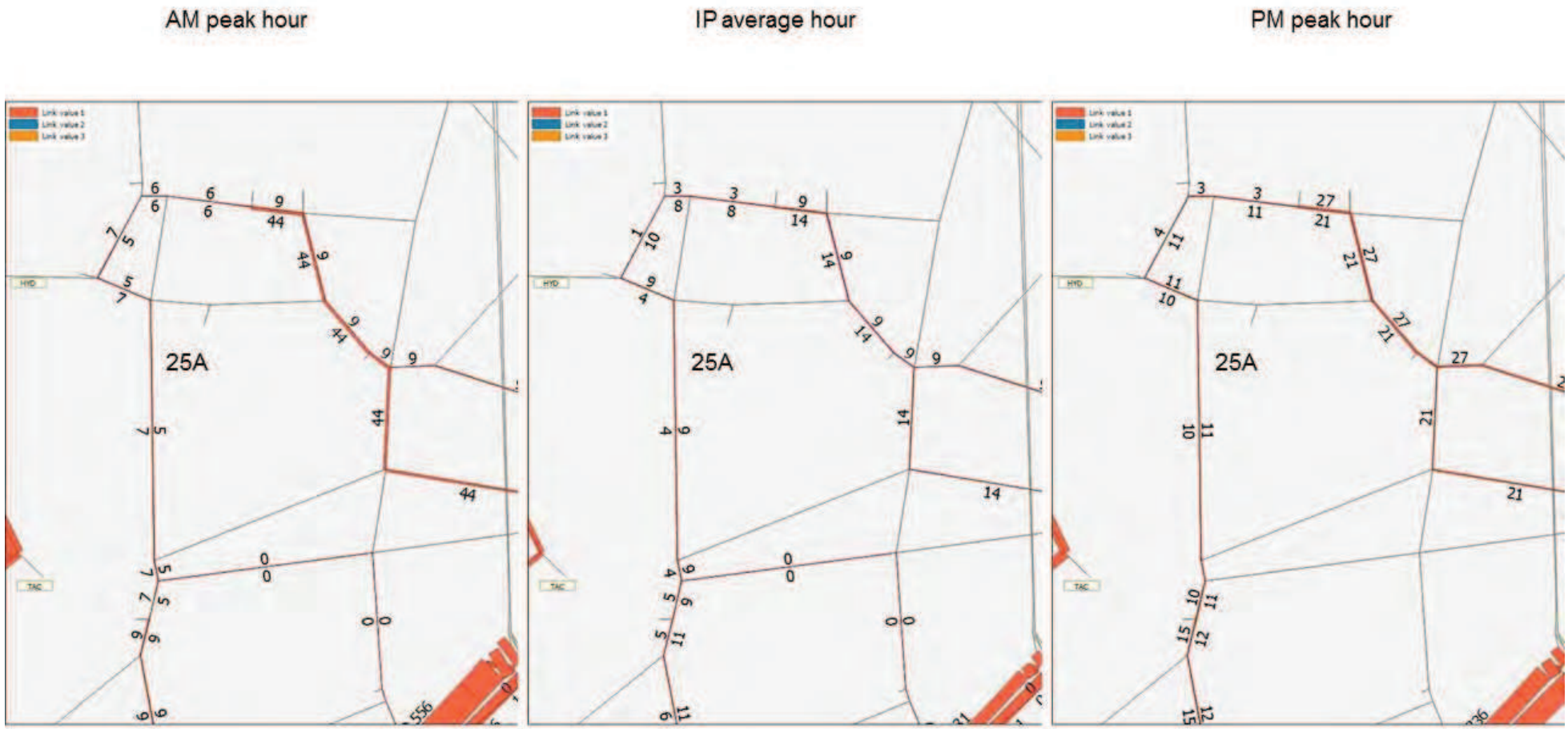
Figure 3-2 Impact of Local Plan (2031 Evening Peak Hour)



3.2.3. Public Transport Network

In the following figures are presented the loads for bus on the Oxford – Upper Heyford corridor where service 25 A operates for forecast scenario. It can be observed an increase in patronage between Upper Heyford and Bicester where it was considered an improvement to the public transport (a frequency of 2 bph between the two sites). Despite the increase in the number of dwellings and jobs in Upper Heyford, the bus loads between the site and Oxford remains unchanged due to the low frequency of service 25A.

Figure 3-3 Loads on the public transport services around Upper Heyford for the Forecast Year



Technical note

4. Scenario 3

4.1. Assumptions

Scenario 3 includes 2031 Local Plan with Local Plan transport mitigation plus the Local Plan Modifications and the Modifications transport mitigation **BUT excludes Upper Heyford development** and associated mitigations. Table 4-1 summarises the additional land use inputs for this scenario.

Table 4-1 Additional Land Use Inputs – Local Plan Modifications excluding Upper Heyford

Type	District and site	House	Jobs
Residential	NW Bicester Eco Town	1,500	
Residential	Graven Hill	200	
Residential	SW Bicester	76	
Residential	South East Bicester	1100	
Residential	Gavray Drive	300	
Residential	Bankside phase 2	200	
Residential	Canalside	-250	
Residential	Bolton Road	200	
Residential	South of Salt Way area – Crouch Farm to Bodicote	1495	
Residential	N of Hanwell Fields	44	
Residential	Drayton Lodge Farm	250	
Residential	Higham Way	150	
Residential	*Upper Heyford*	*0*	
Commercial	*Upper Heyford*		*0*
Commercial	NW Bicester Eco Town		400
Commercial	NW Bicester Eco Town		400
Commercial	NW Bicester Eco Town		400
Commercial	South East Bicester		333
Commercial	South East Bicester		333
Commercial	South East Bicester		333
Commercial	Graven Hill		-70
Commercial	Bicester Business Park		2150
Commercial	Bicester Gateway		2600
Commercial	NE Bicester business park		-92
Commercial	Land W of M40		550
Commercial	Land North East of Junction 11 – Banbury 15		3500
TOTAL		**5265**	**10837**

The additional highway schemes coded for the local plan modifications, excluding Upper Heyford development mitigation schemes are shown in Table 4-2.

Table 4-2 Highway Schemes included in Local Plan Modifications transport mitigation (2031)

Highway Scheme	Include in 2031 without scheme?
Signal optimisation at Junction 11	Yes
Signals at the junctions along Hennef Way	Yes
The new link road through the development south of Salt Way and a connection onto White Post Road / Oxford Road	Yes
Improvements to the Upper Cherwell Street corridor, including at Bridge Street junction	Yes

4.2. Impact of Local Plan at Cherwell

This section describes the impact that the new demand and mitigation schemes will have as it results from the models.

4.2.1. Demand Model

Table 4-3 to Table 4-6 summarises the **Reference Forecast** and the **Forecast Scenario** demand for Upper Heyford in the Local Plan modifications scenario (Scenario 3). Due to the fact that we don't consider any additional demand for Upper Heyford in Scenario 3, the Reference Case demand for Upper Heyford remains the same as in Scenario 1.

The results for the Forecast Scenario over the 12 hour period are also similar to the Reference case, which shows the impact of the Local Plan Modifications and associated mitigation on the Local Plan level of demand at Upper Heyford. The extra demand in the area and lack of local mitigation results overall in fewer car trips being able to make their journeys over a 12 hour period. Approximately 6,000 person movements are made during the 12 hour period from 7am to 7pm, with almost 8% of journeys (excluding walking and cycling) taking place by public transport in both the reference case and the forecast scenario.

Table 4-3 Forecast demand at Upper Heyford in Local Plan Modifications with transport mitigation excluding Upper Heyford (AM Period)

Mode	Forecast Scenario		Reference Scenario		Difference	
	Origin	Destination	Origin	Destination	Origin	Destination
Car (vehicles)	1075	1351	1081	1412	-6	-61
Bus (people)	26	123	23	119	3	4
Rail (people)	29	207	30	157	-1	51

Table 4-4 Forecast demand at Upper Heyford in Local Plan Modifications with transport mitigation excluding Upper Heyford (IP Period)

Mode	Forecast Scenario		Reference Scenario		Difference	
	Origin	Destination	Origin	Destination	Origin	Destination
Car (vehicles)	1978	1946	1947	1948	31	-2
Bus (people)	56	30	66	53	-10	-22
Rail (people)	78	63	80	55	-2	8

Table 4-5 Forecast demand at Upper Heyford in Local Plan Modifications with transport mitigation excluding Upper Heyford (PM Period)

Mode	Forecast Scenario		Reference Scenario		Difference	
	Origin	Destination	Origin	Destination	Origin	Destination
Car (vehicles)	1407	981	1446	1025	-39	-43
Bus (people)	69	11	99	21	-29	-9
Rail (people)	188	33	136	28	52	5

Table 4-6 Forecast demand at Upper Heyford in Local Plan Modification with transport mitigation excluding Upper Heyford (12 hour)

Mode	Forecast Scenario		Reference Scenario		Difference	
	Origin	Destination	Origin	Destination	Origin	Destination
Car (vehicles)	4459	4278	4473	4385	-14	-107
Bus (people)	152	165	188	193	-36	-28
Rail (people)	295	303	246	240	50	64
TOTAL (people)	6021	5815	6025	5914	-4	-98

4.2.2. Highway Network

This section describes the network performance around the site on the links and junctions shown in Table 4-7. The network statistics for the model simulation area are shown below. Delay is forecast to almost triple between 2013 and 2031 and speeds drop by approximately 15% in the peak hours. Compared to the Local Plan (Scenario 1) delay is forecast to increase by approximately 30% and speeds drop be 6% in the peak hours.

Table 4-7 Local Plan Modification with transport mitigation excluding Upper Heyford Network Statistics

Time	Metric	Results	Unit
Moring Peak Hour	Total Time	14484	Pcu Hr
	Delay	2488	Pcu Hr
	Total distance	907376	Pcu KM
	Speed	62.65	KM/h
Inter Peak Hour	Total Time	11484	Pcu Hr
	Delay	1104	Pcu Hr
	Total distance	826182	Pcu KM
	Speed	71.94	KM/h
Evening Peak Hour	Total Time	17337	Pcu Hr
	Delay	4140	Pcu Hr
	Total distance	991595	Pcu KM
	Speed	57.20	KM/h

The network performance for the Local Plan, as submitted in January 2014, level of growth is shown below and the assessment focuses upon the key corridors in the Upper Heyford area as described in the table below whilst Figure 4-1 and Figure 4-2 show this for the morning and evening peak hours respectively. The assessment is organised in to routes and focuses primarily on the link performance in to key junctions along the route and also provides further detail relating specifically to junction performance where that differs to the link performance.

The network link and junction performance are measured by the volume to capacity (v/c) ratio and highlights those links on the highway network that are operating below operational capacity (v/c <85%), at operational capacity (v/c between 85% and 95%) and those that are exceeding operational capacity (v/c >95%).

The junction performance described below refers to results from a forecast of the strategic highway model and it is possible that detailed junction modelling software would not only be able to optimise signalised junction performance, but also produce marginally different junction performance results.

Table 4-8 Local Plan Modification with transport mitigation excluding Upper Heyford network performance assessment

Link	Junction	Morning peak hour	Evening peak hour
Camp Road Station Rd to B4030	Camp Road and Station Road Junction	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.
	Camp Road and Unnamed Road Junction	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links	Overall the performance of this junction is below capacity. With reference to the links

Link	Junction	Morning peak hour	Evening peak hour
		perform below capacity.	entering this junction, all links perform below capacity.
	Camp Road and B4030 Junction	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.
Unnamed Road between Camp Road and B430	Unnamed Road and B430 Junction	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.
	Camp Road and Unnamed Road Junction	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.
Station Road Camp Road to B4030	Station Road and B4030 Junction	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.
	Camp Road and Station Road Junction	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.
B4030 Bicester to A4260	B4030 and A4095 Howes Lane Junction	Overall the performance of this junction is below capacity. However 3 turns perform over capacity. With reference to the links entering this junction, the northbound link performs over capacity;	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.

Link	Junction	Morning peak hour	Evening peak hour
	Middleton Stoney Junction	Overall the performance of this junction is below capacity. However 6 turns perform over capacity. With reference to the links entering this junction, the eastbound link performs over capacity; the westbound link performs over capacity;	Overall the performance of this junction is below capacity. However 2 turns perform at capacity and 6 turns perform over capacity. With reference to the links entering this junction, the eastbound link performs over capacity; the westbound link performs over capacity;
	Camp Road and B4030 Junction	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.
	Station Road and B4030 Junction	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.
	Rousham	Overall the performance of this junction is below capacity. However 3 turns perform over capacity. With reference to the links entering this junction, the westbound link performs over capacity;	Overall the performance of this junction is below capacity. However 3 turns perform over capacity. With reference to the links entering this junction, the westbound link performs over capacity;
	Holt Junction (B4030 and A4260)	Overall the performance of this junction is below capacity. However 6 turns perform over capacity. With reference to the links entering this junction, the eastbound link performs over capacity; the southbound link performs over capacity;	Overall the performance of this junction is at capacity. However 8 turns perform over capacity. With reference to the links entering this junction, the northbound link performs over capacity; the eastbound link performs over capacity; the southbound link performs over capacity;
B430 Ardley to A34	B430 and Ardley Road Junction	Overall the performance of this junction is below capacity. However 6 turns perform over capacity. With reference to the links entering this junction, the eastbound link performs over capacity; the westbound link performs over capacity;	Overall the performance of this junction is below capacity. However 2 turns perform at capacity and 1 turn performs over capacity. With reference to the links entering this junction, the southbound link performs at capacity; the westbound link

Link	Junction	Morning peak hour	Evening peak hour
			performs over capacity;
	Unnamed Road and B430 Junction	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.
	Middleton Stoney Junction	Overall the performance of this junction is below capacity. However 6 turns perform over capacity. With reference to the links entering this junction, the eastbound link performs over capacity; the westbound link performs over capacity;	Overall the performance of this junction is below capacity. However 2 turns perform at capacity and 6 turns perform over capacity. With reference to the links entering this junction, the eastbound link performs over capacity; the westbound link performs over capacity;
	B430 and A4095 Junction	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.
	A34 Junction	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.
M40 J9	M40 Slips	The M40 southbound is at capacity and the A41 southbound off slips exceed capacity.	The A41 southbound off slip exceeds capacity.
	Circulation	The circulatory carriageway exceeds capacity.	The circulatory carriageway is over capacity.
M40 J10	M40 Slips	The southbound on slip is at capacity. The link between the northern roundabout and the new signalised junction is over capacity.	The northbound off slip exceeds capacity. The link between the northern roundabout and the new signalised junction is over capacity.

Link	Junction	Morning peak hour	Evening peak hour
	B430 Roundabout	Overall the performance of this junction is below capacity. However 2 turns perform at capacity. With reference to the links entering this junction, the northbound link performs over capacity;	Overall the performance of this junction is at capacity. However 2 turns perform at capacity and 2 turns perform over capacity. With reference to the links entering this junction, the northbound link performs at capacity; the westbound link performs over capacity;
	A43 Roundabout	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.
A34	Link only	Section between the B4027 and B430 is at capacity in both northbound and southbound directions.	Section between the B4027 and B430 is at capacity in northbound direction.

Figure 4-1 Impact of Local Plan Modification with transport mitigation excluding Upper Heyford (2031 Morning Peak Hour)

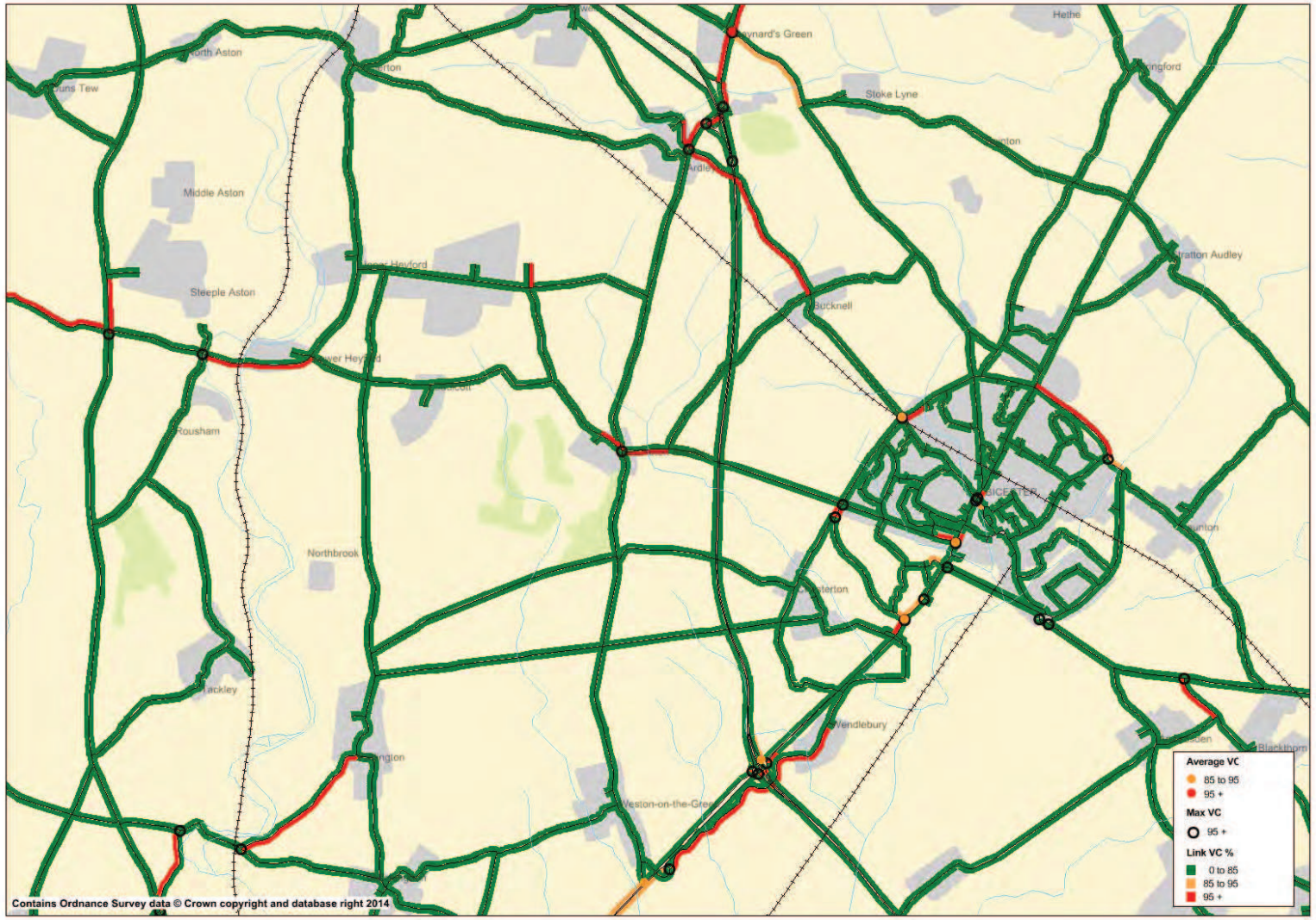
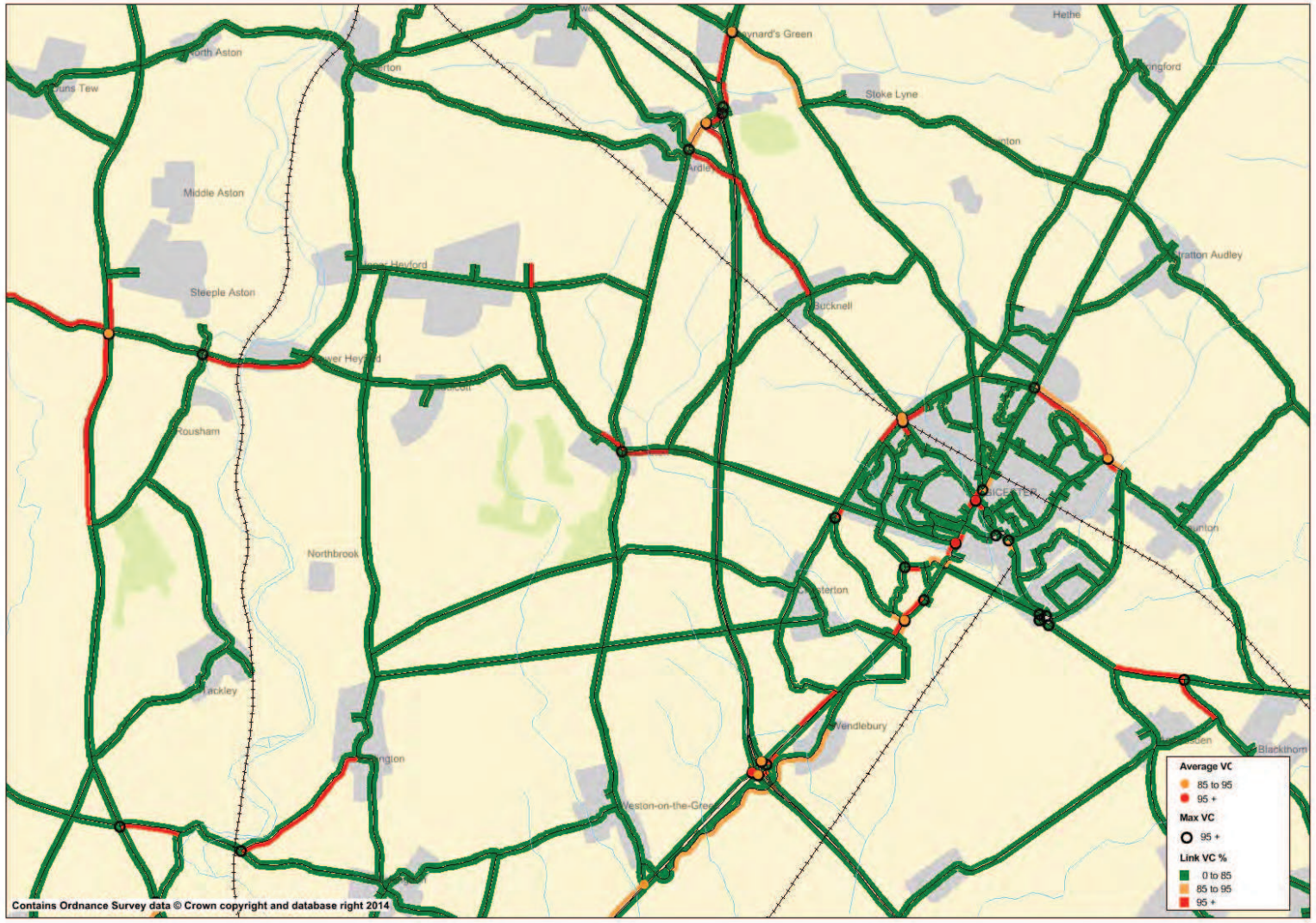


Figure 4-2 Impact of Local Plan Modification with transport mitigation excluding Upper Heyford (2031 Evening Peak Hour)

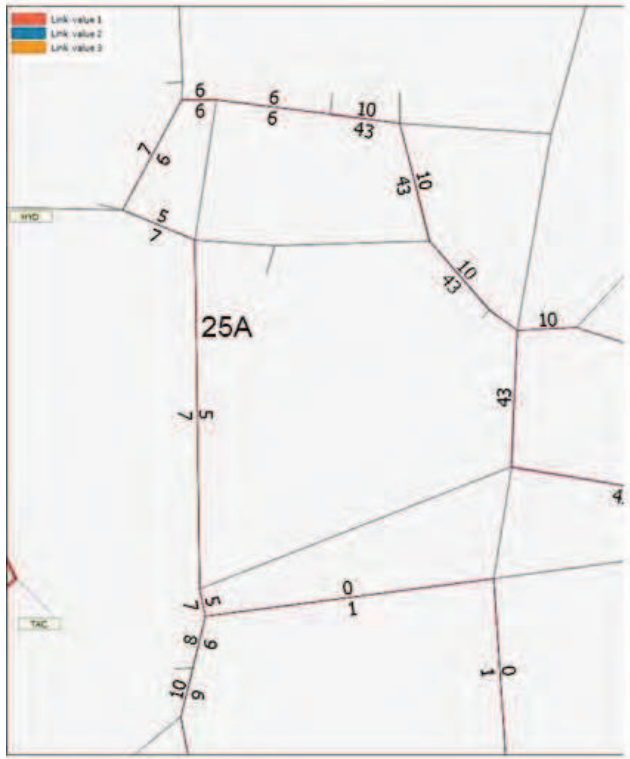


4.2.3. Public Transport Network

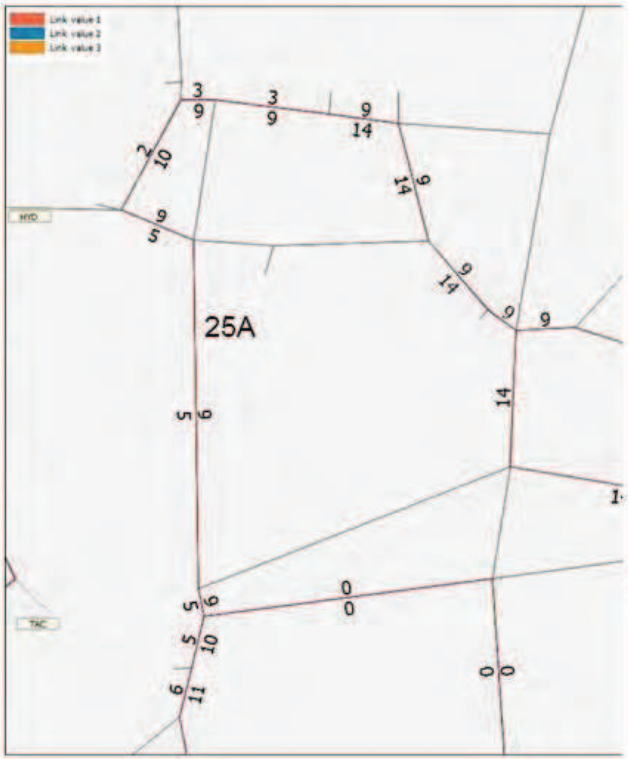
Figure 4-3 presents the forecast bus patronage on the Oxford – Upper Heyford corridor where service 25A operates. Since the Reference Case demand and the public transport supply are identical to Scenario 1, the results of the two scenarios are similar.

Figure 4-3 Loads on the public transport services around Upper Heyford for the Forecast Year

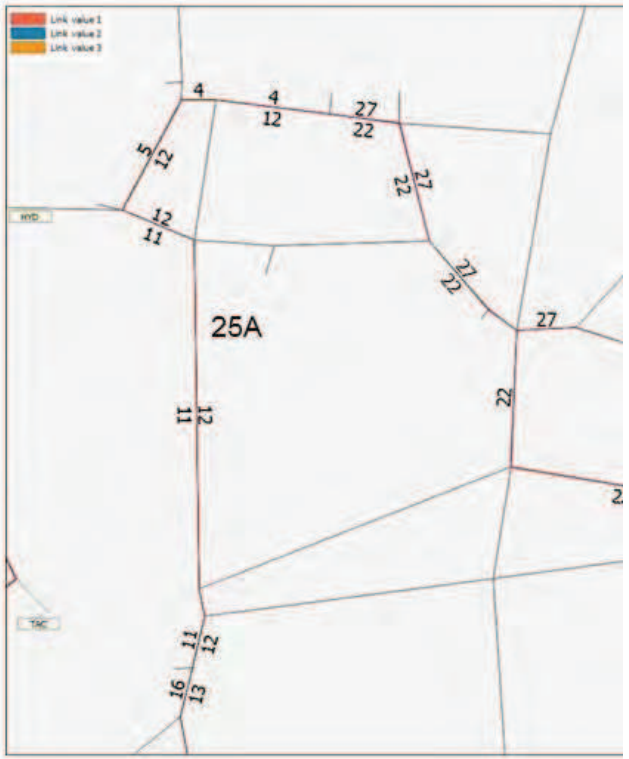
AM peak hour



IP average hour



PM peak hour



Technical note

5. Scenario 4

5.1. Assumptions

Scenario 4 includes Local Plan Modifications and associated mitigation in Banbury and Bicester demand with and including Upper Heyford demand but excluding any specific mitigation in the Upper Heyford area. Compared to Scenario 3, we have 1600 additional dwellings in Upper Heyford.

The trip rates used for these additional dwellings in Upper Heyford are presented in Table 5-1 below.

Table 5-1 Trip rates for Upper Heyford additional dwellings

Time Period	Car		Public Transport	
	Arrival	Departure	Arrival	Departure
AM Period	0.587	1.383	0.015	0.045
IP Period	1.718	1.577	0.036	0.033
PM Period	1.475	0.963	0.033	0.006

5.2. Impact of Scenario 4

This section describes the impact that the new demand and mitigation schemes will have as it results from the models.

5.2.1. Demand Model

Table 5-2 to Table 5-5 summarises the Reference Forecast and the Forecast Scenario demand for Upper Heyford in the Scenario 4. The extra development together with the Local Plan Demand results in a total of approximately 13,500 person movements during the 12 hour period from 7am to 7pm. Although this is approximately the double of the movements in Scenario 1, the demand forecast shows that whilst almost all trips are forecast to be able to leave the site between 7am and 7pm, approximately 500 person trips are forecast to be unable to arrive at the site. This suggests that there is some constraint on the highway network for journeys to and from Upper Heyford and that these movements are being facilitated by public transport.

The mode share is estimated as being approximately 4% of journeys (excluding walking and cycling) taking place by public transport in the reference case with slight increase to 5% in the Forecast Year. The absolute number of public transport trips actually increases when compared with the Local Plan values (Scenario 1). The number of car trips increases more between the two scenarios, and the public transport becomes less important in relative terms.

Table 5-2 Forecast demand at Upper Heyford with transport mitigation but excluding Upper Heyford local mitigation (AM Period)

Mode	Forecast Scenario		Reference Scenario		Difference	
	Origin	Destination	Origin	Destination	Origin	Destination
Car (vehicles)	3176	2238	3294	2352	-118	-114
Bus (people)	62	135	61	132	0	3
Rail (people)	93	231	79	173	15	58

Table 5-3 Forecast demand at Upper Heyford with transport mitigation but excluding Upper Heyford local mitigation (IP Period)

Mode	Forecast Scenario		Reference Scenario		Difference	
	Origin	Destination	Origin	Destination	Origin	Destination
Car (vehicles)	4597	4607	4470	4697	126	-90
Bus (people)	75	47	94	83	-18	-36
Rail (people)	116	102	111	91	5	11

Table 5-4 Forecast demand at Upper Heyford with transport mitigation but excluding Upper Heyford local mitigation (PM Period)

Mode	Forecast Scenario		Reference Scenario		Difference	
	Origin	Destination	Origin	Destination	Origin	Destination
Car (vehicles)	2893	3156	2987	3385	-94	-229
Bus (people)	73	25	103	48	-31	-23
Rail (people)	198	83	143	65	55	18

Table 5-5 Forecast demand at Upper Heyford with transport mitigation but excluding Upper Heyford local mitigation (12 hour)

Mode	Forecast Scenario		Reference Scenario		Difference	
	Origin	Destination	Origin	Destination	Origin	Destination
Car (vehicles)	10666	10001	10751	10433	-85	-432
Bus (people)	210	207	258	263	-49	-56
Rail (people)	407	416	333	329	74	87
TOTAL (people)	13949	13124	14030	13634	-80	-510

5.2.2. Highway Network

This section describes the network performance around the site on the links and junctions shown in Figure 2-2. The network statistics for the model simulation area are shown below.

Delay is forecast to almost triple between 2013 and 2031 and speeds drop by approximately 15% in the peak hours. Compared to the Local Plan (Scenario 1) delay is forecast to increase by approximately 40% and speeds drop by 6% in the peak hours. Compared to Local Plan Modifications without Upper Heyford (Scenario 3) delay is forecast to increase by approximately 5% and speed drops by 1% in the peak hours. Therefore, the impact of Upper Heyford without associated mitigation on the Cherwell network is slightly negative.

Table 5-6 Impact of Forecast demand at Upper Heyford with transport mitigation but excluding Upper Heyford local mitigation network statistics

Time	Metric	Results	Unit
Moring Peak Hour	Total Time	14803	Pcu Hr
	Delay	2613	Pcu Hr
	Total distance	917246	Pcu KM
	Speed	61.97	KM/h
Inter Peak Hour	Total Time	11700	Pcu Hr
	Delay	1141	Pcu Hr
	Total distance	836601	Pcu KM
	Speed	71.50	KM/h
Evening Peak Hour	Total Time	17770	Pcu Hr

Time	Metric	Results	Unit
	Delay	4321	Pcu Hr
	Total distance	1005157	Pcu KM
	Speed	56.56	KM/h

Table 5-7 compares the highway network performance of Scenario 4 compared with Scenario 3.

Table 5-7 Highway network performance in Cherwell (Scenario 4 – Scenario 3)

Time Period	Time	Delay	Distance	Speed
Morning Peak hour	102.2%	105.0%	101.1%	98.9%
Inter Peak hour	101.9%	103.3%	101.3%	99.4%
Evening Peak hour	102.5%	104.4%	101.4%	98.9%

The additional demand at Upper Heyford without transport mitigation in scenario 4 increased the delay by 5% approximately and a slight reduction in speed.

The network performance for the Local Plan modifications with transport mitigation excluding Upper Heyford mitigation is shown below and the assessment focuses upon the key corridors in the district as described in the table below whilst Figure 5-1 and Figure 5-2 show this for the morning and evening peak hours respectively. The assessment is organised in to routes and focuses primarily on the link performance in to key junctions along the route and also provides further detail relating specifically to junction performance where that differs to the link performance.

The network link and junction performance are measured by the volume to capacity (v/c) ratio and highlights those links on the highway network that are operating below operational capacity (v/c <85%), at operational capacity (v/c between 85% and 95%) and those that are exceeding operational capacity (v/c >95%).

The junction performance described below refers to results from a forecast of the strategic highway model and it is possible that detailed junction modelling software would not only be able to optimise signalised junction performance, but also produce marginally different junction performance results.

Table 5-8 Impact of Forecast demand at Upper Heyford with transport mitigation but excluding Upper Heyford local mitigation performance assessment

Link	Junction	Morning peak hour	Evening peak hour
Camp Road Station Rd to B4030	Camp Road and Station Road Junction	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.
	Camp Road and Unnamed Road Junction	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.
	Camp Road and B4030 Junction	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.
Unnamed Road	Unnamed Road and	Overall the performance of this	Overall the performance of

Link	Junction	Morning peak hour	Evening peak hour
between Camp Road and B430	B430 Junction	junction is below capacity. However 2 turns perform over capacity. With reference to the links entering this junction, the eastbound link performs over capacity;	this junction is below capacity. However 1 turn performs at capacity. With reference to the links entering this junction, the eastbound link performs at capacity;
	Camp Road and Unnamed Road Junction	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.
Station Road Camp Road to B4030	Station Road and B4030 Junction	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.
	Camp Road and Station Road Junction	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.
B4030 Bicester to A4260	B4030 and A4095 Howes Lane Junction	Overall the performance of this junction is below capacity. However 2 turns perform over capacity. With reference to the links entering this junction, the northbound link performs over capacity;	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.
	Middleton Stoney Junction	Overall the performance of this junction is below capacity. However 6 turns perform over capacity. With reference to the links entering this junction, the eastbound link performs over capacity; the westbound link performs over capacity;	Overall the performance of this junction is below capacity. However 9 turns perform over capacity. With reference to the links entering this junction, the northbound link performs over capacity; the eastbound link performs over capacity; the westbound link performs over capacity;
	Camp Road and B4030 Junction	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all

Link	Junction	Morning peak hour	Evening peak hour
			links perform below capacity.
	Station Road and B4030 Junction	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.
	Rousham	Overall the performance of this junction is below capacity. However 3 turns perform over capacity. With reference to the links entering this junction, the westbound link performs over capacity;	Overall the performance of this junction is below capacity. However 3 turns perform over capacity. With reference to the links entering this junction, the westbound link performs over capacity;
	Holt Junction (B4030 and A4260)	Overall the performance of this junction is below capacity. However 3 turns perform over capacity. With reference to the links entering this junction, the eastbound link performs at capacity; the southbound link performs over capacity;	Overall the performance of this junction is at capacity. However 8 turns perform over capacity. With reference to the links entering this junction, the northbound link performs over capacity; the eastbound link performs over capacity; the southbound link performs over capacity;
B430 Ardley to A34	B430 and Ardley Road Junction	Overall the performance of this junction is below capacity. However 6 turns perform over capacity. With reference to the links entering this junction, the eastbound link performs over capacity; the westbound link performs over capacity;	Overall the performance of this junction is below capacity. However 3 turns perform at capacity and 3 turns perform over capacity. With reference to the links entering this junction, the southbound link performs at capacity; the westbound link performs over capacity;
	Unnamed Road and B430 Junction	Overall the performance of this junction is below capacity. However 2 turns perform over capacity. With reference to the links entering this junction, the eastbound link performs over capacity;	Overall the performance of this junction is below capacity. However 1 turn performs at capacity. With reference to the links entering this junction, the eastbound link performs at capacity;

Link	Junction	Morning peak hour	Evening peak hour
	Middleton Stoney Junction	Overall the performance of this junction is below capacity. However 6 turns perform over capacity. With reference to the links entering this junction, the eastbound link performs over capacity; the westbound link performs over capacity;	Overall the performance of this junction is below capacity. However 9 turns perform over capacity. With reference to the links entering this junction, the northbound link performs over capacity; the eastbound link performs over capacity; the westbound link performs over capacity;
	B430 and A4095 Junction	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.
	A34 Junction	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.
M40 J9	M40 Slips	The M40 southbound the A41 southbound off slips are at capacity.	The A41 southbound off slip is at capacity.
	Circulation	The circulatory carriageway exceeds capacity.	The circulatory carriageway is over capacity.
M40 J10	M40 Slips	The southbound on slip is at capacity. The link between the northern roundabout and the new signalised junction is over capacity.	The northbound off slip exceeds capacity. The link between the northern roundabout and the new signalised junction is over capacity.
	B430 Roundabout	Overall the performance of this junction is below capacity. However 2 turns perform over capacity. With reference to the links entering this junction, the northbound link performs over capacity;	Overall the performance of this junction is at capacity. However 1 turn performs at capacity and 2 turns perform over capacity. With reference to the links entering this junction, the northbound link performs at capacity; the westbound link performs over capacity;

Link	Junction	Morning peak hour	Evening peak hour
	A43 Roundabout	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.
A34	Link only	Section between the B4027 and B430 is at capacity in both northbound and southbound directions.	Section between the B4027 and B430 is at capacity in northbound direction.

Figure 5-1 Impact of Local Plan Modifications including Upper Heyford demand and transport mitigation but excluding Upper Heyford local mitigation (2031 Morning Peak Hour)

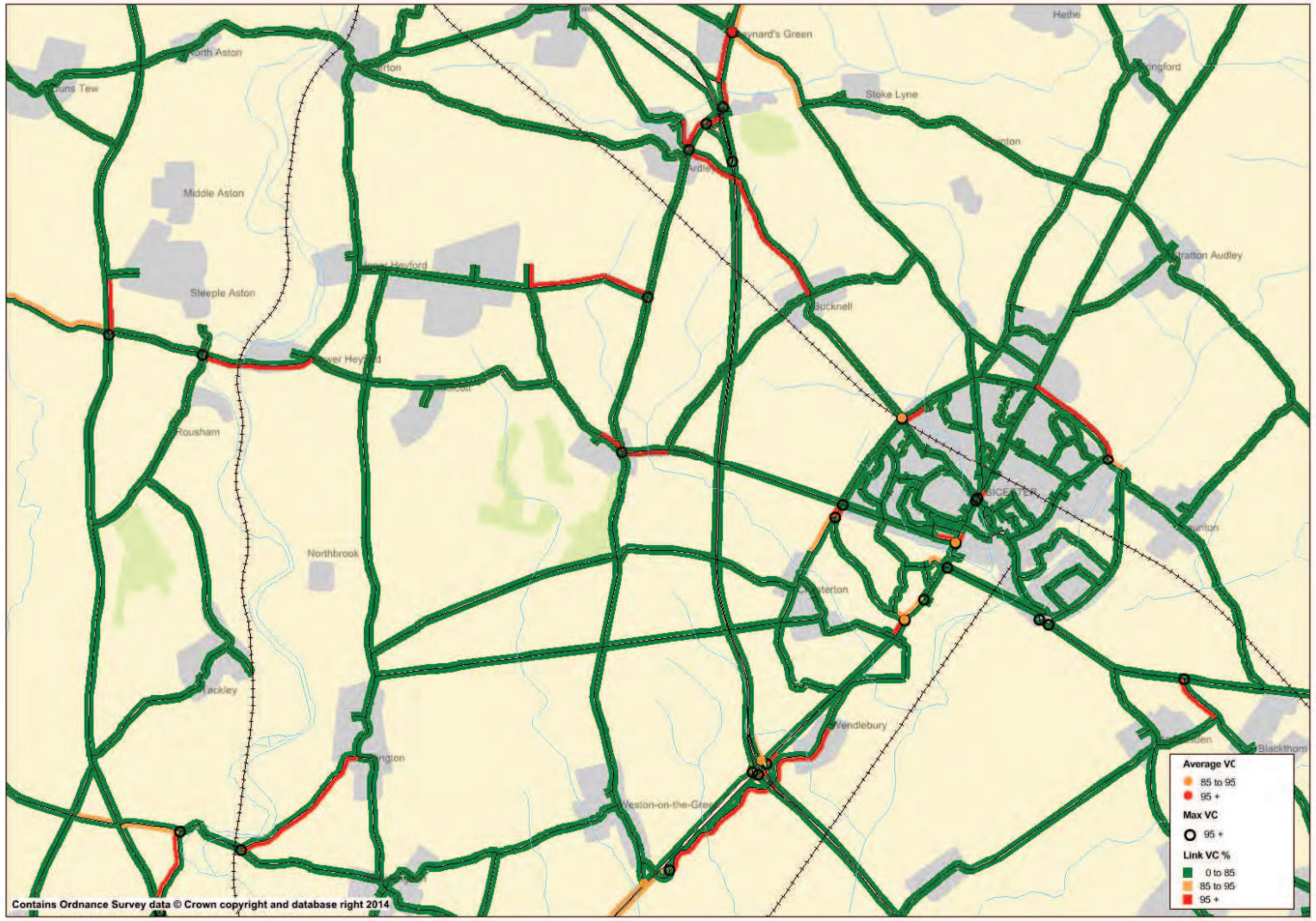
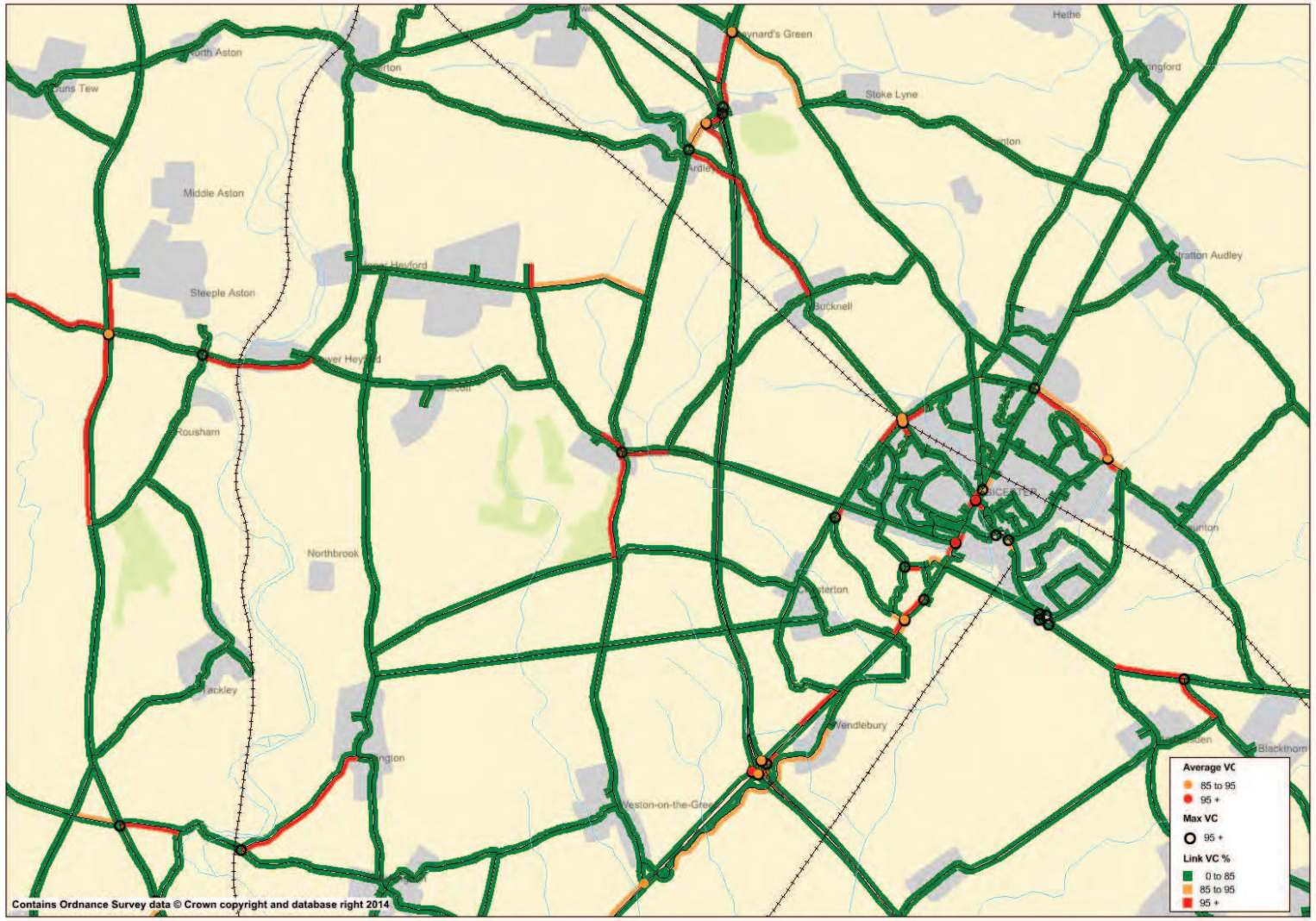


Figure 5-2 Impact of Local Plan Modifications including Upper Heyford demand and transport mitigation but excluding Upper Heyford local mitigation (2031 Evening Peak Hour)



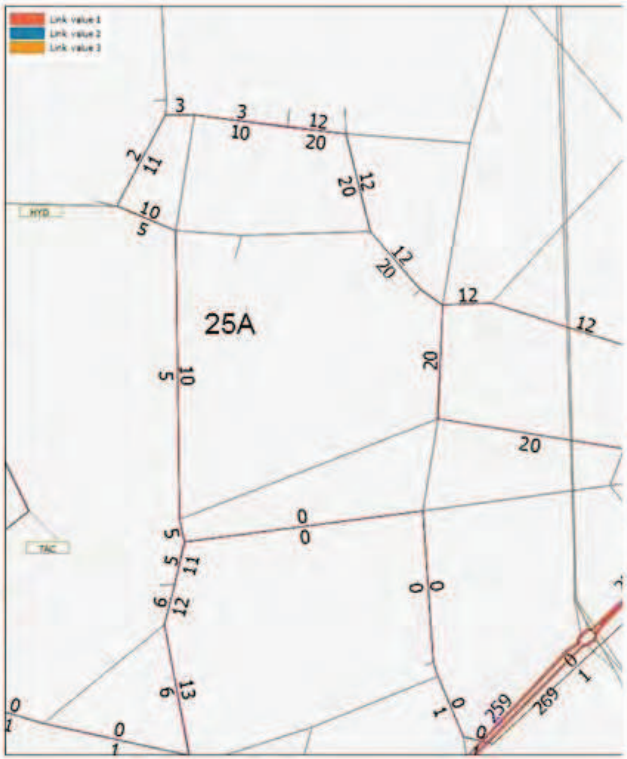
5.2.3. Public Transport Network

Figure 5-3 shows forecast bus loadings on the Oxford – Upper Heyford corridor where service 25A operates for forecast scenario. Despite the additional dwellings in Upper Heyford when compared with the previous two scenarios, the bus loads between the site and Oxford remains unchanged due to the low frequency of service 25A.

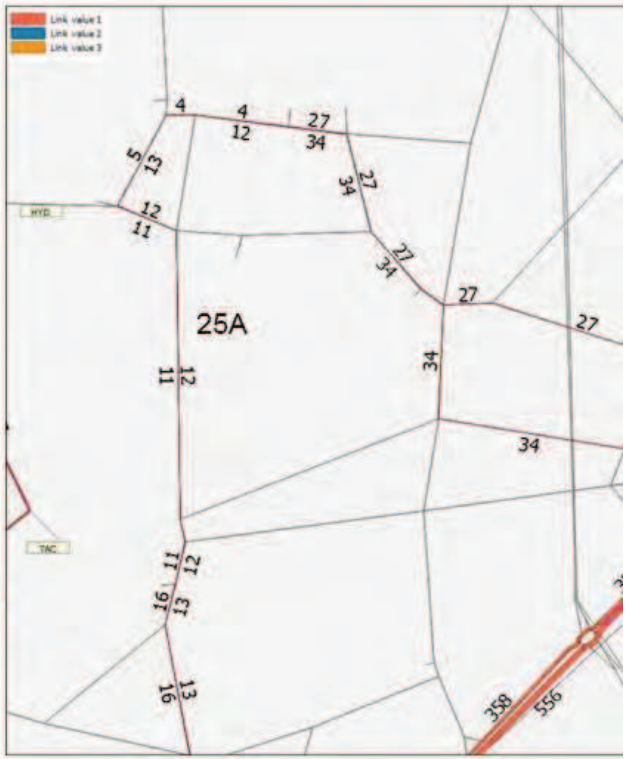
Figure 5-3 Loads on the public transport services around Upper Heyford for the Forecast Year

AM peak hour

IP average hour



PM peak hour



Technical note
6. Scenario 5

6.1. Assumptions

This scenario represents Local Plan Modifications demand with full mitigation for Cherwell. The demand assumptions are the same as in the previous scenario, and comprises of 17902 new dwellings and 25450 new jobs.

The additional highway and public transport schemes coded in as per the local plan modifications with transport mitigation are presented in Table 6-1and
Table 6-2 below.

Table 6-1 Highway Schemes included in Local Plan Modifications with transport mitigation (2031)

Highway Scheme	Include in 2031 without scheme?
B430 / Ardley Village Junction - 4-Arm Staggered traffic signal junction	Yes
B430 / Camp Road Junction - 3-Arm traffic signal junction	Yes
B430 Middleton Stoney Junction – effectively a 3-Arm traffic signal junction with eastbound approach prioritised for public transport and 'local' access only	Yes
B4030 Station Road/Lower Heyford Road - Traffic Signals Optimised to 'manage' east-west movement north to Camp Road	Yes
B4030 Lower Heyford Road /B4030 Heyford Road - Traffic Signals Optimised to 'manage' east-west movement north to Camp Road and provide for bus movement	Yes
B4030/A4260 - Traffic Signals Optimised to 'manage' east-west movement	Yes

Table 6-2 Public Transport Schemes included in in Local Plan Modifications with transport mitigation (2031)

Location	Scheme description	Include in 2031 without scheme?
Upper Heyford	Frequency of 1 service per hour that runs between Banbury, Upper Heyford and Bicester and 3 services per hour (25A) between Oxford, Upper Heyford and Bicester. This results in 4 services per hour to Bicester, 3 to Oxford and 1 to Banbury (and the reverse to Upper Heyford).	Yes

6.2. Impact of Local Plan Modifications and mitigation in 2031

This section describes the impact that the new demand and mitigation schemes will have as it results from the models.

6.2.1. Demand Model

Table 6-3 to Table 6-6 summarises the Reference Forecast and the Forecast Scenario demand for Upper Heyford in Scenario 5. The developments that we consider in the model are the same as in Scenario 4, and, as consequence, the Reference Case demand is the same. However, the Forecast Scenario present a higher level of movements during the 12 hour period from 7am to 7pm of approximately 14,000 person, due to the improvement of the public transport supply which facilitates these movements. Consequently, even more demand is generated in the area and only 22 person trips would be unable to arrive at the site between 7am and 7pm.

The mode share is estimated as being approximately 4% of journeys (excluding walking and cycling) taking place by public transport in the reference case with slight increase to 8% in the Forecast Scenario.

The results show a significant improvement on Scenario 4, due to the increase in public transport supply.

Table 6-3 Forecast demand at Upper Heyford in Local Plan Modification with transport mitigation (AM Period)

Mode	Forecast Scenario		Reference Scenario		Difference	
	Origin	Destination	Origin	Destination	Origin	Destination
Car (vehicles)	3210	2166	3294	2352	-84	-186
Bus (people)	186	707	61	132	125	575
Rail (people)	36	88	79	173	-43	-85

Table 6-4 Forecast demand at Upper Heyford in Local Plan Modification with transport mitigation (IP Period)

Mode	Forecast Scenario		Reference Scenario		Difference	
	Origin	Destination	Origin	Destination	Origin	Destination
Car (vehicles)	4506	4565	4470	4697	36	-132
Bus (people)	357	265	94	83	263	182
Rail (people)	32	30	111	91	-79	-61

Table 6-5 Forecast demand at Upper Heyford in Local Plan Modification with transport mitigation (PM Period)

Mode	Forecast Scenario		Reference Scenario		Difference	
	Origin	Destination	Origin	Destination	Origin	Destination
Car (vehicles)	2796	3160	2987	3385	-191	-225
Bus (people)	358	125	103	48	255	78
Rail (people)	67	32	143	65	-76	-33

Table 6-6 Forecast demand at Upper Heyford in Local Plan Modification with transport mitigation (12 hour)

Mode	Forecast Scenario		Reference Scenario		Difference	
	Origin	Destination	Origin	Destination	Origin	Destination
Car (vehicles)	10512	9891	10751	10433	-239	-542
Bus (people)	902	1098	258	263	643	835
Rail (people)	136	150	333	329	-197	-179
TOTAL (people)	14178	13612	14030	13634	148	-22

6.2.2. Highway Network

This section describes the network performance around the site on the links and junctions shown in Figure 2-2. The network statistics for the model simulation area are shown below in Table 6-9. Delay is forecast to almost triple between 2013 and 2031 and speeds drop by approximately 15% in the peak hours. Compared to the Local Plan (Scenario 1) delay is forecast to increase by approximately 30% and speeds drop by 6% in the peak hours. Therefore, the impact of Upper Heyford with its associated mitigation on the Cherwell network is slightly negative which is because the nature of the mitigation is to control highway movements approaching Middleton Stoney junction.

Table 6-7 compares the highway network performance of Scenario 5 compared with Scenario 3.

Table 6-7 Highway network performance in Cherwell (Scenario 5 – Scenario 3)

Time Period	Time	Delay	Distance	Speed
Morning Peak hour	100.9%	101.4%	100.8%	99.8%
Inter Peak hour	101.3%	103.2%	100.9%	99.6%
Evening Peak hour	99.5%	93.6%	101.1%	101.6%

Table 6-8 compares the highway network performance of Scenario 5 compared with Scenario 4.

Table 6-8 Highway network performance in Cherwell (Scenario 5 – Scenario 4)

Time Period	Time	Delay	Distance	Speed
Morning Peak hour	98.7%	96.6%	99.7%	101.0%
IP hour	99.4%	99.9%	99.7%	100.3%
Evening Peak hour	97.1%	89.7%	99.7%	102.7%

The mitigation in Banbury, Bicester and Upper Heyford results in reduced journey times in the order of 2% in the morning and evening peak and reductions in delay of 4%. This results in a slight increase in network speed of 1% in the morning peak hour and approximately 3% in the evening peak hour.

With the additional demand and transport mitigation at Upper Heyford in scenario 5, there is a slight increase in delay in morning peak and inter peak with speed almost remaining the same.

An alternative approach to mitigation would be to reduce demand on the B430 that had approached the B430 from either the M40 (or further north) or from the A34 (of further south). The northbound approach of the B430 has 241pcu/hr in the morning peak hour approaching Middleton Stoney and 888pcu/hr on the southbound approach to Middleton Stoney. Analysis shows that less than 20pcu/hr are making the southbound journey from the M40 to the A34 via the B430; this journey being the main movement at the junction in the morning peak hour. As such, there was no real case to implement such a direct approach.

Table 6-9 Local Plan Modification with transport mitigation network statistics

Time	Metric	Results	Unit
Moring Peak Hour	Total Time	14615	Pcu Hr
	Delay	2523	Pcu Hr
	Total distance	914220	Pcu KM
	Speed	62.55	KM/h
Inter Peak Hour	Total Time	11635	Pcu Hr
	Delay	1140	Pcu Hr
	Total distance	834027	Pcu KM
	Speed	71.69	KM/h
Evening Peak Hour	Total Time	17253	Pcu Hr
	Delay	3877	Pcu Hr
	Total distance	1002420	Pcu KM
	Speed	58.10	KM/h

The network performance for the Local Plan modifications with full Cherwell mitigation, as received in September 2014, level of growth is shown below and the assessment focuses upon the key corridors in the district as described in the table below whilst Figure 6-1 and Figure 6-2 show this for the morning and evening peak hours respectively. The assessment is organised in to routes and focuses primarily on the link performance in to key junctions along the route and also provides further detail relating specifically to junction performance where that differs to the link performance.

The network link and junction performance are measured by the volume to capacity (v/c) ratio and highlights those links on the highway network that are operating below operational capacity (v/c <85%), at operational capacity (v/c between 85% and 95%) and those that are exceeding operational capacity (v/c >95%).

The junction performance described below refers to results from a forecast of the strategic highway model and it is possible that detailed junction modelling software would not only be able to optimise signalised junction performance, but also produce marginally different junction performance results.

Table 6-10 Impact of Local Plan Modifications and mitigation network performance assessment

Link	Junction	Morning peak hour	Evening peak hour
Camp Road Station Rd to B4030	Camp Road and Station Road Junction	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.
	Camp Road and Unnamed Road Junction	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.
	Camp Road and B4030 Junction	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.
Unnamed Road between Camp Road and B430	Unnamed Road and B430 Junction	Overall the performance of this junction is below capacity. However 1 turn performs over capacity. With reference to the links entering this junction, the eastbound link performs at capacity;	Overall the performance of this junction is below capacity. However 1 turn performs at capacity. With reference to the links entering this junction, all links perform below capacity.
	Camp Road and Unnamed Road Junction	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.
Station Road Camp Road to B4030	Station Road and B4030 Junction	Overall the performance of this junction is below capacity. However 1 turn performs over capacity. With reference to the links entering this junction, all links	Overall the performance of this junction is below capacity. However 1 turn performs over capacity. With reference to the links entering this junction, all

Link	Junction	Morning peak hour	Evening peak hour
		perform below capacity.	links perform below capacity.
	Camp Road and Station Road Junction	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.
B4030 Bicester to A4260	B4030 and A4095 Howes Lane Junction	Overall the performance of this junction is below capacity. However 2 turns perform over capacity. With reference to the links entering this junction, the northbound link performs over capacity;	Overall the performance of this junction is below capacity. However 2 turns perform at capacity. With reference to the links entering this junction, the northbound link performs over capacity;
	Middleton Stoney Junction	Overall the performance of this junction is below capacity. However 1 turn performs at capacity and 6 turns perform over capacity. With reference to the links entering this junction, the eastbound link performs over capacity;	Overall the performance of this junction is below capacity. However 1 turn performs at capacity and 4 turns perform over capacity. With reference to the links entering this junction, the northbound link performs at capacity; the eastbound link performs over capacity;
	Camp Road and B4030 Junction	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.
	Station Road and B4030 Junction	Overall the performance of this junction is below capacity. However 1 turn performs over capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. However 1 turn performs over capacity. With reference to the links entering this junction, all links perform below capacity.

Link	Junction	Morning peak hour	Evening peak hour
	Rousham	Overall the performance of this junction is below capacity. However 3 turns perform over capacity. With reference to the links entering this junction, the westbound link performs over capacity;	Overall the performance of this junction is below capacity. However 3 turns perform over capacity. With reference to the links entering this junction, the westbound link performs over capacity;
	Holt Junction (B4030 and A4260)	Overall the performance of this junction is below capacity. However 3 turns perform over capacity. With reference to the links entering this junction, the southbound link performs over capacity;	Overall the performance of this junction is at capacity. However 8 turns perform over capacity. With reference to the links entering this junction, the northbound link performs over capacity; the eastbound link performs over capacity; the southbound link performs over capacity;
B430 Ardley to A34	B430 and Ardley Road Junction	Overall the performance of this junction is at capacity. However 9 turns perform over capacity. With reference to the links entering this junction, the northbound link performs over capacity; the eastbound link performs over capacity; the westbound link performs over capacity;	Overall the performance of this junction is over capacity. However 1 turn performs at capacity and 8 turns perform over capacity. With reference to the links entering this junction, the northbound link performs over capacity; the southbound link performs over capacity; the westbound link performs over capacity;
	Unnamed Road and B430 Junction	Overall the performance of this junction is below capacity. However 1 turn performs over capacity. With reference to the links entering this junction, the eastbound link performs at capacity;	Overall the performance of this junction is below capacity. However 1 turn performs at capacity. With reference to the links entering this junction, all links perform below capacity.
	Middleton Stoney Junction	Overall the performance of this junction is below capacity. However 1 turn performs at capacity and 6 turns perform over capacity. With reference to the links entering this junction, the eastbound link performs over capacity;	Overall the performance of this junction is below capacity. However 1 turn performs at capacity and 4 turns perform over capacity. With reference to the links entering this junction, the northbound link performs at capacity; the eastbound

Link	Junction	Morning peak hour	Evening peak hour
			link performs over capacity;
	B430 and A4095 Junction	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.
	A34 Junction	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.
M40 J9	M40 Slips	The M40 southbound off slip is at capacity whilst the A41 southbound off slip is over capacity.	The A41 southbound off slip is over capacity.
	Circulation	The circulatory carriageway exceeds capacity.	The circulatory carriageway is over capacity.
M40 J10	M40 Slips	The southbound on slip is over capacity. The link between the northern roundabout and the new signalised junction is over capacity.	The northbound off slip is over capacity. The link between the northern roundabout and the new signalised junction is over capacity.
	B430 Roundabout	Overall the performance of this junction is below capacity. However 2 turns perform at capacity. With reference to the links entering this junction, the northbound link performs at capacity;	Overall the performance of this junction is at capacity. However 2 turns perform over capacity. With reference to the links entering this junction, the northbound link performs at capacity; the westbound link performs over capacity;
	A43 Roundabout	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below

Link	Junction	Morning peak hour	Evening peak hour
			capacity.
A34	Link only	Section between the B4027 and B430 is at capacity in both northbound and southbound directions.	Section between the B4027 and B430 exceeds capacity in northbound direction.

Figure 6-1 Impact of Local Plan Modifications and mitigation (2031 Morning Peak Hour)

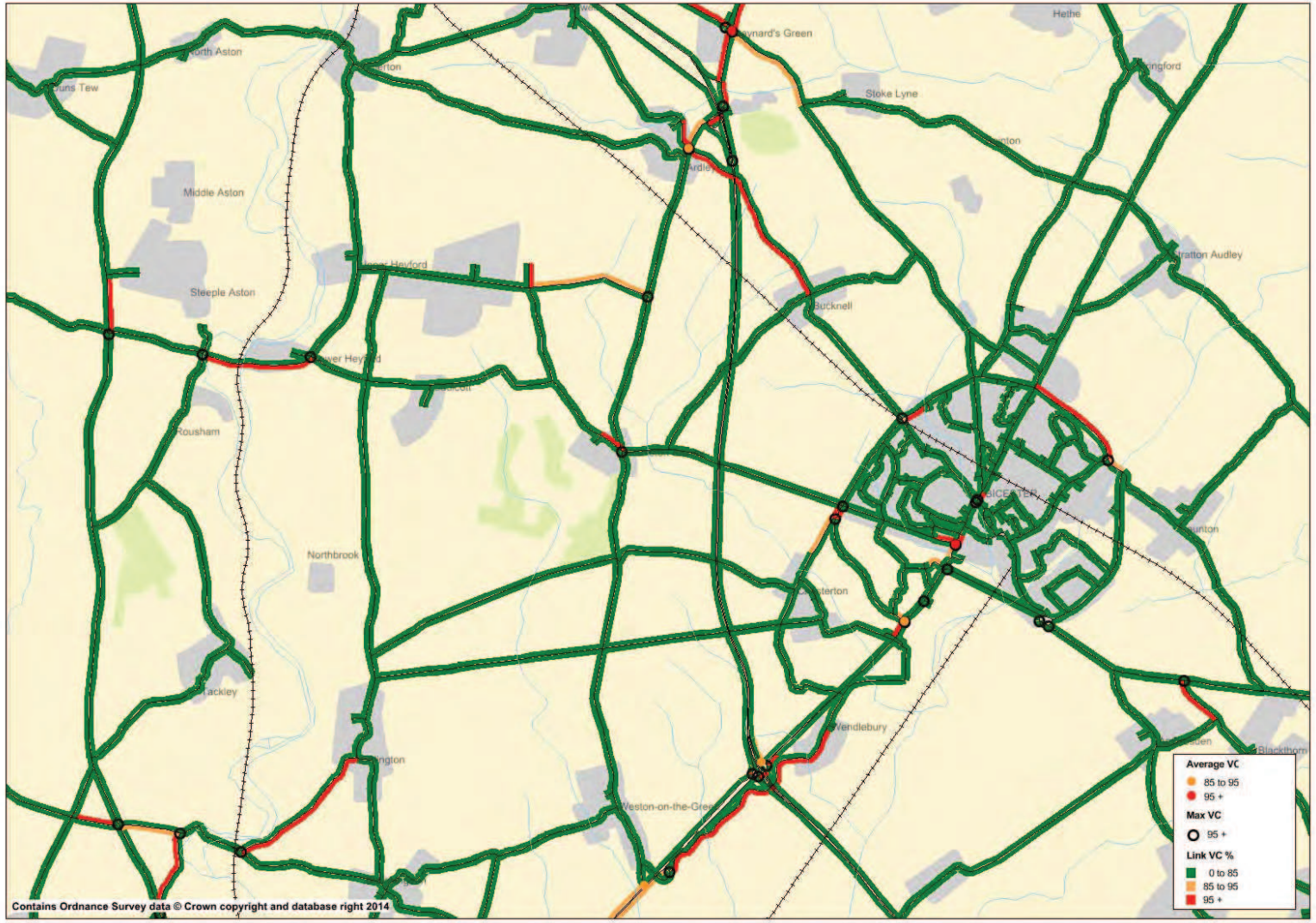
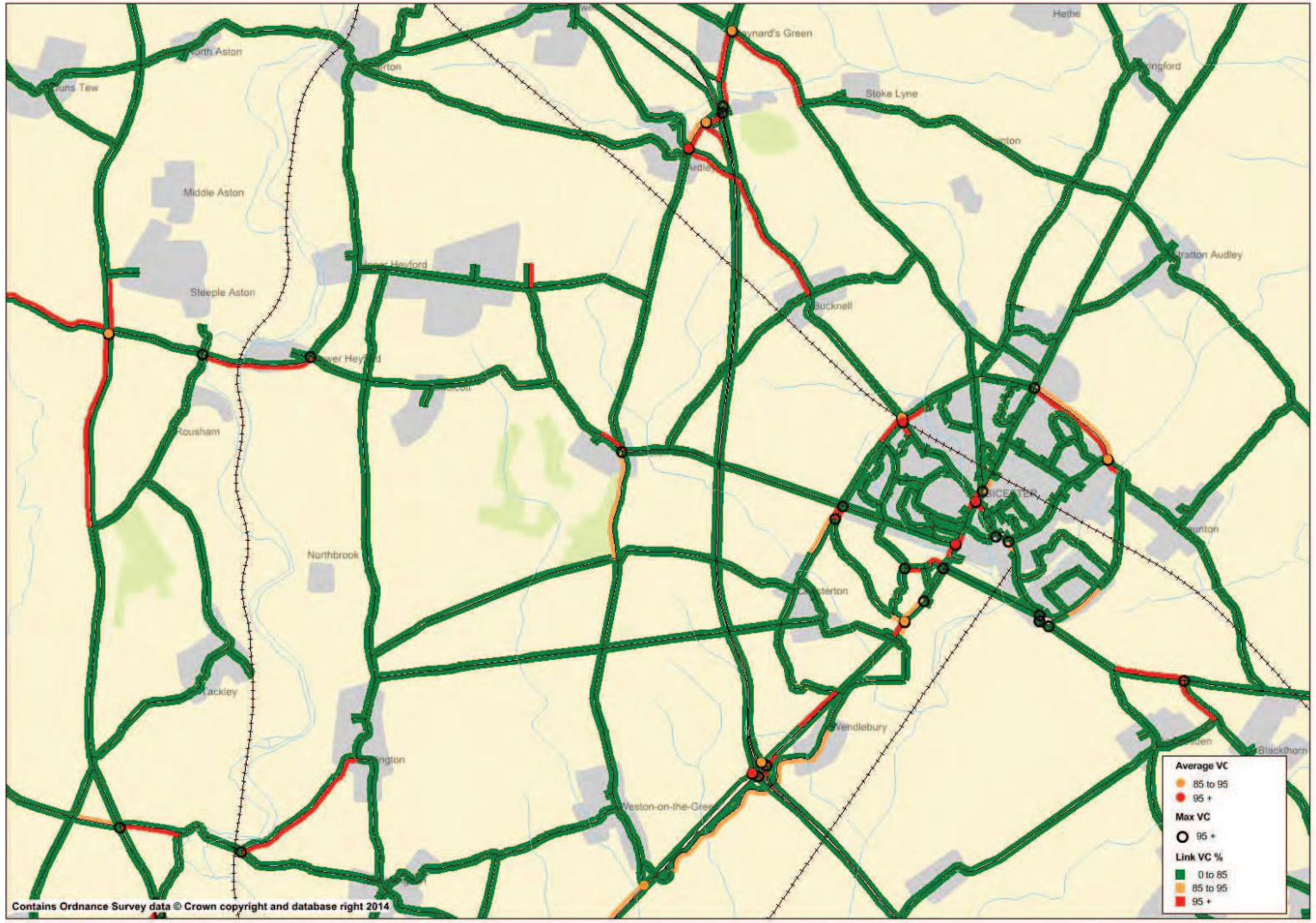


Figure 6-2 Impact of Local Plan Modifications and mitigation (2031 Evening Peak Hour)



6.2.3. Analysis of Middleton Stoney Junction

A comparative analysis of the performance of the Middleton Stoney junction in Scenarios 3-5 is shown in this section. These are the Local Plan Modifications without Upper Heyford Modifications scenario (Scenario 3), With Upper Heyford Modifications scenario (Scenario 4) and with Upper Heyford Modifications and its local mitigation scenario (Scenario 5). The results of the assessment are summarised in Table 6-11.

Table 6-11 Middleton Stoney Junction assessment

Scenario Number	Morning peak hour	Evening peak hour
Scenario 3	Overall the performance of this junction is below capacity. However 6 turns perform over capacity. With reference to the links entering this junction, the eastbound link performs over capacity; the westbound link performs over capacity;	Overall the performance of this junction is below capacity. However 2 turns perform at capacity and 6 turns perform over capacity. With reference to the links entering this junction, the eastbound link performs over capacity; the westbound link performs over capacity;
Scenario 4	Overall the performance of this junction is below capacity. However 6 turns perform over capacity. With reference to the links entering this junction, the eastbound link performs over capacity; the westbound link performs over capacity;	Overall the performance of this junction is below capacity. However 9 turns perform over capacity. With reference to the links entering this junction, the northbound link performs over capacity; the eastbound link performs over capacity; the westbound link performs over capacity;
Scenario 5	Overall the performance of this junction is below capacity. However 1 turn performs at capacity and 6 turns perform over capacity. With reference to the links entering this junction, the eastbound link performs over capacity;	Overall the performance of this junction is below capacity. However 1 turn performs at capacity and 4 turns perform over capacity. With reference to the links entering this junction, the northbound link performs at capacity; the eastbound link performs over capacity;

With the addition of Upper Heyford modifications in Scenario 4, there is an increase in the number of links and turns which perform over capacity. In Scenario 5, the mitigation at Middleton Stoney junction improved the junction performance in terms of number of links or turns performing at/over capacity.

6.2.4. Public Transport Network

Figure 6-3 shows the bus loadings for the Oxford – Upper Heyford corridor where service 25A operates. The model shows a significant increase in patronage for this service in line with the overall increase of public transport movements that was described above.

The improvements in public transport supply for Scenario 5 consist of:

- Change of frequency for service 25A from 1 bph to 3 bph between Bicester – Upper Heyford – Oxford;
- No additional service between Upper Heyford and Bicester;
- New service between Bicester – Upper Heyford – Banbury with a frequency of 1 bph.

Table 6-12 provides a comparison of transport demand by mode for Scenarios 4 and Scenario 5 which have consistent trip ends but revised bus services.

Table 6-12 Upper Heyford Transport Demand in Scenarios 4 and 5

Mode	Reference Case		Forecast Scenario 4		Forecast Scenario 5	
	Origin	Origin	Origin	Origin	Origin	Destination
Car (vehicles)	10751	10433	10666	10001	10512	9891
Bus (people)	258	263	210	207	902	1098
Rail (people)	333	329	407	416	136	150
TOTAL (people)	14030	13634	13949	13124	14178	13612

From Table 6-12 it can observed that the changes in bus supply determines a significant increase in bus demand to and from the site in Scenario 5 compared with Scenario 4 shifting from car and rail.

Again, the model reflects a greater bus patronage towards Upper Heyford in the morning peak hour than from it in the morning peak hour. The base year evidence shows that the main demand is from Upper Heyford to Oxford in the morning peak hour but the additional jobs in the forecast scenario results in more trips to Upper Heyford. This can be seen in Table 6-13 and Table 6-14 where trip ends by peak period and mode are shown for existing and development zones.

Table 6-13 Trip ends per time period for Upper Heyford

As Origin (persons)	Car			PT		
	AM	IP	PM	AM	IP	PM
Base Year – Existing zone	239	140	176	10	6	3
Base Year – Development zones[1]	0	0	0	0	0	0
Future Year – Existing zone	246	175	193	13	6	3
Future Year – Development zones	3294	4470	2987	116	179	204

Table 6-14 Trip ends per time period for Upper Heyford

As Destination (persons)	Car			PT		
	AM	IP	PM	AM	IP	PM
Base Year – Existing zone	179	133	178	8	2	10
Base Year – Development zones	0	0	0	0	0	0
Future Year – Existing zone	184	164	202	8	2	13
Future Year – Development zones	2940	5871	4231	252	156	93

[1] Development sites are coded as additional model zones separate from the existing zones that exist in the base year. This allows the impacts of the developments to be identified separately.

Figure 6-3 Loads on the public transport services around Upper Heyford for the Forecast Year

AM peak hour

IP average hour

PM peak hour

7. Summary

Four future year scenarios were devised for testing the Local Plan and the major modifications to the Local Plan. They test the impact of development in and around Banbury and Bicester as well as Upper Heyford. This Technical Note focuses on the impact at Upper Heyford using the following scenarios:

- 2013 Base Year
- Scenario 1 - 2031 Local Plan with Local Plan transport mitigation
- Scenario 3 - 2031 Local Plan with Local Plan transport mitigation plus Local Plan Modifications and the Modifications transport mitigation BUT excluding Upper Heyford development and associated mitigations
- Scenario 4 - 2031 Local Plan with Local Plan transport mitigation plus Local Plan Modifications and the Modifications transport mitigation including Upper Heyford development BUT excluding Upper Heyford associated mitigations
- Scenario 5 - 2031 Local Plan with Local Plan transport mitigation plus Local Plan Modifications and Modifications transport mitigation including Upper Heyford development and Upper Heyford associated mitigations

The OSM has been used to test Local Plan and Local Plan Modifications for Cherwell District. A model containing the local plans and core strategy documents of all Districts in Oxfordshire has been modelled to reflect the Local Plan scenario as submitted in January 2014. This impact of this growth in 2031 around Upper Heyford is described in Section 3 and the conclusion is that the network surrounding the site is broadly able to cope with committed levels of growth at Upper Heyford and elsewhere within the District.

The addition of the Local Plan Modifications (including mitigation) for Cherwell District but excluding Upper Heyford is presented in Section 4. The implication from the demand model is that the growth and associated mitigation contained in the Local Plan Modifications does not negatively impact on the Local Plan only level of growth at Upper Heyford as measured by the performance of the Forecast Scenario demand against the Reference Case demand.

The Major Modifications scenario that includes 1,600 additional dwellings at Upper Heyford is presented in Section 5. Scenario 4 considered the impact of this additional development at Upper Heyford but in the absence of associated local mitigation. The implication from the demand model is that the additional growth and without mitigation contained in the Local Plan Modifications results in approximately 510 trips (3.7%) not having a destination at Upper Heyford as measured by the performance of the Forecast Scenario demand against the Reference Case demand.

Scenario 5 considered the impact of this additional development at Upper Heyford but with highway and public transport mitigation and is presented in Section 6. The implication from the demand model is that the additional growth and with the local mitigation contained in the Local Plan Modifications results in approximately 22 trips (<1%) not having a destination at Upper Heyford as measured by the performance of the Forecast Scenario demand against the Reference Case demand.

The difference of trips between each of the forecast scenarios and the reference scenarios are presented in Table 7-1 for Upper Heyford. It can be seen the most impact is in Scenario 5 with the introduction of the local mitigation measures.

Table 7-1 Change in the number of movements for Upper Heyford

	Scenario 1 Difference		Scenario 3 Difference		Scenario 4 Difference		Scenario 5 Difference	
Mode	Origin	Dest.	Origin	Dest.	Origin	Dest.	Origin	Dest.
Car (vehicles)	8	-67	-14	-107	-85	-432	-239	-542
Bus (people)	-38	-27	-36	-28	-49	-56	643	835
Rail (people)	43	57	50	64	74	87	-197	-179
TOTAL (people)	15	-54	-4	-98	-80	-510	148	-22

The change in the percentage of public transport trips is presented in Table 7-2 below. It should be noted that the frequency of service 25A between Upper Heyford and Oxford is 1 bus per hour for Scenario1,

Scenario 3 and Scenario 4 while for Scenario 5 it is 3 buses per hour; which resulted a significant increase of 3.1% in scenario 5.

Table 7-2 Change in percentage of Public Transport for the four scenarios for Upper Heyford

Scenario	Forecast	Reference	Difference
Scenario 1	7.26%	7.19%	0.1%
Scenario 3	7.43%	7.19%	0.2%
Scenario 4	4.42%	4.21%	0.2%
Scenario 5	7.32%	4.21%	3.1%

Speed and delay statistics for the four scenarios considered is presented in Table 7-3.

Table 7-3 Speed and Delay Statistics for the four scenarios for Upper Heyford

Scenario Number	Morning Peak Hour		Evening Peak Hour	
	Speed (Kph)	**Delay (PCU-Hr)**	**Speed (Kph)**	**Delay (PCU-Hr)**
Scenario 1	65.85	1875	60.12	3306
Scenario 3	62.65	2488	57.20	4140
Scenario 4	61.97	2613	56.56	4321
Scenario 5	62.55	2523	58.10	3877

The conclusion is that whilst the network surrounding the site is forecast to experience some stress which the difference between the Reference Forecast and the Forecast Scenario would suggest deters car traffic (as demonstrated by reduced highway demand and lower network speeds), the increased bus provision brought about by the mitigation measures enables (almost) all of these displaced car trips to be made by bus. The overall impact is a very small (<1%) reduction in total trips to the site but an increase in total trips from the site when the forecast scenario is compared to the reference case scenario.

The impact of the additional dwellings has an impact on the highway network despite the mitigation measures, although not all of the impact can be apportioned to the Upper Heyford site, as the tests also include developments in Bicester and Banbury. Further work would be required to test the performance of affected junctions in appropriate local junction modelling software and to refine the strategy of traffic movements in the area.

This has shown that increased public transport access to Upper Heyford would be essential. The change in tidality between Upper Heyford and Oxford (as a result of increased jobs on the site) requires further analysis before the mitigation strategy could be finalised.

Sequential Test and Exception Test (Flooding)

October 2014

Strategic Sites

Cherwell Local Plan – Proposed Modifications

Contents

1.0 Introduction

1.1 This document considers the flood risk for potential strategic development sites at Banbury, Bicester and Upper Heyford and their wider sustainability and has informed the allocation of sites for new homes, employment and town centre uses in the Council's Local Plan.

1.2 It sets out 'sequential tests' for Banbury, Bicester and Upper Heyford and 'exception tests' for strategic sites at Banbury and Bicester and is informed by the National Planning Policy Framework (NPPF) and National Planning Practice Guidance (NPPG).

1.3 This document is linked to and is informed by the Local Plan Sustainability Appraisal (SA) for the Local Plan (October 2014 Addendum). The background work was undertaken during the 'Issues and Options' stage of the plan making process and the document has been updated to reflect changes to the Local Plan and SA. The Environment Agency have been consulted on the production of this document from the early stages of production of the Local Plan. Representations received to the proposed modifications to the Local Plan (August 2014) from the Environment Agency have been taken into account and minor changes have been made to the Local Plan and this document.

1.4 The Oxfordshire Strategic Housing Market Assessment (SHMA) requirements mean that the Local Plan will need to identify land for 22,800 homes between 2011 and 2031. This document has been updated to consider and reflect these requirements.

2.0 Methodology

2.1 The requirements in the NPPF mean that the Council is required to undertake a sequential test to inform the location of development and the allocation of sites in the Local Plan. Other information and evidence has also informed the strategy in the Local Plan such as that relating to viability. For the sequential test all the sites are assessed in this document in terms of their flood risk and sustainability.

The NPPF states:

'Inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk, but where development is necessary, making it safe without increasing flood risk elsewhere.

'Local Plans should apply a sequential, risk-based approach to the location of development to avoid where possible flood risk to people and property and manage any residual risk, taking account of the impacts of climate change, by:
-applying the Sequential Test;
-if necessary, applying the Exception Test;

'The aim of the Sequential Test is to steer new development to areas with the lowest probability of flooding. Development should not be allocated or permitted if there are reasonably available sites appropriate for the proposed development in areas with a lower probability of flooding.'

'If, following application of the Sequential Test, it is not possible, consistent with wider sustainability objectives, for the development to be located in zones with a lower probability of flooding, the Exception Test can be applied if appropriate. For the Exception Test to be passed:
-it must be demonstrated that the development provides wider sustainability benefits to the community that outweigh flood risk, informed by a Strategic Flood Risk Assessment where one has been prepared;
-and a site-specific flood risk assessment must demonstrate that the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.'

'Both elements of the test will have to be passed for development to be allocated or permitted'.

2.2 The NPPG on Flood Risk and Coastal Change sets out guidance on the sequential, risk-based approach to the location of development. The NPPG has informed this document and the preparation of the proposed modifications to the Local Plan. It states that this general approach is designed to ensure that areas at little or no risk of flooding from any source are developed in preference to areas at higher risk. It states that the aim should be to keep development out of medium and high flood risk areas (Flood Zones 2 and 3) and other areas affected by other sources of flooding where possible.

The Sequential Test

2.3 A diagram (Diagram 2: Application of the Sequential Test for Local Plan preparation) is shown in the NPPG. The NPPG sets out the main requirements of the sequential test as follows:

"The Sequential Test ensures that a sequential approach is followed to steer new development to areas with the lowest probability of flooding. The flood zones as refined in the Strategic Flood Risk Assessment for the area provide the basis for applying the Test. The aim is to steer new development to Flood Zone 1 (areas with a low probability of river or sea flooding). Where there are no reasonably available sites in Flood Zone 1, local planning authorities in their decision making should take into account the flood risk vulnerability of land uses and consider reasonably available sites in Flood Zone 2 (areas with a medium probability of river or sea flooding), applying the Exception Test if required. Only where there are no reasonably available sites in Flood Zones 1 or 2 should the suitability of sites in Flood Zone 3 (areas with a high probability of river or sea flooding) be considered, taking into account the flood risk vulnerability of land uses and applying the Exception Test if required.

Within each flood zone, surface water and other sources of flooding also need to be taken into account in applying the sequential approach to the location of development.

As some areas at lower flood risk may not be suitable for development for various reasons and therefore out of consideration, the Sequential Test should be applied to the whole local planning authority area to increase the possibilities of accommodating development which is not exposed to flood risk.

A local planning authority should demonstrate through evidence that it has considered a range of options in the site allocation process, using the Strategic Flood Risk Assessment to apply the Sequential Test and the Exception Test where necessary. This can be undertaken directly or, ideally, as part of the sustainability appraisal. Where other sustainability criteria outweigh flood risk issues, the

decision making process should be transparent with reasoned justifications for any decision to allocate land in areas at high flood risk in the sustainability appraisal report".

Exception Test

2.4 The Exception Test, as set out in paragraph 102 of the Framework, is a method to demonstrate and help ensure that flood risk to people and property will be managed satisfactorily, while allowing necessary development to go ahead in situations where suitable sites at lower risk of flooding are not available. The NPPG sets out the main requirements of the exception test as follows:

Essentially, the two parts to the Test require proposed development to show that it will provide wider sustainability benefits to the community that outweigh flood risk, and that it will be safe for its lifetime, without increasing flood risk elsewhere and where possible reduce flood risk overall.

Evidence of wider sustainability benefits to the community should be provided, for instance, through the sustainability appraisal. If a potential site allocation fails to score positively against the aims and objectives of the sustainability appraisal, or is not otherwise capable of demonstrating sustainability benefits, the local planning authority should consider whether the use of planning conditions and/or planning obligations could make it do so. Where this is not possible the Exception Test has not been satisfied and the allocation should not be made.

Wider safety issues need to be considered as part of the plan preparation. If infrastructure fails then people may not be able to stay in their homes. Flood warnings and evacuation issues therefore need to be considered in design and layout of planned developments. In considering an allocation in a Local Plan a level 2 Strategic Flood Risk Assessment should inform consideration of the second part of the Exception Test. Further information on making development safe from flood risk and on what is considered to be the lifetime of development is provided in the NPPG.

2.5 The Sustainability Appraisal (which covers the requirements of the SEA Directive) and Strategic Flood Risk Assessments (SFRA) for the Local Plan have informed the Sequential and Exceptions Tests. The Council's sustainability appraisal considers flood risk as one factor, (albeit an important one) amongst many in determining the location new development. The Council has therefore taken the same approach in this document.

Evidence

Flooding

2.6 The Council has completed a Level 1 SFRA for the District and Level 2 SFRA's for the sites allocated in the Local Plan where it was required. For the Level 1 SFRA, data provided has been split into five main sources of flood risk: flooding from rivers and watercourses, sewer flooding, overland flooding, groundwater flooding and flooding from man-made and artificial sources.

2.7 The predominant risk of flooding within the Cherwell is due to flooding from rivers and watercourses. Cherwell District falls within four major river catchments being: The River Thames, The River Great Ouse, The River Cherwell and The Warwickshire Avon Catchment. In order to present the best available flood information, SFRA Flood Zones were derived using a variety of existing sources of data. Flood Zones have been mapped with an allowance for climate change. Recent flood zones are also available from the Environment Agency. This information has informed the Sequential Test.

2.8 The different flood zones in the NPPG are defined in the table below:

Flood Zones
Zone 1 Low Probability Land having a less than 1 in 1,000 annual probability of river or sea flooding. (Shown as 'clear' on the Flood Map – all land outside Zones 2 and 3)
Zone 2 Medium Probability **Definition** Land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding; or Land having between a 1 in 200 and 1 in 1,000 annual probability of sea flooding. (Land shown in light blue on the Flood Map)
Zone 3a High Probability **Definition** Land having a 1 in 100 or greater annual probability of river flooding; or Land having a 1 in 200 or greater annual probability of sea flooding. (Land shown in dark blue on the Flood Map)
Zone 3b The Functional Floodplain **Definition** This zone comprises land where water has to flow or be stored in times of flood. Local planning authorities should identify in their Strategic Flood Risk Assessments areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency. (Not separately distinguished from Zone 3a on the Flood Map)

3.0 Sequential Test Methodology

3.1 The sequential test considers, in varying detail, the whole of the District. The following tables assess the sites set out in figures 1, 2 and 3 in the Local Plan Sustainability Appraisal Non-Technical Summary (October 2014) in terms of their flood risk and wider sustainability. Through the production of the Local Plan these are the sites considered by the Council as 'options' for development and have been considered in the sustainability appraisal. Some of these are allocated in the Local Plan (modifications).

Scope

3.2 The following paragraphs explain the scope of this sequential test, explaining why particular sites have been considered for the sequential test in more detail. Further information about the site selection process is set out in the Local Plan Sustainability Appraisal.

3.3 Based on evidence, the Local Plan sets out a spatial distribution of development for the District. Banbury (45,000 people) and Bicester (30,000 people) will be the focus of growth with some limited development located in the villages. New homes are proposed to be provided at both Banbury and Bicester. Banbury is constrained and the Council considers there to be no reasonable option which would involve all or nearly all new development being located at one town. Flood risk evidence does not conflict with this approach as neither Banbury nor Bicester (and immediate surrounding land) are extensively limited in their development potential by flood risk. Flood risk is therefore not one of the main factors that determines the proposed District wide distribution of development. The production of separate sequential tests to inform the selection of the most sustainable development sites at each town was therefore considered the most reasonable and valuable approach for the Local Plan.

3.4 The Council's Strategic Housing Land Availability Assessment (2014) shows that there are limited suitable sites within the built up area of Banbury which could accommodate a strategic site (100 dwellings or more), with the exception of land at Canalside, Bolton Road and at Higham way in Banbury. The total capacity of smaller sites at Banbury and Bicester is not sufficient to meet housing needs. Some of these sites are also likely to be difficult to deliver and will not secure community facilities which larger sites will deliver. This sequential test will therefore not consider further non-strategic sites for housing or employment within the built up area of Banbury or Bicester.

3.5 Unless there are exceptional circumstances the rural areas should not accommodate strategic sites as this is considered less sustainable. A certain amount of development is expected to come forward through windfalls but the locations are not known. Development in the rural areas will therefore not be considered further for this document except at the former RAF Upper Heyford where there are considered to be sustainability benefits of some further development. Land at the former RAF upper Heyford is located in Flood Zone 1 and

development will lead to the improvement of a previously developed site but there are considered to be limits to growth in relation to sustainability effects including in relation to transport and the historic environment. The Local Plan Sustainability Appraisal and other evidence provides further information about the options for development here and the sustainability effects.

3.7 The Council's economic evidence for the Local Plan identifies a need for land to be identified for employment development in Cherwell District.

Assessment Process

3.8 The following tables show the flood risk associated with each site option. The tables show where the development of each site would not be consistent with wider sustainability objectives in order to show the reasons why some sites, despite being located in flood zone 1, are not allocated for development. This is shown by an 'x' or double 'xx' (depending upon the significance of the impact) and is informed by the matrices in the Local Plan Sustainability Appraisal. Some sites have been selected (or not) for other reasons such as deliverability or availability which are outside the scope of this report and the SA Report. This is explained further in table 7.7 of the Local Plan SA (October 2014). All sites are also in some way (but to a varying extent) consistent with wider sustainability objectives, and this information is set out in the Council's SA report.

3.9 As some sites have a higher probability of flooding, further work is required to explore their sustainability and to confirm the sites suitability for development. This is considered through the Exception Test.

4.0 Bicester Assessment

4.1 Bicester will need to accommodate 10,129 dwellings and provide for a significant amount of employment land to 2031.

Step 1 – Where are the potential strategic sites for development?

South West Bicester Phase 2 (Policy Bicester 3)
Former RAF Bicester (Policy Bicester 8)
South and West of Caversfield (BI212, 224, 225, 226)
Dymocks Farm (CV001) (BIC 7)
Land east of Chesterton (BIC 10)
Bessemer Close/Launton Road (BI19)
Stratton Audley Quarry (ST2)
Ambrosden Poultry Farm (AM013)
North West Bicester (BI200) including area to the west of the eco town
Graven Hill, MOD site together with extension of BI201 to the north/BI223 or BI211
Land north of Caversfield House (BI230)
South East Bicester (Policy Bicester 12) including sites BI227, area north of A41 east of Bicester 12
Land at Lodge Farm (CH15)
Bignell Park (BIC 11)
Land at Oxford Road (BI48)
Bicester Business Park (Bicester 4)
Bicester Gateway (Bicester 10) with extension to include sites CH11 and Facenda Chicken Farm
North East Bicester Business Park (Bicester 11) with extension, including sites BI210, to include land north of the allotments and the Skimmingdish Lane area
Land north of Gavray Drive

Step 2 – Which sites are located wholly in Flood Zone 1 (lower probability of Flooding)?

Site Code	Site name/ description (& relevant policy number if applicable)	Homes	Flooding	Flooding Assessment in Sustainability Appraisal Matrix	Health & Well-Being	Crime	Poverty/ Social Exclusion	Vibrant Communities	Accessibility	Efficient Land Use	Air Quality	Biodiversity	Landscape / Heritage	Road Traffic	Resource Use	Waste	Water	Energy Efficiency	Employment	Economic Growth	Tourism
BI44	Southwest Bicester Phase 2 (Policy Bicester 3)			The site is mostly occupied by agricultural farmland. A small watercourse is located along the northern boundary of the site, flowing along the south side of Middleton Stoney Road. The watercourse is a minor tributary of Langford Brook and could potentially present a flood risk to the site if the channel capacity becomes exceeded resulting in bank overtopping. However, the site is shown to be located within EA Flood Zone 1, as the catchment of the minor watercourse is <3km. A neutral effect is identified.						XX											
BI5	Former RAF Bicester (Policy Bicester 8)			The site is located in Flood Zone1; however, EA mapping also indicates some localised areas susceptible to surface water flooding (intermediate level). No watercourses are located within the site boundary; however, a small ordinary watercourse borders the north eastern edge of the site.								X									
BI212	South and West of Caversfield			The site lies entirely within Flood Zone 1, with some localised areas in the east and south east of the site identified by EA mapping as being susceptible to surface water flooding.						XX			XX								
BI224	Fringford Road extended area Bicester																				
BI225	Fringford Road Bicester																				
BI226	Land Known at The Plain Caversfield																				
CV001 (BIC 7)	Dymocks Farm			The site is located in EA Flood Zone 1; however, EA mapping also indicates some localised areas susceptible to surface water flooding (intermediate level).					XX	XX											
N/A	Land east of Chesterton			The site is located entirely within EA Flood Zone 1 and there are no surface water features on the site. There are two small areas in the south east and central eastern areas of the site identified by EA mapping as being susceptible to surface water flooding.						XX		X	X								
BI19	Bessemer Close/Launton Road			The site is located entirely within Flood Zone 1 and there are no surface watercourses on or immediately surrounding the site. Therefore, the development of the site is likely to have a negligible effect against this objective.																	
ST2	Stratton Audley Quarry			Although there are some water bodies present on site, the entire site lies within Flood Zone 1. Therefore, the site is not expected to affect this objective.					XX	X		XX	XX								
AM013	Ambrosden Poultry Farm			There are no watercourses within this site, which is entirely within Flood Zone 1. Therefore, the development of the site is likely to have a negligible effect against this objective.						XX			X								

Residential development is compatible with flood zone 1 and the total capacity of the sites above in flood zone 1 allows for Bicester's housing requirements to be accommodated on these sites. However, the assessment above demonstrates that development on some sites above would conflict with a number of the sustainability objectives including in relation to effects on landscape, biodiversity, the historic environment, air quality and sustainable transport despite sites being located in flood zone 1. (move to step 3). Development of the site at south west Bicester (phase 2) has minimal negative impacts and is allocated in the Local Plan.

Step 3 – Which sites are located mostly in Flood Zone 1 but with small areas in Flood Zones 2 and 3?

Site Code	Site name/ description (& relevant policy number if applicable)	Homes	Flooding	Flooding Assessment in Sustainability Appraisal Matrix	Health & Well-Being	Crime	Poverty/ Social Exclusion	Vibrant Communities	Accessibility	Efficient Land Use	Air Quality	Biodiversity	Landscape / Heritage	Road Traffic	Resource Use	Waste	Water	Energy Efficiency	Employment	Economic Growth	Tourism
BI200	Northwest Bicester (Policy Bicester 1)			The River Bure and three un-named tributary watercourses have been identified within the allocated site. Only the River Bure itself is represented by EA Flood Zones 2 and 3. However, the majority of the allocated site and all of the proposed extension area lie in Flood Zone 1 and therefore is at low flood risk.						XX		X									
N/A	Area to the west of Northwest Bicester Eco-town between B4030 to the south, M40 to the south west, Middleton Road to the north west and railway line to the north																				
BI201	Graven Hill, MOD site (Policy Bicester 2)			The majority of the site is located within Flood Zone 1. However, approximately five small watercourse tributaries of Langford Brook run through the north western part of the site. Due to the presence of these tributaries and their close hydrological connectivity to Langford Brook, the EA has recommended that detailed modelling be undertaken of these ordinary watercourses as part of a site specific Level 3 FRA to define the flood outlines for Flood Zone 2 3, plus an allowance for climate change. EA mapping shows that the risk of flooding from surface water runoff from land is greater in the north western area of the site, with areas of 'less' and 'intermediate' susceptibility. Site BI223 within BI211 avoids the area of significant flood risk, i.e. the areas of the site within Flood Zones 2 and 3. If this part of the site was to be developed, and not the area within BI211 in Flood Zones 2 and 3, then the extension to the Graven Hill MOD site would score more positively against this objective.								X						X				
BI211	Land South of the A41 and north of Graven Hill																				
BI223	Langford Park Farm, London Road, Bicester																				

BI230	Land north of Caversfield House, Bicester		X	A medium-sized watercourse which is within EA Flood Zones 2 and 3 flows through the centre of the site. However, the area of flood risk represents less than 10% of the total area of the site.						XX											
BI2	South East Bicester (Policy Bicester 12)		X	EA Flood Zones 2 and 3 cover an area of approximately 17 ha in the north east corner of the site. The remainder of the site is currently shown to be located within Flood Zone 1. OS 1:25,000 scale mapping illustrates a small un-named ordinary watercourse flowing in a south westerly direction through the site. This watercourse is fed by two groundwater fed ponds immediately south of Middle Wretchwick Farm and appears to sink after approximately 250m in length. EA mapping indicates areas susceptible to surface water flooding in the vicinity of this watercourse, covering much of the north eastern part of the site. The site is given a minor negative impact against the achievement of this objective.						XX		XX	X									
BI227	South East Bicester																					
N/A	Area north of A41 east of Bicester 12																					
CH15	Land at Lodge Farm		X	There is a watercourse in the north eastern part of this site, which is within an area of Flood Zone 3. Therefore, the development of the site is likely to have a minor negative effect against this objective.					X	XX	X		X	X							
BIC 11	Bignell Park		X	The majority of the site is located in EA Flood Zone 1; however, the Gagle Brook flows through the site from west to east and land either side of it lies in Flood Zones 2 and 3. The Gagle Brook has been dammed in places to form several small lakes.					X	XX	X	XX	XX	X							
BI48	Land at Oxford Road		X	Only the southern boundary of the site is within Flood Zones 2 and 3, the rest of the site is within Flood Zone 1. A small watercourse is located along the length of the southern boundary, within Flood Zones 2 and 3. However, the area of flood risk represents less than 5% of the total area of the site.					X	X	X		X	X							
There are parts of these sites above that are not in flood zone 1 but generally residential development could be accommodated in flood zone 1 areas on these sites. However, the assessment demonstrates that development on some sites would conflict with a number of sustainability objectives including in relation to effects on landscape, biodiversity and the historic environment. (move to step 4). The assessment of sites at North West Bicester and Graven Hill show minimal negative impacts and are allocated in Local Plan. Development of land at South East Bicester is sustainable, scoring positively against a number of sustainability objectives but contains areas of flood risk and therefore an exception test is required. This is set out in the table below. The Council's Level 2 SFRA for the site addresses the second part of the exception test.																						

	South East Bicester (Policy Bicester 12)
SA Objective	**Sustainability**
To ensure that everyone has the opportunity to live in a decent, sustainably constructed and affordable home.	The site has capacity to contribute a significant number of homes, which will make a significant contribution to the objectively assessed need.
To improve the health and well-being of the population & reduce inequalities in health	The site lies largely within Ambrosden and Chesterton ward, which has existing deficiencies in children's playspace and tennis court provision and partially within Launton ward, which has existing deficiencies in natural/semi-natural greenspace, amenity open space, children's playspace and allotment provision. National Cycle Route 51 meets the combined site boundary north of Langford village then turns northward along the western boundary of the site. There is a Medium capacity for formal and informal recreation associated with the Deserted Medieval Village of Wretchwick, with wider potential to open up the area to the wider public to create a local resource. There is the potential to improve health and well-being of the population by retaining the footpaths on the site and extending the cycle network.
To reduce poverty and social exclusion	The site has capacity for residential, employment and recreational developments. Provision of new housing and employment on the site, including new community centres, local education, sport and open space facilities, would have the potential to reduce poverty and social exclusion within and in the immediate vicinity of the site.
To improve accessibility to all services and facilities	The site is located approximately 1 km south-east of Bicester town centre and Bicester Town rail station. The site is in close proximity to existing residential, employment and services in the north east and east of the town. Development of the site would improve its accessibility to existing services and facilities but should also ensure good provision of new services and facilities, including local centres, primary and secondary schools, sports facilities, formal and informal open spaces and play areas.
To ensure high and stable levels of employment so everyone can benefit from the economic growth of the District.	The site is large scale and would be able to accommodate commercial and employment land, as well as new community facilities and local services, all of which will generate long term employment opportunities in the area. In addition, the construction of the site will create a significant number of jobs in the short to medium term. Perimeter and other major access roads as well as distributor roads will be constructed ensuring that the sites new mixed uses will be integrated and well connected to existing residential, retail and employment areas.
To sustain and develop economic growth and innovation, a educated/skilled workforce and support the long term competitiveness of the District.	The site is large scale and would be able to accommodate commercial and employment land, as well as new community facilities and local services, all of which will generate long term employment and training opportunities in the area. Primary and secondary schools are likely to be constructed.

Step 4 - Which are the sites where a significant proportion of the site is located in Flood Zones 2 and/or 3?

Site Code	Site name/ description (& relevant policy number if applicable)	Homes	Flooding	Flooding Assessment in Sustainability Appraisal Matrix	Health & Well-Being	Crime	Poverty/ Social Exclusion	Vibrant Communities	Accessibility	Efficient Land Use	Air Quality	Biodiversity	Landscape / Heritage	Road Traffic	Resource Use	Waste	Water	Energy Efficiency	Employment	Economic Growth	Tourism
BI46	Bicester Business Park (Land to the East of the A41 - Oxford Road) (Policy Bicester 4)		X	Langford Brook, an upstream reach of the River Ray, flows along the south eastern boundary of the site and two un-named watercourses flow southwards through the eastern area of the site into Langford Brook. The EA's Flood Map presents Flood Zones 2 and 3 associated with Langford Brook covering the entire south eastern area of the site. The remainder of the site is shown to be located within Flood Zone 1. EA and CDC HFMs illustrate no historical incidents of fluvial flooding have been recorded at the site. A raised flood defence is located alongside the railway embankment which forms the eastern site boundary.						X							X				
N/A	West extension of Bicester Gateway (Bicester 10) (includes site CH11 and Facenda Chicken Farm)		X	The eastern half of the Bicester 10 site is within flood zones 2 and 3, while the eastern half of the Facenda Chicken Farm is also in flood zone 2 and has a small area within in flood zone 3. The extension area to the west of Bicester 10 (site CH11) is not within flood zones 2 or 3. There is also a watercourse which runs through the west edge of the extended boundary of the site which may present a flood risk. No historical incidents of surface water flooding have been reported in this area.	X					X		X					X				
BI210	Extension to North East Bicester Business Park (Bicester 11) (BI210) - East of Bicester		X	Langford Brook, an upstream reach of the River Ray containing both Flood Zones 2 and 3 runs through the centre of the site through the lower third of site Bicester 11 and the upper half of the Skimmingdish Lane Area. The EA's uFMfSW map illustrates that an area covering around 5% of Bicester 11, in the southern corner, is at a high risk of flooding and a further area of between 10% and 15% of the site which is at a low risk of flooding. The Langford Brook has been modelled by the Environment Agency and the flood plain represents an absolute obstruction to development unless compensation scheme can be delivered. The rest of the site is located within Flood Zone 1.						XX		X	XX				X				
N/A	Extended North East Bicester Business Park																				
BI31	Land North of Gavray Drive Bicester		X	There is a watercourse flowing through the centre of the site, and land either side of the watercourse lies within EA Flood Zones 2 and 3. The uFMfSW maps illustrate that a small area of the site is at a high risk of flooding and this area is surrounded by a further area at low risk of flooding.				X		X		XX										
Land at Gavray Drive scores positively against a number of sustainability objectives and is allocated in the Local Plan, however there are areas of flood risk and therefore an exception test is required. This is set out in the table below. The Council's Level 2 SFRA for the site covers the second part of the exception test. Information in the above assessment regarding flood risk suggests that that land at Bicester Gateway and land at North East Bicester would best accommodate employment uses as a less vulnerable use. For the plan making process an 'Exception Test' is not required for employment development located in flood zone 2 and 3a (employment development should not be permitted in flood zone 3b). However, the following table further sets out the positive sustainability effects of development at Bicester Gateway and at North East Bicester to show why the sites are allocated despite the risk of flooding identified. The Council's Level 2 SFRA for the site addresses the second part of the exception test.																					

Land at Gavray Drive (Policy Bicester 13)	
SA Objective	**Sustainability**
To ensure that everyone has the opportunity to live in a decent, sustainably constructed and affordable home.	The site has capacity to contribute a moderate number of homes to the objectively assessed need.
To improve the health and well-being of the population & reduce inequalities in health.	The site lies within Bicester South ward. Bicester has an existing deficiency in children's playspace, tennis court and golf courses provision and allotments and in amenity greenspace. The site is currently undeveloped, with a railway line forming the northern and western site boundaries, with an industrial estate further north, and two areas of existing housing development located to the south. The A4421 forms the eastern site boundary, with open ground beyond. In the north, there is a medium capacity for formal recreation. The flat topography would require limited grading works and the area is easily accessible from nearby residential areas. There is a public footpath crossing the western part of the site, and National Cycle Route 51 is located on the southern site boundary. The existing footpaths in the south of the area could be developed and enhanced to ensure the protection of the ecological value within the site and therefore a Medium capacity for informal recreation exists. There is the potential to improve health and well-being of the population through the development of the site.
To reduce poverty and social exclusion.	There is some capacity for residential, employment and recreational development on different parts of the site. Provision of new housing or employment on the site would have the potential to reduce poverty and social exclusion.
To improve accessibility to all services and facilities.	The site lies approximately 700 m east of Bicester town centre and close to existing employment areas (industrial estate), residential development and services and facilities in the eastern area of the town. It is located approximately 800 m north east of Bicester train station. In addition, some facilities and services are likely to be provided within the boundary of the new development.
To reduce air pollution including reducing greenhouse gas emissions and ensure the district is ready for its impacts	The site is located in close proximity to existing, residential, employment, services and facilities in the eastern part of town. The site has good permeability with the surrounding area, by road and footpath. Therefore, there would be high potential to promote sustainable transport from the site. There are no known air quality issues in the area.
To protect, enhance and make accessible for enjoyment, the district's countryside and historic environment.	Natural England National Character Area 108: Upper Thames Clay Vales. At a county level, the site lies within an urban area, which is not covered by the OWLS study. At a local level, CDLA identifies the site as being located within the Otmoor Lowlands landscape character area. The combined Landscape Sensitivity and Visual Sensitivity of the site is Medium. There is a Medium capacity for residential development in the north of the area but a low capacity in south due to the ecological value; the delineating boundary on site of the two areas is the watercourse passing through the site. There is a Medium to Low capacity for employment development. The north west of the site could potentially accommodate some employment development if sensitivity designed. A public footpath crosses the site. No cultural heritage assets are located within or adjacent to the site. An NMR Monument is located approximately 150 m west of the site on the opposite side of the rail lines. The development of this site would help minimise development of green field sites on areas of biodiversity sensitivity.
To reduce road congestion and pollution levels by improving travel choice, and reducing the need for travel by car/ lorry	The site is located close to existing employment areas and sustainable transport measures could be encouraged, designed to reduce car use. The site has good permeability through existing residential areas (to the town centre). The site's location and range of uses in the area could potentially help reduce the distance to travel to work and enable sustainable transport modes such as walking, cycling and public transport.
To ensure high and stable levels of employment so everyone can benefit from the economic growth of the district.	The site is large enough to accommodate some commercial and employment land, new community facilities and local services, all of which will generate long term employment opportunities in the area. In addition, the construction of the site will create a significant number of jobs in the short to medium term. Distributor roads will be constructed ensuring that the sites new mixed uses will be integrated and well connected to existing residential, retail and employment areas.
To sustain and develop economic growth and innovation, an educated/ skilled workforce and support the long	The site is large enough to accommodate commercial and employment land, new community facilities and local services, all of which will generate long term employment and training opportunities in the area.

term competitiveness of the District	

	Bicester Gateway (Policy Bicester 10)	North East Bicester (Policy Bicester 11)
SA Objective	**Sustainability**	**Sustainability**
To improve the health and well-being of the population & reduce inequalities in health	No positive effects recorded	The site has the potential for improving access for walkers to the countryside through connection to a public footpath located on the south eastern site boundary and the network of paths located to the north of the site.
To reduce poverty and social exclusion	No positive effects recorded	No positive effects recorded
To improve accessibility to all services and facilities	The site is located approximately 1.5km from Bicester town centre and 1km from Bicester Village, and some 200 metres from South West Bicester Phase 1 (residential development plus services and facilities) which is currently under construction. It is some 500 metres from Bicester 4 – Bicester Business Park which has planning permission for offices and a hotel. The site is currently accessible by means of National Cycle Route 51. Development of the site for employment uses could improve accessibility to employment for existing residents, and some of the employment uses may include community services and facilities.	The site is located approximately 2 km north west of Bicester town centre and in close proximity to existing employment and services in the north east area of Bicester. Development of the site for employment uses could improve accessibility to employment for existing residents, and some of the employment uses may include community services and facilities.
To reduce air pollution including reducing greenhouse gas emissions and ensure the District is ready for its impacts.	The site is located within 1.5-2 km of Bicester town centre. There is currently no designated Air Quality Management Area in Bicester. The site is currently accessible by means of National Cycle Route 51. There is potential for good connectivity given the site's location and range of existing, under construction and proposed uses nearby, which would limit the need to travel.	The site is located within 2 km of Bicester town centre. It is adjacent to the north eastern boundary of Bicester and in close proximity to existing employment, services and facilities in this part of the town. There is no Air Quality Management Area in Bicester. There is potential for good connectivity and use of sustainable transport modes given the site's location and range of uses nearby as well as existing public rights of way and the nearby National Cycle Route;
To conserve and enhance and create resources for the district's biodiversity	No positive effects recorded	The site has potential for the enhancement, restoration or creation of wildlife corridors and contribution to the creation of a green infrastructure network for Bicester.
To reduce road congestion and pollution levels by improving travel choice, and reducing the need for travel by car / lorry	The site is located some 1.5 - 2 km from Bicester town centre. It is close to the A41 and the National Cycle Route 51 is located near the western site boundary. It is likely that traffic generated would be accommodated by the local road network. The site is located next to existing commercial and employment development and in close proximity to residential development services and facilities under construction at South West Bicester Phase 1. This could potentially reduce travelling distances and enabling sustainable transport modes such as walking, cycling and public transport.	The western boundary of the site runs along the A4421 and existing residential and employment development is located to the west of the site. It is likely that any increase in traffic would be accommodated by the local road network. The site's location near existing employment, residential development and services could potentially reduce the distance to travel to work and enabling sustainable transport modes such as walking, cycling and public transport.
To ensure high and stable levels of employment so everyone can benefit from the economic growth of the District.	The site is proposed for commercial and industrial development all of which will generate long term employment opportunities in the area. In addition, the construction of the site will create jobs in the short to medium term.	The site is large and proposed for commercial and industrial development, which will generate long term employment opportunities in the area. In addition, the construction of the site will create a significant number of jobs in the short to medium term. Perimeter and other major access roads as well as distributor roads will be constructed ensuring that the sites new mixed uses will be integrated and well connected to existing residential, retail and employment areas.
To sustain and develop economic growth and innovation, a educated/skilled workforce and support the long term competitiveness of the District.	The site is proposed for commercial and industrial development which will generate long term employment and training opportunities in the area.	The site is large and proposed for commercial and industrial development, which will generate long term employment and training opportunities in the area.

5.0 Banbury

5.1 As set out above, the draft Local Plan sets out that Banbury will need to accommodate 7,319 dwellings and provide employment land to 2031.

Step 1 - Where are the potential strategic sites for development?

Land South of Salt Way (BA66, BA362, BA368, BA369, BA370)
Land North of Duke's Meadow Drive (BA312, BA367)
Land at Crouch Farm, West of Bloxham Road (BA308, BA366)
Land at Crouch Hill (BA69, BA365 & BA378)
Land at Drayton Lodge Farm (BA361)
Land North of Hanwell Fields (Banbury 5)
Bankside Extension, Oxford Road and relocation of Banbury United Football Club (Banbury 4 and Banbury 12)
West of Bretch Hill (BA98)
Land at Thornbury Rise/Dover Avenue (BA343, BA371)
Milestone Farm, North of Broughton Road (BA87, BA377)
Land to the North of Broughton Road (BA360)
Land South of Bodicote (BO22)
Area near Junction 11
Land east of the M40
Southam Road (residential and retail/commercial scenario)
Bolton Road (Banbury 8)
Bretch Hill Regeneration Area (Banbury 10)
Land West of Southam Road (part of Banbury 2) and extension to north (BA311, BA359)
Land West of Southam Road (intensification of part of Banbury 2) (BA310)
Ex Hella Manufacturing site, Noral Way
Land West of the M40 (Banbury 6)
Extension to Banbury 6 (triangular parcel between the railway to the south)
Canalside (Banbury 1)
Land at Higham Way (BA317)
Land adjacent to Power Park Ltd

Step 2 - Which sites are located wholly in Flood Zone 1 (low probability of Flooding)?

Site Code	Site name/ description (& relevant policy number if applicable)	Homes	Flooding	Flooding Assessment in Sustainability Appraisal Matrix	Health & Well-Being	Crime	Poverty/ Social Exclusion	Vibrant Communities	Accessibility	Efficient Land Use	Air Quality	Biodiversity	Landscape / Heritage	Road Traffic	Resource Use	Waste	Water	Energy Efficiency	Employment	Economic Growth	Tourism
BA66	Land South of Salt Way			The site is located entirely within Flood Zone 1. There is one small surface watercourse on the southern site boundary, to the north of Wykham Farm, which originates on the site and flows west to east into a pond outside of the site. EA mapping shows that the risk of flooding from surface water runoff from land is greater in the central area of the site, with areas of 'less' and 'intermediate' susceptibility shown following field boundaries running north-south. Therefore there is likely to be a negligible effect against this objective.						xx		x	xx								
BA362	South of Salt Way, Banbury																				
BA370	Land at White Post Road, Banbury																				
BA368	Land at Wykham Park Farm, East of Bloxham Road, Banbury																				
BA369	Land at Wykham Park Farm, North of Wykham Lane, Banbury																				
BA312	Land North of Duke's Meadow Drive			The majority of the site lies within Flood Zone 1, with only a small area in the east of the site within Flood Zones 2 and 3, associated with the watercourse which forms the eastern site boundary. EA mapping shows that very little of the site is at risk of flooding from surface water runoff, with isolated areas in the south east, north west and central northern parts of the site shown as areas of 'less' and 'moderate' susceptibility. The background OS mapping (1:25,000 scale) shows two natural springs on the site, in the north western area and in the central northern area of the site, with a watercourse flowing northward out of the site.						XX		X	XX								
BA367	Land north of Dukes Meadow Drive																				
BA308	Land at Crouch Farm, West of Bloxham Road			The site is located entirely within Flood Zone 1 and there are no surface watercourses on or immediately surrounding the site. EA mapping shows that there are small areas at risk of flooding from surface water runoff west and north of Crouch Farm and in the southern area of the site, shown as areas of 'less' susceptibility.						XX		X	XX								
BA366	Land West of Bloxham Road																				
BA69	Land at Crouch Hill			The site is located entirely within Flood Zone 1 and there are no surface watercourses on or immediately surrounding the site. A small pond is located on the north side of Crouch Hill. EA mapping shows that the risk of flooding from surface water runoff from land is greater in the northern area of the site, with areas of 'less' and 'intermediate' susceptibility.						XX		X	XX								

Site Code	Site name/ description (& relevant policy number if applicable)	Homes	Flooding	Flooding Assessment in Sustainability Appraisal Matrix	Health & Well-Being	Crime	Poverty/ Social Exclusion	Vibrant Communities	Accessibility	Efficient Land Use	Air Quality	Biodiversity	Landscape / Heritage	Road Traffic	Resource Use	Waste	Water	Energy Efficiency	Employment	Economic Growth	Tourism
BA365 BA378																					
BA361	Land at Drayton Lodge Farm			The site is located entirely within Flood Zone 1 and there are no watercourses on or immediately surrounding the site. Therefore, the development of the site is likely to have a negligible effect against this objective.						XX			X								
BA356	Land North of Hanwell Fields (Policy Banbury 5)			The site is located entirely within EA Flood Zone 1 and there are no surface watercourses within the sit boundary. There are also no areas susceptible to surface water flooding within the site.						XX			X								
BA341	Bankside extension, Oxford Road, Bodicote (Policies Banbury 4 & 12)			The site lies entirely within EA Flood Zone 1 and there are no surface watercourses located on the site. The EA's updated Flood Map for Surface Water shows that the risk of flooding from surface water runoff from land is very low. EA and CDC Historical Flood Maps illustrate no historical incidents of surface water flooding have been reported at the site. The EA's Areas Susceptible to Groundwater Flooding maps illustrate that one third of the site is susceptible to groundwater emergence.						XX											
BA373	Land south of Bankside Option 1, Bodicote (Policies Banbury 4 & 12)																				
BA374	Land south of Bankside Option 2, Bodicote (Policies Banbury 4 & 12)																				
BA98	West of Bretch Hill (Policy Banbury 3)			The site lies entirely within EA Flood Zone 1 and EA data shows only very small isolated areas susceptible to surface water flooding, shows as areas of 'less' susceptibility.						XX			X								
BA343	Land west Thornbury Rise, allotment gardens & Dover Ave			The site is located entirely within Flood Zone 1 and there are no watercourses on or immediately surrounding the site. Therefore, the development of the site is likely to have a negligible effect against this objective.						XX			X								
BA371	Land adjoining Dover Avenue and Thornbury Drive, Banbury																				
BA87	Milestone Farm, North of Broughton Road			The site is located entirely within Flood Zone 1 and there are no surface watercourses on or immediately surrounding the site. EA mapping shows that there is some risk of flooding from surface water runoff on the site. Therefore, the development of the site is likely to have a negligible effect against this objective.						XX			XX								
BA377	Land at Milestone Farm																				
BA360	Land to the North of Broughton Road Banbury			The site is located entirely within Flood Zone 1 and there are no watercourses on or immediately surrounding the site. Therefore, the development of the site is likely to have a negligible effect against this objective.						XX			XX								
BO22	Land south of Bodicote			The site lies entirely within EA Flood Zone 1 and there are no surface watercourses located on the site. Therefore, development of the site is likely to have a negligible against this objective.						XX											

Site Code	Site name/ description (& relevant policy number if applicable)	Homes	Flooding	Flooding Assessment in Sustainability Appraisal Matrix	Health & Well-Being	Crime	Poverty/ Social Exclusion	Vibrant Communities	Accessibility	Efficient Land Use	Air Quality	Biodiversity	Landscape / Heritage	Road Traffic	Resource Use	Waste	Water	Energy Efficiency	Employment	Economic Growth	Tourism
N/A	Area near Junction 11		X	The entire site lies within Flood Zone 1. The background OS mapping shows some small water bodies within the site; however there are no watercourses flowing through the site. The EA's uFMfSW maps illustrate that the south western corner of the site is at high risk of surface water flooding. Therefore, the development of the site is likely to have a minor negative effect against this objective.					X	XX			X?								
N/A	Southam Road – residential use			The entire site sits within Flood Zone 1. The River Cherwell and Oxford Canal are located to the east of the site. The site is brownfield and predominantly hard standing. Therefore the site is likely to have a negligible effect against this objective.				X													
N/A	Southam Road – retail and commercial use			The entire site sits within Flood Zone 1. The River Cherwell and Oxford Canal are located to the east of the site. The site is brownfield and predominantly hard standing. Therefore the site is likely to have a negligible effect against this objective.				X													
	Bolton Road (BA371) (Policy Banbury 8)			The site is located entirely within EA Flood Zone 1 and there are no surface watercourses located within or near to the site. There are no areas on the site as susceptible to surface water flooding.									X								
	Bretch Hill Regeneration Area (Policy Banbury 10)			There are no surface water courses located within the development area and the site lies within EA Flood Zone 1. EA mapping indicates some linear areas susceptible to surface water flooding, shown as areas of 'less' and 'intermediate' susceptibility running from east to west through the middle of the site, and redevelopment may provide the opportunity to reduce these areas.																	
Residential development is compatible with flood zone 1 and the total capacity of the sites in flood zone 1 allows for Banbury's housing requirements to be accommodated on these sites. However, the assessments demonstrate that development on some sites or on parts of sites would conflict with a number of sustainability objectives particularly in relation to the effects on landscape. (move to step 3). Sites at Southam Road, Drayton Lodge Farm, West of Bretch Hill, Salt Way, Bankside, north of Hanwell fields and at Bolton Road are allocated in the Local Plan for residential development . Land at junction 11 of the M40 is allocated for employment development. These allocated sites are all located in flood zone 1.																				

Step 3 - Which Sites are located in mostly Flood Zone 1 but with small areas in Flood Zones 2 and/or 3?

Site Code	Site name/ description (& relevant policy number if applicable)	Homes	Flooding	Flooding Assessment in Sustainability Appraisal Matrix	Health & Well-Being	Crime	Poverty/ Social Exclusion	Vibrant Communities	Accessibility	Efficient Land Use	Air Quality	Biodiversity	Landscape / Heritage	Road Traffic	Resource Use	Waste	Water	Energy Efficiency	Employment	Economic Growth	Tourism
BA311	Land West of Southam Road			One unnamed watercourse forms the western site boundary, falling within EA Flood Zones 2 and 3. The vast majority of the site lies within Flood Zone 1, with the only exception of an area on the western site boundary. Therefore, no impact is predicted.				X		XX			XX								
BA359	Land adjacent Hardwick Hill House and North of Hardwick Cemetery, Southam Road																				
BA310	Western portion of Banbury 2: Hardwick Farm		X	The Oxford Canal is located less than 500m from the southern border of the site and one unnamed watercourse forms the western site boundary. Both of these watercourses are represented by EA Flood Zones 2 and 3. The vast majority of the site lies within Flood Zone 1, with the only exception of an area on the western site boundary. Intensification of residential development within this western half of the site (an increase of 120 dwellings) could result in increased flood risk, with minor negative effects against this objective.				X		XX			XX								
BA363	Ex Hella Manufacturing Site, Noral Way, Banbury		X	Approximately 25% of the site is within Flood Zones 2 and 3; however the significant areas of flood risk are confined to the western and southern areas of the site meaning that some development might be able to be accommodated in the central, northern and eastern areas of the site, which are within Flood Zone 1. The southern boundary of the site is adjacent to the Oxford Canal, which is within Flood Zones 2 and 3.						X											
N/A	Land East of the M40			The site lies almost entirely within Flood Zone 1, with a small area of Flood Zone 2 (about 3%) located in the north west corner associated with the River Cherwell. EA mapping shows that a number of small areas of the site are susceptible to surface water flooding. This includes an area of high risk at the northern tip of the site and an area of high risk at the southern tip of the site. There is also an area of high risk towards the centre of the site and these three areas are connected by corridors of medium and low risk. As the area is primarily greenfield, any development within the area will increase surface water runoff (unless attenuated). Significant increases in hard standing associated with the site's new employment use could have an adverse effect on this objective; however, the overall effect will depend on implementation.					X	XX						X					

There are parts of these sites in the table above that are not in flood zone 1 but generally residential development could be accommodated in areas in flood zone 1 on these sites. However, the assessment demonstrates that development on some sites would conflict with a number of sustainability objectives including in relation to effects on landscape, transport and accessibility. (move to step 4). Land east of the M40 at junction 11 is allocated for employment development. A very small area of land at the north of the site is located in flood zone 3 and therefore an exception test is provided below showing the positive sustainability effects of development. The second part of the exception test is addressed by the Council's level 2 SFRA.

	Land north east of junction 11 (Policy Banbury 15)
SA Objective	**Sustainability**
To conserve and enhance and create resources for the District's biodiversity	There are no national or local designations on the site. However, an area designated as an Ecologically Important Landscape is located immediately north west of the site[158] which now has planning permission for development into a Country Park (Policy Banbury 14). There are areas of BAP priority habitat to the north of the site and to the west, comprising planting alongside the M40. The site possesses a low diversity of habitats and is simple in its composition both to the east and west of the M40 with a medium sensitivity to development. Development to the west of the M40 and bounded by the A361 is considered minor positive due to its contribution to reduce development pressure on sites of higher ecological sensitivity. There are no designated sites on or immediately surrounding the site. There is an area of BAP priority habitat (lowland mixed deciduous woodland) located in the north east corner of the site but this covers less than 15% of the site's total area. The site is greenfield; therefore any development on the site could have a negative impact on biodiversity, although no important habitats are located on the site. The area comprises a medium scale landscape with large fields divided by mature hedgerows and hedgerow trees with medium ecological sensitivity. A minor positive is identified due to its contribution to reduce development pressure on sites of higher ecological sensitivity.
To protect, enhance and make accessible for enjoyment, the Districts countryside and historic environment	The site is located within Natural England National Character Area 95: Northamptonshire Uplands. At a County level, the Oxfordshire Wildlife and Landscape Study identifies the site comprising two Landscape Types as Clay Vale and Upstanding Village Farmlands. At a local level, the Cherwell District Landscape Assessment identifies the site as being located within the Upper Cherwell Basin landscape character area. The site has high to low landscape sensitivity due to the proximity of the M40 and A361, and industrial development to the west of the motorway. The site has medium to high visual sensitivity. The site is assessed as having low capacity for residential development as this land use would not be in keeping with the existing agricultural land use. Development of residential properties to the east of the M40 would significantly alter the perception of the massing of the town. There is medium capacity for commercial or industrial units on the southern area to the east of the M40 up to the boundary with the A361. It would however be beneficial in landscape and visual terms if this was prevented from encroaching on the valley sides. There are no cultural heritage features located on or immediately surrounding the site. Development of this smaller site would reduce pressure for building on sites of greater landscape and visual sensitivity.
To ensure high and stable levels of employment so everyone can benefit from the economic growth of the District	The site has been proposed for employment uses and is recognised as having a medium capacity to accommodate industrial and/or commercial development with good potential access routes to the M40 and Banbury. Therefore, the site is a good candidate for new employment land in the site, with minor positive effects on this objective. The site is recognised as having a medium capacity to accommodate industrial and/or commercial development. As the site is proposed for commercial and industrial development, long term employment opportunities in the area would be generated. In addition, the construction of the site will create a significant number of jobs in the short to medium term. Perimeter and other major access roads as well as distributor roads will be constructed ensuring that the site's new uses will be integrated and well connected to existing residential, retail and employment areas.
To sustain and develop economic growth and innovation, a educated/skilled workforce and support the long term competitiveness of the District	The site has been proposed for employment uses and is recognised as having a medium capacity to accommodate industrial and/or commercial development[165] with good potential access routes to the M40 and Banbury. Therefore the site is a good candidate for new employment land in the site with potential to include training facilities, with minor positive effects on this objective. The site is recognised as having a medium capacity to accommodate industrial and/or commercial development, and it is proposed for commercial and industrial development which will generate long term employment and training opportunities in the area.

Step 4 - Which are the sites where a significant proportion of the site is located in Flood Zones 2 and/or 3?

Site Code	Site name/ description (& relevant policy number if applicable)	Homes	Flooding	Flooding Assessment in Sustainability Appraisal Matrix	Health & Well-Being	Crime	Poverty/ Social Exclusion	Vibrant Communities	Accessibility	Efficient Land Use	Air Quality	Biodiversity	Landscape / Heritage	Road Traffic	Resource Use	Waste	Water	Energy Efficiency	Employment	Economic Growth	Tourism
BA300	Canalside (Policy Banbury 1)			The River Cherwell and Oxford Canal have been identified within the site. The majority of the site lies in Flood Zones 2 and 3.1 However, in 2012, the EA completed the Banbury Alleviation Scheme and the Canalside SFRA level 2 (2013) confirms that with the implementation of the alleviation scheme and other measures, the site can be safely redeveloped without increasing flood risk elsewhere.																
BA317	Land at Higham Way			Almost the entire site sits within Flood Zones 2 and 3.82 However, in 2012, the EA completed the Banbury Alleviation Scheme and the Canalside SFRA Level 2 confirms that with the implementation of the alleviation scheme and other measures the site should be able to be safely redeveloped without increasing flood risk elsewhere.				X												
BA307	Land West of the M40 Extension and South of Overthorpe Road (includes part of Policy Banbury 6)		X	The northern half of the site is located within EA Flood Zone 1. However, the River Cherwell and Oxford Canal are located directly to the south of the site meaning that the southern half of the site lies entirely within Flood Zones 2 and 3. There are also several drainage ditches located within the site, and EA mapping indicates that much of the site is susceptible to surface water flooding and groundwater flooding. However, in 2012 the EA completed the Banbury Alleviation Scheme, and the Canalside SFRA level 2 (2013) confirms that with the implementation of the alleviation scheme and other measures, the site can be safely redeveloped without increasing flood risk elsewhere. An extension of this alleviation scheme eastwards along the River Cherwell and Oxford Canal would reduce the flood risk in the southern half of the site.						X						X				
N/A	Land West of M40 extension - Triangular parcel between the M40 to the east and railway line to the south																				
	Land adjacent to Power Park Ltd		X	The entire site is within Flood Zone 3 of the River Cherwell and Oxford Canal. Therefore, without significant mitigation measures, the site is likely to have a significant negative effect against this objective. However, in 2012 the EA completed the Banbury Alleviation Scheme and the Canalside SFRA level 2 (2013) confirms that with the implementation of the alleviation scheme and other measures, the site can be safely redeveloped without increasing flood risk elsewhere. An extension of this alleviation scheme eastwards along the River Cherwell and Oxford Canal would reduce the flood risk in the site. Furthermore, the proposed use for the site, i.e. railway infrastructure, is considered to have considerably more limited vulnerability to flooding compared to other more common land uses such as residential dwellings and employment land.										X						

The development of Canalside and land at Higham Way would lead to limited conflicts with sustainability objectives, however as the sites remain mainly in flood zones 2 and 3 on the EA map (despite being defended) an exception test is required and is set out below. The development of land adjacent to Power Park would have negative effects and would not provide significant wider sustainability benefits. Land west of the M40 (including the extension of land) is allocated in the Local Plan for employment uses. This site was assessed through an exception test assessment for the Submission Local Plan in January 2014. The assessment has been updated below to reflect the extension proposed.

	Land west of the M40 Banbury (Policy Banbury 6)
SA Objective	**Sustainability**
To improve accessibility to all services and facilities	The site is easily accessible from the M40, and also lies within 500 m of the railway station. It is located within 500 m of a primary school, in Grimsbury, and lies adjacent to existing employment areas. It is located approximately 1 km from Banbury town centre. Development of the site for employment uses could improve accessibility to employment for existing residents, and some of the employment uses may include community services and facilities.
To reduce air pollution including reducing greenhouse gas emissions and ensure the District is ready for its impacts	The site is located directly adjacent to the M40 a source of significant air pollution. However, sustainable transport options could be encourage due to the sites reasonably close proximity to the town centre and railway station. Furthermore, the site also has good access to public rights of way. A bus service could be provided around the development.
To conserve and enhance and create resources for the District's biodiversity	There are no statutory biodiversity designations within the site. Two areas of BAP priority habitat sit within the site, within the northern half and extending along the dismantled railway line. The site area comprises a simple landscape with little in terms of landscape or ecological features. The remains of removed buildings offer some value in ecological terms and the land is included within the River Cherwell Ecologically Important Landscape. The natural regeneration of vegetation within the site is dominated by pioneer species and currently appears to have limited diversity. The sensitivity of natural factors is therefore considered to be Medium to Low. Development may provide the opportunity to enhance the areas of BAP priority habitat immediately south of the site along the waterways.
To protect, enhance and make accessible for enjoyment, the Districts countryside and historic environment	The site is located within Natural England National Character Area 95 Northamptonshire Uplands. At a county level, OWLS identifies the site as being within the Urban and Clay ValeLandscape Type. At a local level, the Cherwell District Landscape Assessment identifies the site as being located within the Cherwell Valley character area. The combined Landscape Sensitivity of the site is Medium to Low. Although there is a high capacity to development in general, the site would not lend itself to residential development due to external influences such as the railway line and inaccessibility created by the railway line and River Cherwell – thus there is a Medium to Low capacity for residential development. However, there is a High capacity for industrial and commercial development which can tie in with the surrounding industrial estates and make use of the existing infrastructure . Public footpaths run along the eastern and western boundaries of the site and a footpath crosses the southern portion of the site. A scheduled ancient monument is located to the east, separated from the site by the M40, and Grimsbury Conservation Area is also located approximately 250 m north west of the site.
To reduce road congestion and pollution levels by improving travel choice, and reducing the need for travel by car / lorry	Due to the location of the site approximately 1.5 km from Banbury town centre and close to existing employment areas, sustainable transport methods should be encouraged. Sustainable travel patterns are likely to increase due to access to high quality pedestrian infrastructure that is in place.
To ensure high and stable levels of employment so everyone can benefit from the economic growth of the District	The site is recognised as having a high capacity to accommodate light industrial development151 with good access routes and an industrial site to the west of the site. Therefore the site is a good candidate for new employment land and with the extended area could make a contribution to employment land within the district.
To sustain and develop economic growth and innovation, a educated/skilled workforce and support the long term competitiveness of the District	As above, the site is recognised as having a high capacity to accommodate light industrial development with good access routes and an industrial site to the west of the site. Therefore the site is a good candidate for new employment land with potential to include training facilities.

Banbury Canalside and Land at Higham Way

5.2 The following paragraphs provide background information about Banbury Canalside and land at Higham Way and set out how the requirements of the exception test have been met.

5.3 The SFRA for Canalside and for land at Higham Way sets how the flood risk for Canalside and at Higham Way has been assessed, taking the Flood Alleviation Scheme (FAS) into account. The SFRA's show that it will be safe to redevelop the sites for residential use if measures are put in place.

5.4 The Council has produced a draft SPD and work has been produced for the Banbury Masterplan for Banbury Canalside. The design of development on the site will be influenced by the measures proposed in food risk assessments for Canalside. Following future consultation on the Banbury Masterplan with the EA the Council will set out how it has considered the SFRA in the adopted Masterplan and/or SPD. A further site specific FRA will however also be required in conjunction with any planning application for the site.

Canalside

5.5 The Canalside site is 26ha of land between Banbury town centre and the railway station. It is located on previously developed land to the east and close to Banbury town centre near to services and facilities. The bus station is located very close to the site.

5.6 Site Characteristics/Issues include:

- The river Cherwell and Oxford Canal run through the centre of the site.
- Largely in industrial use; mostly low quality, some parts are vacant or poorly occupied and are used for low value and/or temporary use.
- Other uses include the railway station, operational railway land, oil storage, football club, office accommodation, petrol stations, sewage pumping station, residential, a caravan site, a day nursery, a play centre and a small number of retail units.
- Contamination from past industrial use.
- No statutory or non-statutory designated sites of ecological value within the site.
- Two listed structures on the site and a number of 19th century canal wharf related buildings.

- There are public rights of way throughout the site but access and permeability are limited.

5.7 The site is considered to be the most sustainable strategic development site in the District particularly in terms of its accessibility to services and facilities and the opportunity it provides for the re-use of previously developed land.

5.8 In recent years there have been a number of flood events in Banbury. In order to address this, a Flood Alleviation Scheme (FAS) has been constructed by the Environment Agency and supported by the Council. This will mean more of Banbury is defended against flooding. The Canalside site is only viable in terms of flood risk as a development site for the Local Plan due to the implementation of the FAS.

5.9 Some of the Canalside site is located in flood zone 3b. The Flood Alleviation Scheme currently will not change this EA map classification. However, the Environment Agency has agreed that the FAS can be taken into account in the consideration of flood risk and that effectively the Council can consider parts of the site no longer in flood zone 3b. Modelling in the SFRA shows that the FAS has the effect of reducing the flood risk on the site.

Higham Way

5.10 This site is a former waste management facility and concrete batching plant and is located to south east of Banbury town centre. The site is bounded by residential to the north east, railway lines to the west, Town Council allotments and grazing land to the south, a number of commercial/industrial sites to the south west, and grassed amenity land to the south east. A replacement waste management site for Grundons has been approved nearby. The Cemex site had been cleared and is surplus to requirements. The access road (Higham Way) is in the process of being adopted and the site was marketed for a mixed use development in 2013.

5.11 The site is within Flood Zone 2 and 3. A Flood Alleviation Scheme (FAS) to the north of Banbury was completed in 2012 and a large part of the site falls within the defended area.

5.12 In principle the site offers a suitable location for development, and would contribute to the creation of sustainable and mixed communities. The site is close to the town centre and railway stations and in need of bringing back into effective use. However, there are current physical constraints that need to be overcome before development can be progressed. These include addressing the potential for land contamination from the previous use, and noise mitigation measures to reduce noise impact from the railway for future residents.

5.13 The following table sets out how the re-development of Banbury Canalside and Higham Way would provide wider sustainability benefits for Banbury and the District. These proposals will also help address the issues at Canalside described above.

	Banbury Canalside (Policy Banbury 1)	**Land at Higham Way (Policy Banbury 19)**
SA Objective	**Sustainability**	**Sustainability**
To ensure everyone has the opportunity to live in a decent, sustainably constructed and affordable home	Despite a reduction in the overall number of homes proposed to be supported on this site (a reduction of 250 homes down to 700), it will still make a significant contribution to the objectively assessed need. This site offers a unique opportunity for innovative design solutions to achieve this.	The site has capacity to contribute a moderate number of homes, which would make a contribution to the objectively assessed need.
To improve the health and well-being of the population & reduce inequalities in health	The majority of the site lies within Banbury Grimsbury and Castle ward. Grimsbury and Castle has an existing deficiency in children's playspace, tennis courts and allotments and in natural/semi-natural and amenity greenspace. The 2013 LSCA indicates the site has a low capacity for recreational development due to the urban site context but a medium capacity for development associated with the recreational route of the Oxford Canal and the River Cherwell as it passes through the town centre which has	The site lies within Banbury Grimsbury and Castle ward. Grimsbury and Castle has an existing deficiency in children's playspace, tennis courts and allotments and in natural/semi-natural and amenity greenspace. The site does not contain any formal open spaces, although the Cattle Market Sports Pitches are adjacent to the site. If some amenity space and/or a Local Area of Play were to be provided as part of the housing development (in line with Council policy), then there is some potential to improve the health and well-being of the population and the redevelopment

	the potential to be enhanced as a linear park. There is the potential to improve health and well-being of the population through the development of the site. It is not proposed to provide health care services within Canalside as there are many GP surgeries and other primary care facilities close to the site. There will be provision of public open space, primarily in the form of a new linear park along the River Cherwell and the retention and improvement of the canal towpath. Lower than average car ownership and/or usage due to the sites town centre location will result in significantly higher numbers of journeys to work, leisure and retail trips being undertaken on foot or bike or by public transport.	of the site for housing is likely to result in a minor positive effect against this objective.
To reduce poverty and social exclusion	The site has high capacity for employment development and a medium-low capacity for residential development. Provision of new employment development on the site would have the potential to reduce poverty and social exclusion and redevelopment of this site would contribute to area regeneration. There will be provision of affordable housing, public open space, leisure facilities and other community facilities, which will have the effect of helping to reduce poverty and social exclusion. The site is located very near to one of the most deprived parts of the District (Grimsbury). The land uses proposed above and the design principle proposed will help improve this area of Banbury.	Provision of new housing development on the site would have the potential to reduce poverty and social exclusion contributing to the overall regeneration of the area. Therefore a minor positive effect is recognised against this objective. .

To reduce crime and disorder and the fear of crime	The site is comprised of previously developed land, including the Banbury Railway Station, The Tramway Industrial Estate, Banbury United FC and is an area of light industry/manufacturing. The regeneration of this site and the creation of better designed facilities would help improve the satisfaction of people with their neighbourhoods and would have a positive impact in relation to reducing crime and the fear of crime. The site is comprised of previously developed land and is an area of light industry/manufacturing. The regeneration of this site and the creation of masterplanned community complete with connections to neighbouring local amenities and employment land would help improve the satisfaction of people with their neighbourhoods and would have a minor positive impact in relation to reducing crime and the fear of crime. The draft SPD makes clear that high quality design solutions will be required, which will help to design out crime.	The site is comprised of previously developed land and is an area of light industry/manufacturing. The regeneration of this site and the creation of better designed facilities would help improve the satisfaction of people with their neighbourhoods and would have a positive impact in relation to reducing crime and the fear of crime.
To create and sustain vibrant communities and engage cultural activity across all sections of the Cherwell community	There will be a masterplan for the whole site in order to help deliver a comprehensive scheme. There will be a significant change of use of Canalside from primarily industrial to residential. The draft SPD anticipates a new sustainable community being created with a strong sense of place derived from new land uses blended with existing environmental assets and parts of the site's historical legacy. There will be a mix of commercial uses on the northern part of the site including the creation of a new canal basin that can provide a focus for canal-based and other cultural	No positive effects recorded

	events in the town. The SPD sets out that proposals can make a significant improvement to the appearance of the eastern edge of the town centre and to existing environmental and heritage assets on the site.	
To improve accessibility to all services and facilities	The site lies immediately adjacent to Banbury town centre with a small area of the north eastern part of the site falling within the town centre. The site is in close proximity to existing commercial and employment development in the town centre and eastern part of the town. The railway station is located on the eastern site boundary. Canalside is therefore in a highly accessible location. There are two recycling points located within the site boundary, and Banbury FC is located in the southern area of the site. Redevelopment should help improve connectivity within the town centre, enhance the Canalside and riverside and provide a range of new facilities and services. The Canalside site is in a highly sustainable location for major development, given its proximity to the town centre, bus station and railway station. The SPD anticipates that a high proportion of future households at Canalside will be attracted to live there for these specific benefits.	The site lies adjacent to Banbury town centre on the other side of the railway line and is therefore in close proximity to a range of existing local services and facilities, including a school, allotment and sports ground. In addition, many existing commercial and employment developments are close by. The railway station is located on the western site boundary. The site is therefore in a highly accessible location. Due to its size, the site is unlikely to be able to provide new services and facilities in addition to housing, apart from amenity space and a Local Area of Play. Due to its location however, development for housing should have a positive effect against this objective, improving connectivity with the town centre to the west, enhancing the canalside and riverside.
To improve efficiency in land use through the re-use of previously developed land and existing buildings,	The site comprises developed land; therefore, any development of the site would meet the objectives of re-using previously development land and would have the potential for re-use of buildings. Development of the site would also provide the opportunity to contribute to urban renewal.	The site comprises previously developed land; therefore, any development of the site would meet the objectives of re-using previously developed land and would have the potential for re-use of buildings. Development of the site would also provide the opportunity to contribute to urban renewal, and may help to remediate potentially contaminated land.

including the re-use of materials from buildings, and encouraging urban renaissance	This site is unique as a strategic development site, allowing for the re-development of previously developed land in a town centre location. The SPD proposes the re-use of historically significant buildings and makes use of and enhances the existing canal and river corridors, nearby open space, roads and other infrastructure. Proposals in the SPD will remove existing poor quality buildings replacing these with well designed innovative homes and other land uses to help improve the town centre and nearby neighbourhoods.	
To reduce air pollution including reducing greenhouse gas emissions and ensure the District is ready for its impacts	Redevelopment of the site would promote walking and cycling and reduce the need to travel, as the site is located adjacent to the existing town centre with the small north eastern edge of the site falling with the town centre. In addition, Banbury railway station is located on the eastern site boundary. There is potential for good connectivity given the site's location and range of existing, uses nearby, which would limit the need to travel. Canalside is located in an edge of town centre location close to the railway station. The SPD proposes a new bus route through the site, reduced parking standards and pedestrian and cycle routes. All of these will contribute towards reducing the need to travel by private car, reducing air pollution from this source. The SPD sets out how development proposals will have to consider how to reduce energy demand by applying passive design principles and energy efficiency measures. Development proposals consider how to deploy suitable efficient supply technologies to achieve best practice and efficient use of fuels where applicable, for example by using waste heat	Redevelopment of the site would promote walking and cycling and reduce the need to travel, as the site is located close to the existing town centre. In addition, Banbury railway station is located on the western site boundary. There is potential for good connectivity given the site's location and range of existing uses nearby, which would limit the need to travel.

	from power generation via a decentralised energy approach. This will reduce demand from centralised sources most of which contribute to air pollution. Banbury Canalside has greater potential than other potential Strategic Sites to extend any proposed community energy network to the existing stock due to its proximity to the town centre which forms the densest part of Banbury.	
To conserve and enhance and create resources for the District's biodiversity	An Ecologically Important Landscape covers the southern area of the site, extending further south.5 However, there are no BAP Priority Habitats located on the site. Generally, the ecological sensitivity of the site has been deemed to be low. Development of this site would reduce the pressure of green field development and development on sites of greater landscape and visual sensitivity. Also, there is the potential for ecological enhancement, in connection with the Canal and River Cherwell, which flow through the centre of the site. There are no statutory or non-statutory designated sites of ecological value within the site or the immediate wider area. Development of the Canalside area provides a unique opportunity to enhance the biodiversity and ecological value of the site through improvements to the River Cherwell and The Oxford Canal corridors.	There are no ecological designations or BAP Priority Habitats located on the site. Development of this site would reduce the pressure of green field development and development on sites of greater ecological sensitivity. Also, there is the potential for ecological enhancement, in connection with the Canal, which borders the site.
To protect, enhance and make accessible for enjoyment, the Districts countryside and historic	The site is located within Natural England National Character Area 95: Northamptonshire Uplands. At a county level, the Oxfordshire Wildlife and Landscape Study identifies the site as being in the Urban Landscape Type. The landscape sensitivity has been assessed as low	The site sits within the urban fringe of Banbury close to the town centre and therefore has not been assessed for its landscape sensitivity and capacity. However, there is still potential for the development of the site to have effects on townscape and built and buried heritage in and around the site. There are no designated heritage assets within the site;

environment	sensitivity and the visual sensitivity has been assessed as medium–low sensitivity. There is a high capacity for development within the site area with medium capacity for residential development as part of a mixed use development, and high capacity for employment development. There are two Grade II listed buildings located within the site boundary; however, there are no nationally designated sites of heritage importance. There are also a number of non- designated historical assets of which three are located within the site. All the above are already affected by the presence of existing development; therefore, no significant impacts are expected against the baseline. The majority of the site west of the Oxford canal is covered by the Oxford Canal Conservation Area. However, the LSCA 2013 indicates a low cultural sensitivity to development. Development on the site would offer the potential for improvements to access to the countryside through improvements to the river canal corridor. Development at Canalside will reduce the need to allocate land on the edge of Banbury, a significant proportion of which is of high landscape value. The development proposals will allow for the site to be linked with other green infrastructure in Banbury, such as Spiceball park and Bankside and the Cherwell valley. The SPD proposes to retain and refurbish existing historically important buildings and structures and create an appropriate setting for existing them.	however, the Grimsbury Conservation area runs along the northern boundary of the site. The Conservation Area is already affected by the presence of existing development on the site; therefore, as long as new development was in keeping with the setting of the conservation area no significant negative effects are expected against the baseline. Indeed, well designed development, in keeping with the adjacent Conservation Area, could have a positive effect on the setting of the Conservation Area. The site is a brownfield land previously used for commercial and industrial uses. Furthermore, the site is sandwiched between two industrial/commercial sites. Therefore any new development on site should complement these existing uses. Development on the site would offer the potential for improvements to access to the countryside through improvements to the river canal corridor.

To reduce road congestion and pollution levels by improving travel choice, and reducing the need for travel by car / lorry	The A4260 Cherwell Street runs along the northern boundary of the site. It is likely that traffic generated would be accommodated by the local road network. The site is located close to existing commercial and employment development in the centre and eastern parts of the town. This could potentially reduce travelling distances and enable sustainable transport modes such as walking, cycling and public transport. Since the site is adjacent to Banbury town centre with its eastern boundary comprising the railway station and Sustrans National Cycle route 5 and the Banbury Circular Walk/Oxford Canal Trail crossing the site, it is anticipated that sustainable transport measures could be introduced, in order to reduce car use and improve travel choice. Canalside is located in an edge of town centre location close to the railway station. The SPD proposes a new bus route through the site, reduced parking standards and pedestrian and cycle routes. All of these will contribute towards reducing the need to travel by private car, reducing air pollution from this source. There may be increase in traffic in this area of the town. A Transport Assessment and Travel Plan will be required as part of a planning application. There may be an opportunity to transport other goods and services associated with the proposed land uses at Canalside on the canal, which could reduce the need to travel by road.	Higham Way runs along the south western boundary of the site. It is likely that traffic generated would be accommodated by the local road network. The site is located close to existing commercial and employment development in the centre and eastern parts of the town. This could potentially reduce travelling distances and enable sustainable transport modes such as walking, cycling and public transport. The site is very close to the existing town centre of Banbury and its western edge borders the Banbury railway station. Therefore, it is anticipated that sustainable transport measures could be introduced, in order to reduce car use and improve travel choice.
To reduce the global, social and environmental impact of consumption of resources by using sustainably	The SPD sets out how development proposals will have to consider how to reduce energy demand in the first instance, by applying passive design principles and energy efficiency measures. Development proposals consider how to deploy suitable efficient supply technologies to achieve best practice and efficient use of fuels where applicable, for example by using waste heat	No positive effects recorded

produced and local products.	from power generation via a decentralised energy approach. This will reduce demand from centralised sources most of which contribute to air pollution. Banbury Canalside has greater potential than other potential Strategic Sites to extend any proposed community energy network to the existing stock due to its proximity to the town centre which forms the densest part of Banbury. Allotments and gardens on the site will allow for the opportunity to grow produce locally.	
To maintain and improve the water quality of the District's rivers and to achieve sustainable water resources management	The intrusive investigation carried out has identified strong evidence of hydrocarbon contamination on a number of the parcels within the site, particularly within the fuel distribution depot on the east bank of the River Cherwell. This may be resulting in pollution to the river Cherwell. Development proposals will provide the opportunity to remove any potential pollution.	No positive effects recorded
To increase energy efficiency, and the proportion of energy generated from renewable sources in the District	Banbury Canalside has greater potential than other potential Strategic Sites to extend any proposed community energy network to the existing stock due to its proximity to the town centre which forms the densest part of Banbury. The SPD sets out the potential to consider a form of low carbon cooling via water source cooling to buildings. The location of the site close to the river and canal may allow for this.	No positive effects recorded
To ensure high and stable levels of employment so everyone can benefit from the economic growth of	The site is large enough to accommodate commercial and employment land, new community facilities and local services, all of which will generate long term employment opportunities in the area. In addition, the construction of the site will create a significant number of jobs in the short to medium term.	The site may be able to accommodate some new community facilities and local services to service any new dwellings on site which will generate long term employment opportunities in the area. In addition, the construction of the site will create a significant number of jobs in the short to medium term.

the District	Distributor roads will be constructed ensuring that the site's new mixed uses will be integrated and well connected to existing residential, retail and employment areas. The site is located close to the town centre, a supermarket, the hospital and County Council offices which provides many employment opportunities. Existing employment opportunities located to the north and east of the town are relatively accessible from the Canalside site. Many of the buildings on site are of poor quality. Proposals for Canalside include provision for the retention of businesses or the relocation of existing businesses to new improved, more accessible premises. Jobs will be created in the town centre uses proposed on the site and through the regeneration of central Banbury.	Distributor roads will be constructed ensuring that the sites new mixed uses will be integrated and well connected to existing residential, retail and employment areas.
To sustain and develop economic growth and innovation, a educated/skilled workforce and support the long term competitiveness of the District	The site is large enough to accommodate commercial and employment land, new community facilities and local services, all of which will generate long term employment and training opportunities in the area. The site is located close to the town centre, a supermarket, the hospital and County Council offices which provides many employment opportunities. Existing employment opportunities located to the north and east of the town are relatively accessible from the Canalside site. Many of the buildings on site are of poor quality. Proposals for Canalside include provision for the retention of existing businesses or the relocation of existing businesses to new improved, more accessible premises. Jobs will be created in the town centre uses proposed on the site and through the regeneration of central Banbury.	The site may be able to accommodate some new community facilities and local services to service any new dwellings on site which will generate long term employment and training opportunities in close proximity to the centre of Banbury.

To encourage the development of buoyant, sustainable tourism sector.	The regeneration of this town centre site would provide improved facilities and an improved sense of place, which would enhance the attractiveness of the town centre to visitors. The regeneration of the site close to the town centre would provide improved facilities and an improved sense of place, particularly in the vicinity of the railway station, which would enhance the attractiveness of the town centre to visitors.	The regeneration of the site close to the town centre would provide improved facilities and an improved sense of place, particularly in the vicinity of the railway station, which would enhance the attractiveness of the town centre to visitors.

Sites for Retail and Town Centre Uses

5.14 The Council has identified three potential locations to accommodate retail and other town centre uses. They include:

5.15 Land at:

- Bolton Road
- Canalside (northern part)
- Spiceball

5.16 The following table sets out the flood risk for each site and where development of the site would result in significant positive and negative effects. (There are no significant negative effects) The full assessment is set out in the SA report.

5.17 Despite the differences in relation to flood risk shown, all the sites are considered sustainable due to their central location. The Council's Retail Study identifies a significant need for retail and leisure development. It identifies over 60,000 sq metres of capacity for retail comparison floor space in the District to 2031. The Council therefore considers all these sites are needed for the Local Plan.

5.18 There are no other strategic sites suitable sites for these uses in Banbury. Using other sites would involve demolition of existing uses and/or the use of land outside the town centre, including potentially greenfield land at the edge of Banbury which would generally be less sustainable. (Other sites are being considered for the Banbury Masterplan and for the Local Plan part 2).

5.19 Development is needed at Spiceball but an exception test is required due to the flood risk in this location and this is set out below.

Sequential Test

	Bolton Road (Policy Banbury 8)	Canalside (Policy Banbury 1)	Spiceball (Policy Banbury 9)
Flood Risk			
	The site is located entirely within ES Flood Zone 1 and there are no surface watercourses located within or near to the site. There are no areas on the site shown as susceptible to surface water flooding.	The River Cherwell and Oxford Canal have been identified within the site. Both of these watercourses are represented by EA Flood Zones 2and 3, and the majority of the site lies in Flood Zones 2 and 3. However, in 2012, the EA completed the Banbury Alleviation Scheme and the Canalside SFRA level 2 confirms that with the implementation of the alleviation scheme and other measures the site can be safely.	The Oxford Canal forms the western site boundary and the River Cherwell forms the eastern site boundary. The site lies within EA Flood Zones 2 and 3, and much of the site is covered by areas shown as susceptible to flooding from surface water run-off, as areas of 'more' and 'intermediate' susceptibility. Therefore, any new development on the site would need to take account of flood protection measures.
Sustainability			
To improve accessibility to all services and facilities	The site is located in central Banbury, close to existing facilities. It is therefore in a highly accessible location. There is a recycling point located on the site, and the site is approximately 180 m east of Peoples Park and approximately 200 m west of Castle Quay Shopping Centre. The site is in close proximity to existing commercial and employment development in the town centre and eastern part of the town. Redevelopment should help improve connectivity within the town centre.	The site lies immediately adjacent to Banbury town centre with a small area of the north eastern part of the site falling within the town centre. The site is in close proximity to existing commercial and employment development in the town centre and eastern part of the town. The railway station is located on the eastern site boundary. Canalside is therefore in a highly accessible location. There are two recycling points located within the site boundary, and Banbury FC is located in the southern area of the site. Redevelopment should help improve connectivity within the town centre and enhance the canalside and riverside.	This location is highly sustainable as it is close to the town centre and the bus station is located on the site's southern boundary. In addition, the train station, leisure facilities, schools and employment opportunities are all located within the town centre.

To improve efficiency in land use through the re-use of previously developed land and existing buildings, including the re-use of materials from buildings, and encouraging urban renaissance	The development of this site would achieve this objective as much of the site is on previously developed land. Due to its close location to the town centre it would help in achieving urban regeneration.	The site comprises developed land; therefore, any development of the site would meet the objectives of re-using previously development land and would have the potential for re-use of buildings. Development of the site would also provide the opportunity to contribute to urban renewal.	The site is previously developed and any development on the site would achieve urban regeneration and would have the potential for re-use of buildings. Development would also require the remediation of any contaminated land.
To reduce road congestion and pollution levels by improving travel choice, and reducing the need for travel by car / lorry	The site is located within Banbury town centre and development in this location may help to reduce road congestion and provide improved connectivity/accessibility. It would potentially reduce distances to travel to work and would enable sustainable transport modes such as walking, cycling and public transport.	Redevelopment of the site would promote walking and cycling and reduce the need to travel, as the site is located adjacent to the existing town centre with the small north eastern edge of the site fallen with the town centre. In addition, Banbury railway station is located on the eastern site boundary. There is potential for good connectivity given the site's location and range of existing, uses nearby, which would limit the need to travel.	The site is located near the town centre and within 500m of the railway station which should reduce the need for private car. The sites accessibility also lends itself for people to walk or cycle, using the canal towpath.

Spiceball

5.20 The site has planning permission for a supermarket and other town centre uses. The draft Local Plan sets out policy requirements for the site. Development of the site will lead to wider sustainability benefits as follows:

- Contribute towards creating a linear park through Banbury

- Make use of the currently un-occupied and unsightly site of the former Spiceball leisure centre
- Make use of previously developed land
- Provide development in a sustainable town centre location in close proximity to sustainable modes of transport
- Preserve and enhance the canal corridor and provide an opportunity to make the most of the canal at Banbury
- Provide better public access to the river and canal
- Potentially provide new homes (potential for flats above commercial uses)
- Lead to the refurbishment of the Mill theatre
- Improve the public realm
- Provide retail and town centre uses
- Contribute to the overall improvements to central Banbury
- Create jobs and lead to economic growth

5.21 Flood risk assessment work has been prepared for the Spiceball site and the Environment Agency have worked with the Council, landowners and agents on this site to ensure development will be safe. Development will be located and designed considering flood risk on the site.

6.0 Former RAF Upper Heyford

Step 1 - Where are the potential strategic sites for development?

UH001 Former RAF Upper Heyford (Policy Villages 5) including site UH004
Land abutting the south and eastern boundary of Former RAF Upper Heyford (UH002, UH003, UH005)

Step 2 – Which sites are located wholly in Flood Zone 1 (lower probability of Flooding)?

Site Code	Site name/ description (& relevant policy number if applicable)	Homes	Flooding	Flooding Assessment in Sustainability Appraisal Matrix	Health & Well-Being	Crime	Poverty/ Social Exclusion	Vibrant Communities	Accessibility	Efficient Land Use	Air Quality	Biodiversity	Landscape / Heritage	Road Traffic	Resource Use	Waste	Water	Energy Efficiency	Employment	Economic Growth	Tourism
UH1	Former RAF Upper Heyford (Policy Villages 5)			The entire site sits within Flood Zone 1. Some small unnamed watercourses are located on the edges of the site but they pose no significant flood risk.283 The uFMfSW maps illustrate minimal surface water flooding from the 1 in 30 year flood event and 1 in 100 year rainfall event to a maximum depth of 0.60 m to 0.90 m. In a 1 in 1000 year flood event there are corridors of flooding across the site which concentrate towards the southern boundary. EA and CDC HFMs illustrate no historical incidents of surface water flooding have been reported at the site. Therefore, the development of the site is likely to have a negligible effect against this objective.								XX	XX							
UH004	Site within UH1/Policy Villages 5 boundary																				
N/A	Land abutting the south and eastern boundary of Former RAF (includes UH002, UH003 and UH005)			The entire site sits within Flood Zone 1. Some small unnamed watercourses are located on the edges of the site but they pose no significant flood risk.293 The uFMfSW maps illustrate minimal surface water flooding from the 1 in 30 year flood event and 1 in 100 year rainfall event to a maximum depth of 0.60 m to 0.90 m. In a 1 in 1000 year flood event there are corridors of flooding across the site which concentrate towards the southern boundary. EA and CDC HFMs illustrate no historical incidents of surface water flooding have been reported at the site. Therefore, the development of the site is likely to have a negligible effect against this objective.						XX		X	X							
UH002	Land north of Camp Road, RAF Upper Heyford																				
UH003	Land at Upper Heyford																				
UH005	Heyford Leys Caravan Park																				
The site at the Former RAF Upper Heyford is in flood zone 1 and has scope to accommodate dwellings on this basis. However due to the significant historical constraints on the site, effects on biodiversity and potential transport impact the level of development on this site should be restricted.																					

7.0 Conclusions

7.1 There is land at Bicester in flood zone 1 to in theory accommodate the new homes needed at Bicester to 2031 on sites considered to be reasonable options. However, the Council's Sustainability Appraisal and other evidence shows that some of these sites are less sustainable and development of other sites will provide wider sustainability benefits to the community. Land at South East Bicester and Gavray Drive score positively against a number of sustainability objectives despite the flood risk in these locations. A significant proportion of the Bicester Gateway and North East Bicester sites have a high probability to flood but development of the sites would be generally sustainable in relation the sustainability objectives. Development is necessary to meet local employment needs and to ensure Bicester becomes a more sustainable location. Consideration of flood risk and mitigation of any negative effects will be a requirement of site policies in the Local Plan.

7.2 There is land at Banbury in Flood Zone 1 to in theory accommodate the development needed at Banbury to 2031 on sites considered to be reasonable options. However, the Council's Sustainability Appraisal and other evidence shows that some of these sites are less sustainable and other sites will provide wider sustainability benefits to the community such as development at Canalside. Without defences there is a high probability of flooding at Canalside and Higham way but development of the sites would be sustainable in relation to a significant proportion of the Council's sustainability objectives. Development at Canalside and at Higham Way is necessary to regenerate and improve Banbury. The implementation of the Flood Alleviation Scheme reduces the probability of flooding at Canalside significantly and future development is shown to be safe for future residents. Some of the land at the extended employment site west of the M40 has a high probability of flooding but development on this site would be generally sustainable in relation the sustainability objectives including providing for economic growth. Land north east of Junction 11 of the M40 contains a very small parcel of land which has a high probability of flooding. Development is necessary to meet local employment needs and to ensure Banbury remains a sustainable location. Mitigation of any negative effects will be a requirement of site policies in the Local Plan. Development at Spiceball, Banbury, is sustainable and allows for the delivery of particular planning benefits and therefore, despite its high potential to flood, is needed to deliver these. However, all the site options assessed in Banbury town centre are sustainable. Consideration of flood risk and mitigation of any negative effects will be requirement of site policies in the Local Plan.

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