

Technical note

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

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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

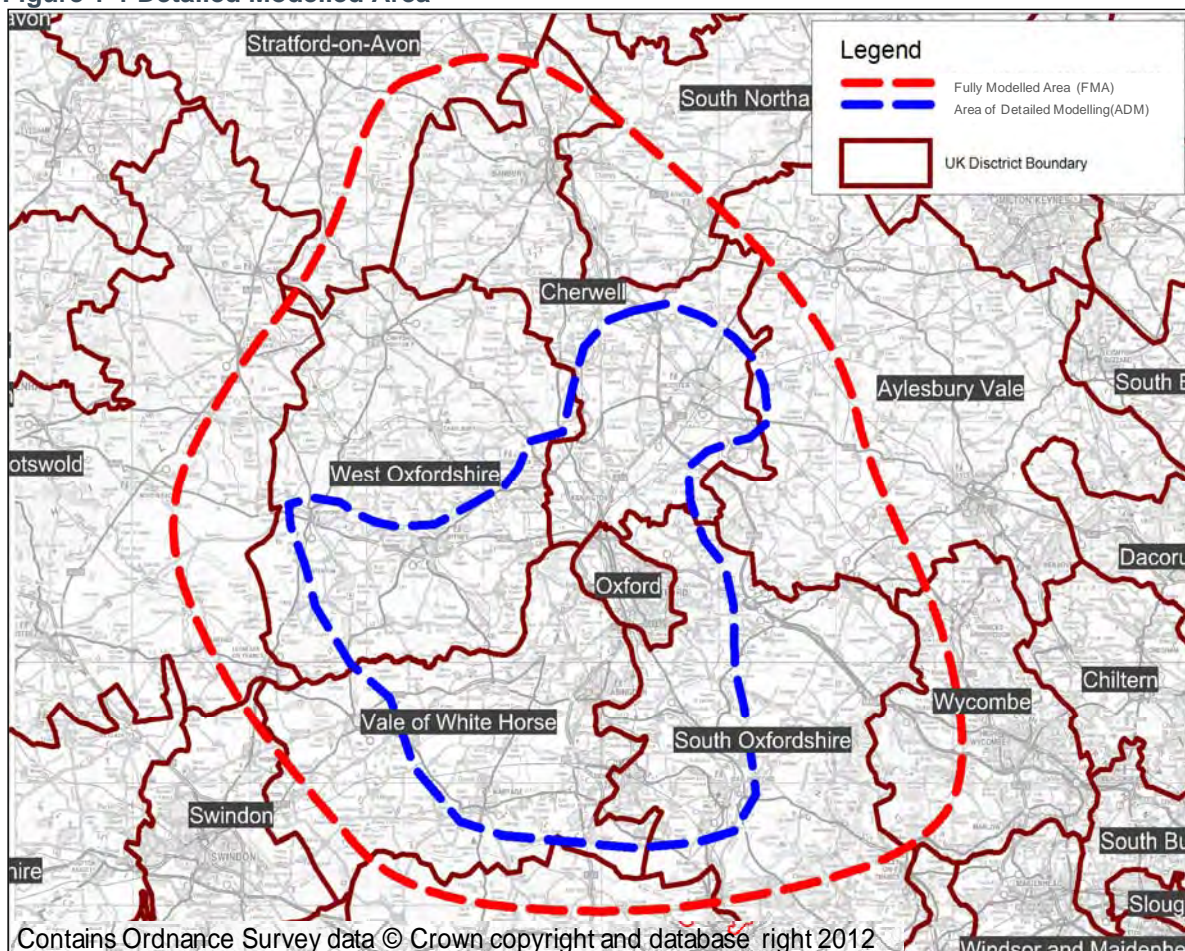
The work is based on the new Oxfordshire Strategic Model (OSM). The base model has recently been completed and early forecasts for 2031 have been finalised. The OSM covers the strategic links in Oxfordshire and has a detailed modelled area and fully modelled area shown in Figure 1-1.

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.

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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

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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.

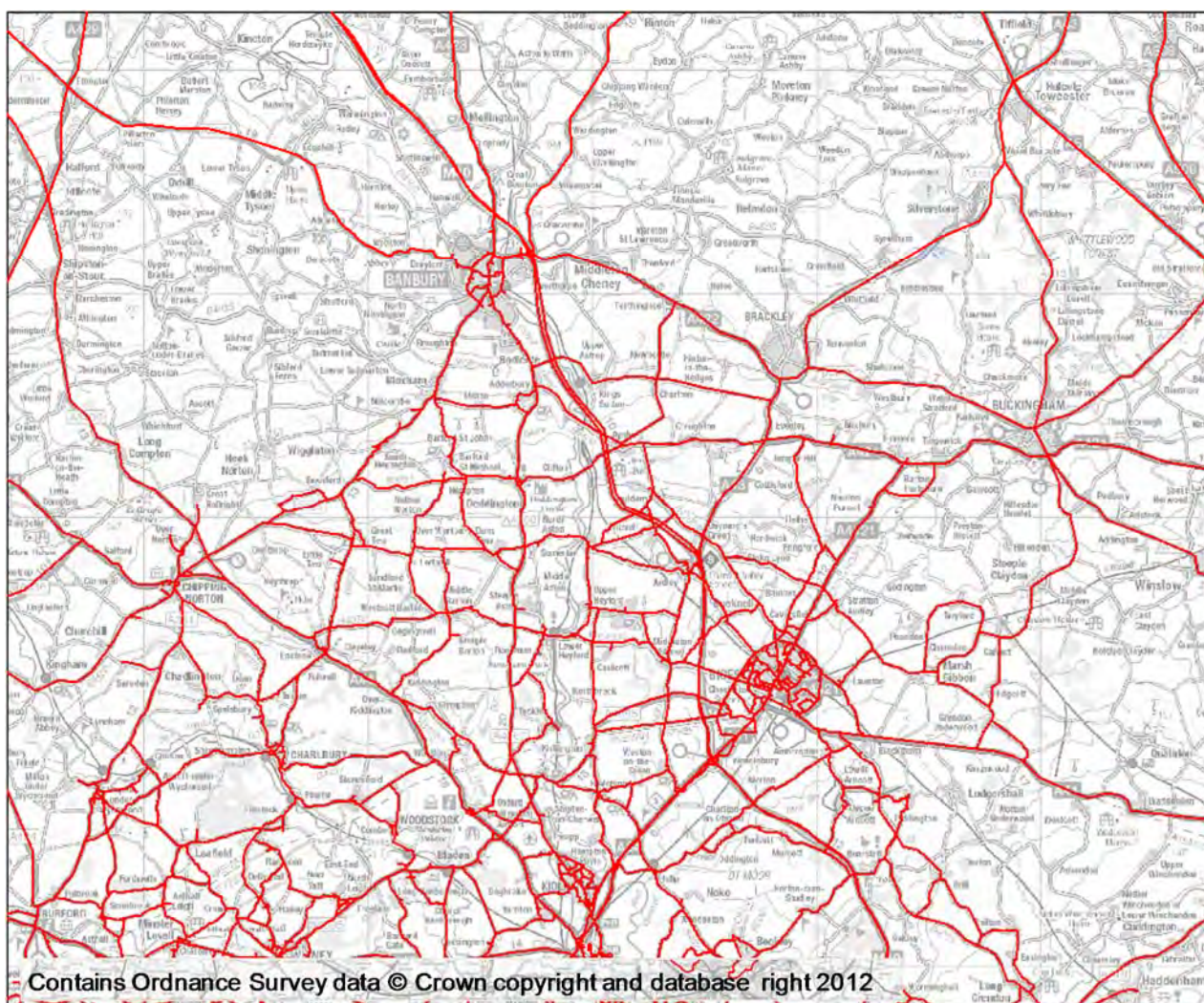
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2. Base Year 2013

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



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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

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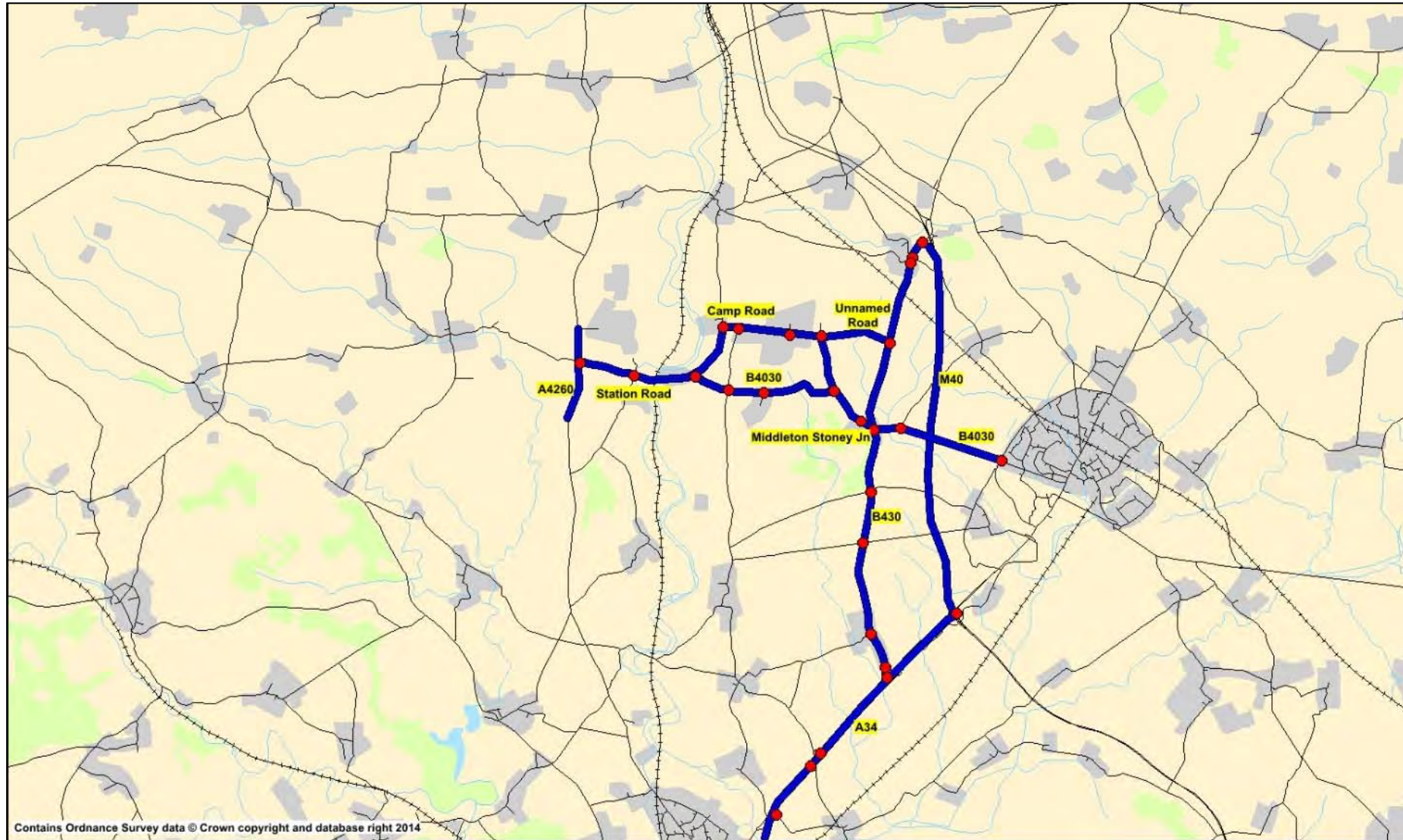
Time	Metric	Results	Unit
	Delay	421.7	Pcu Hr
	Total distance	539370.6	Pcu KM
	Speed	79.0	KM/h
Evening Peak Hour	Total Time	11057.2	Pcu Hr
	Delay	1631	Pcu Hr
	Total distance	745919.4	Pcu KM
	Speed	67.5	KM/h

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%).

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Figure 2-2 Upper Heyford Area of Assessment



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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.

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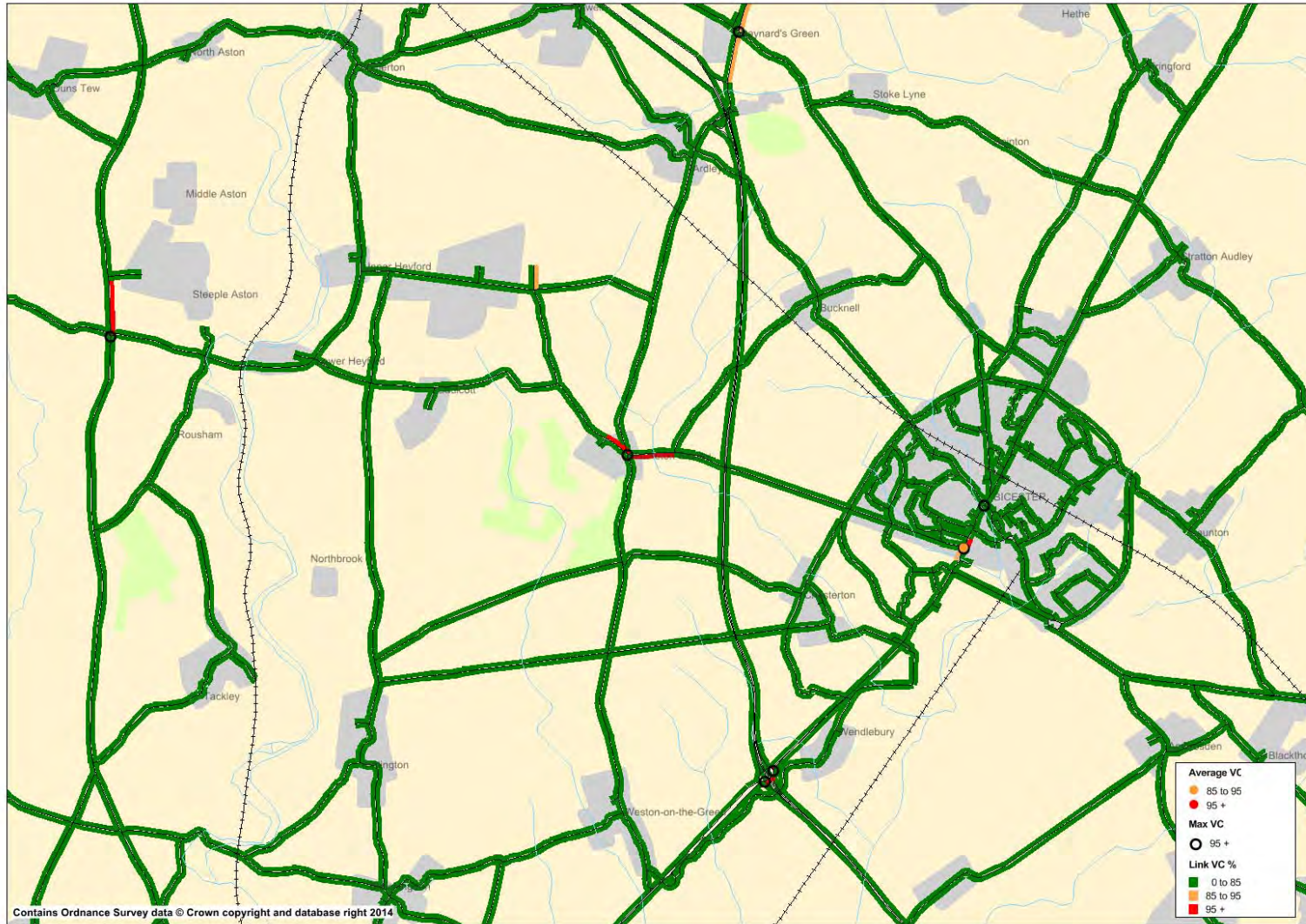
Link	Junction	Morning peak hour	Evening peak hour
	Middleton Stoney Junction	Overall the performance of this junction is below capacity. However 5 turns perform over capacity. With reference to the links entering this junction, the eastbound link performs over capacity; the westbound link performs over 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.

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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.

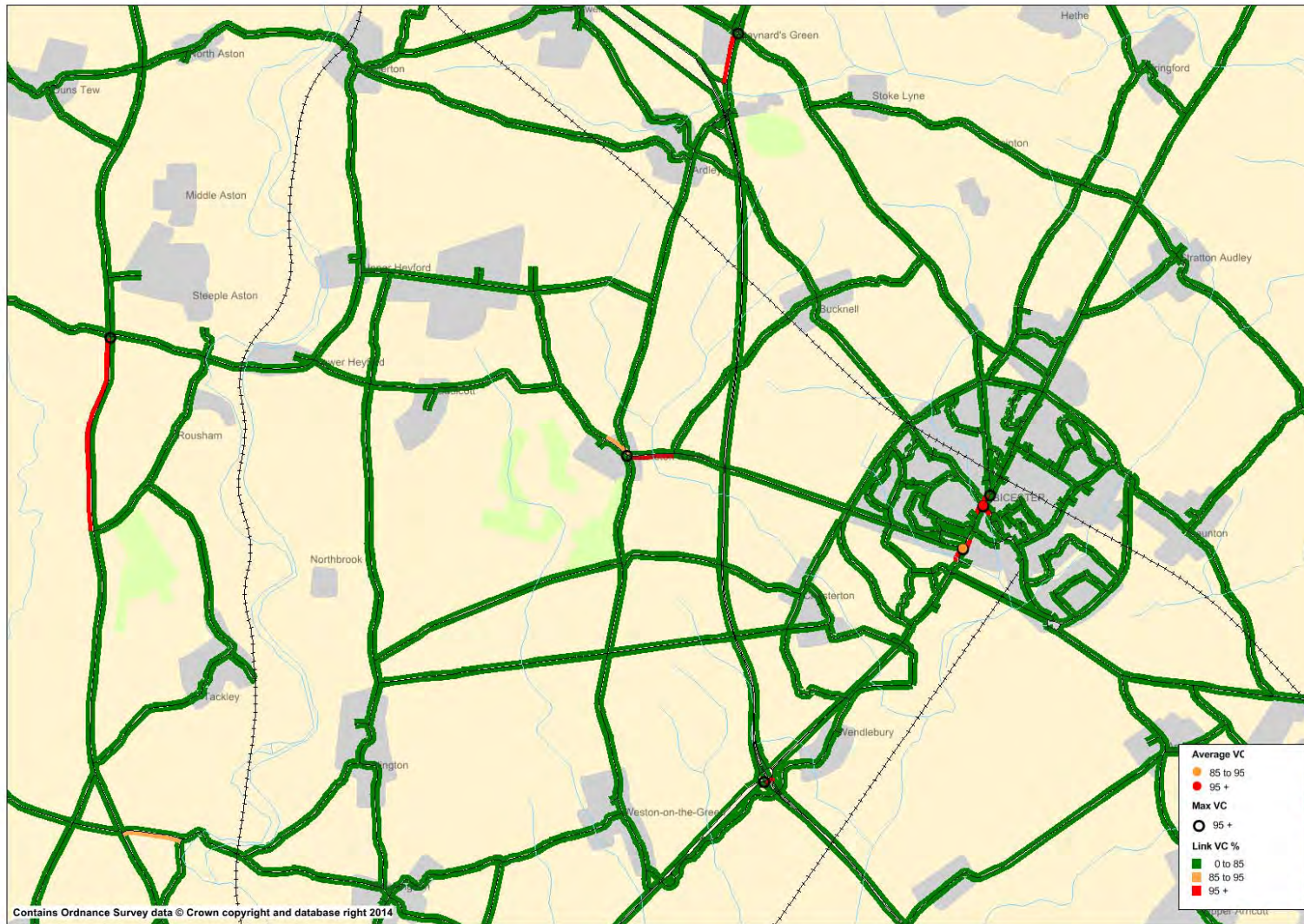
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Figure 2-3 Base Year (2013) network performance (Morning Peak Hour)



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



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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

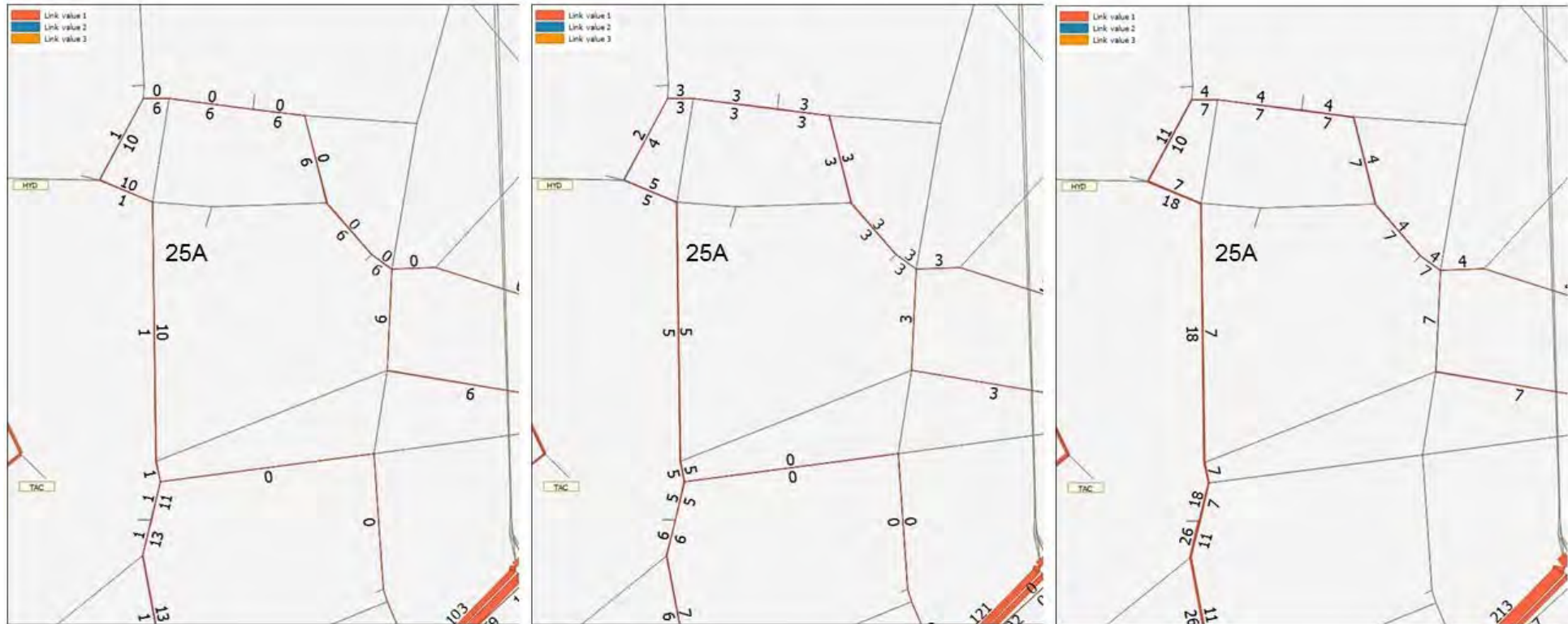
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Figure 2-5 Loads on the public transport services around Upper Heyford in the Base Year

AM peak hour

IP average hour

PM peak hour



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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

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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

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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	<p>“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”</p> <p>“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)”</p>	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	<p>East West Rail comprises four new services:</p> <ul style="list-style-type: none"> • 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

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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)

Mode	Forecast Scenario		Reference Scenario		Difference	
	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)

Mode	Forecast Scenario		Reference Scenario		Difference	
	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)

Mode	Forecast Scenario		Reference Scenario		Difference	
	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)

Mode	Forecast Scenario		Reference Scenario		Difference	
	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

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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.

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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

Technical note

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.

Technical note

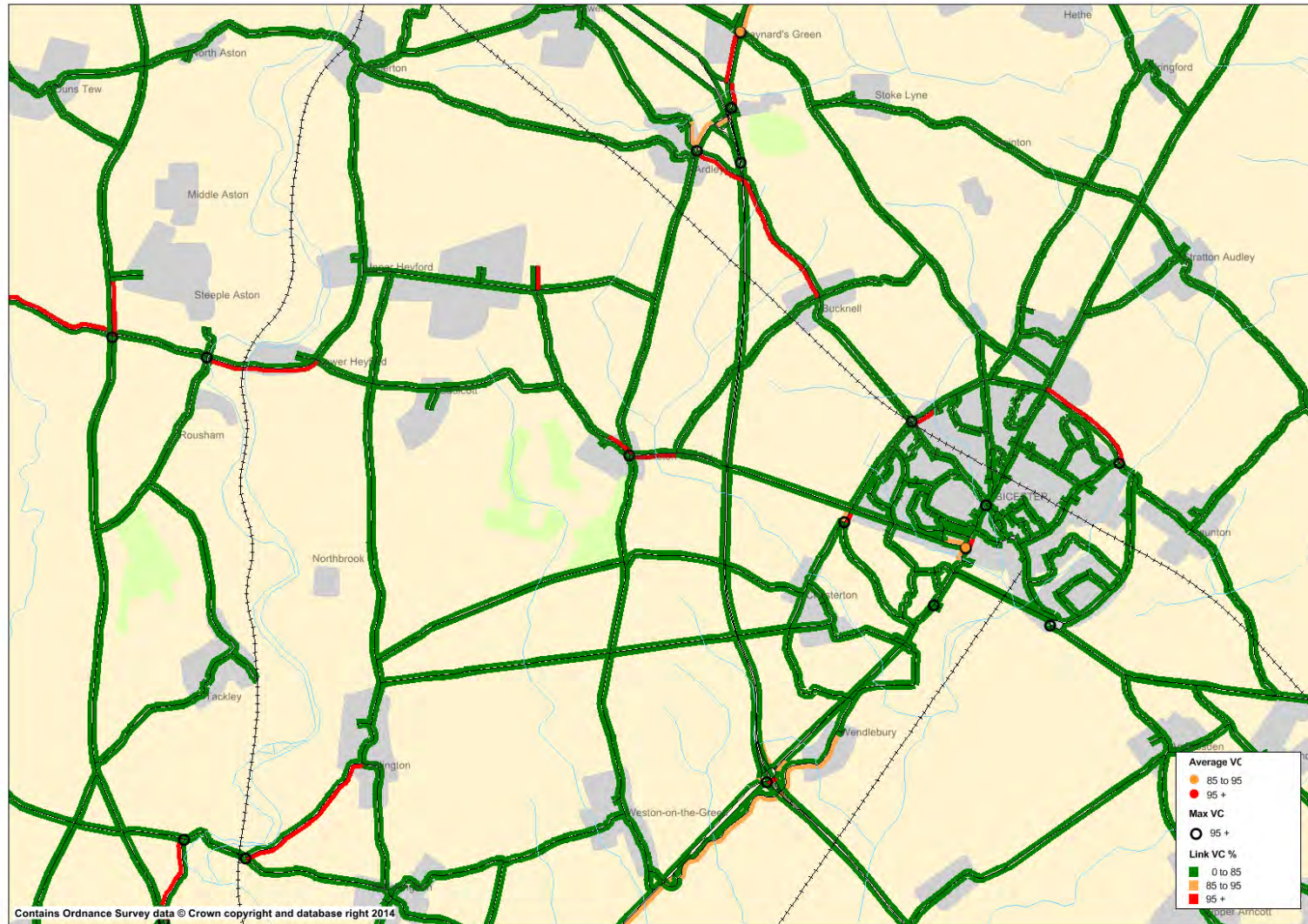
Link	Junction	Morning peak hour	Evening peak hour
	Middleton Stoney Junction	Overall the performance of this junction is below capacity. However 6 turns perform over capacity. With reference to the links entering this junction, the eastbound link performs over capacity; the westbound link performs over 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;

Technical note

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.

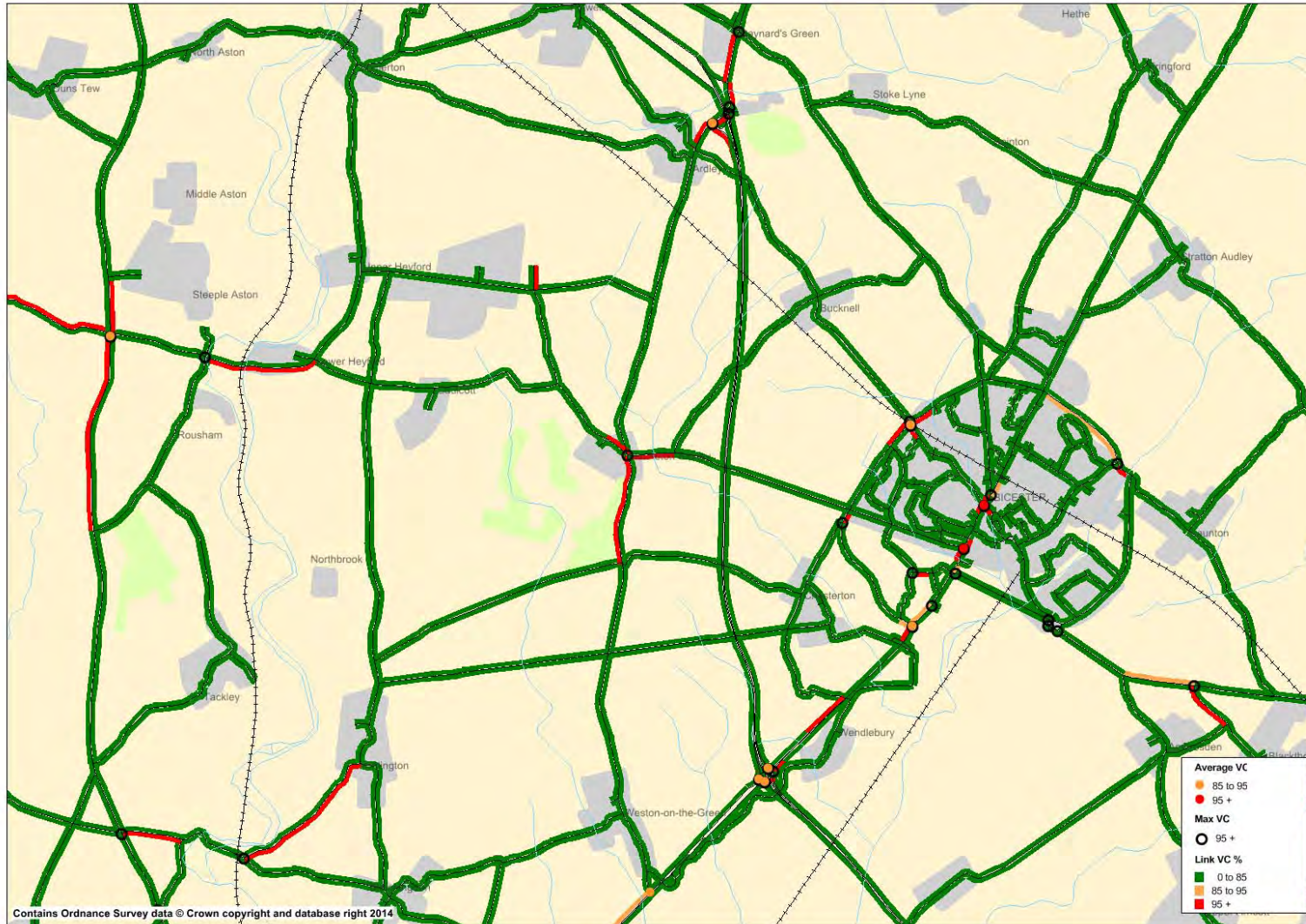
Technical note

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



Technical note

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



Technical note

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.

Technical note

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

AM peak hour

IP average hour

PM peak hour



Technical note

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	
<i>Residential</i>	<i>Upper Heyford</i>	<i>0</i>	
<i>Commercial</i>	<i>Upper Heyford</i>		<i>0</i>
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

Technical note

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

Technical note

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 by 6% in the peak hours.

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

Time	Metric	Results	Unit
Morning 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

Technical note

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.

Technical note

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

Technical note

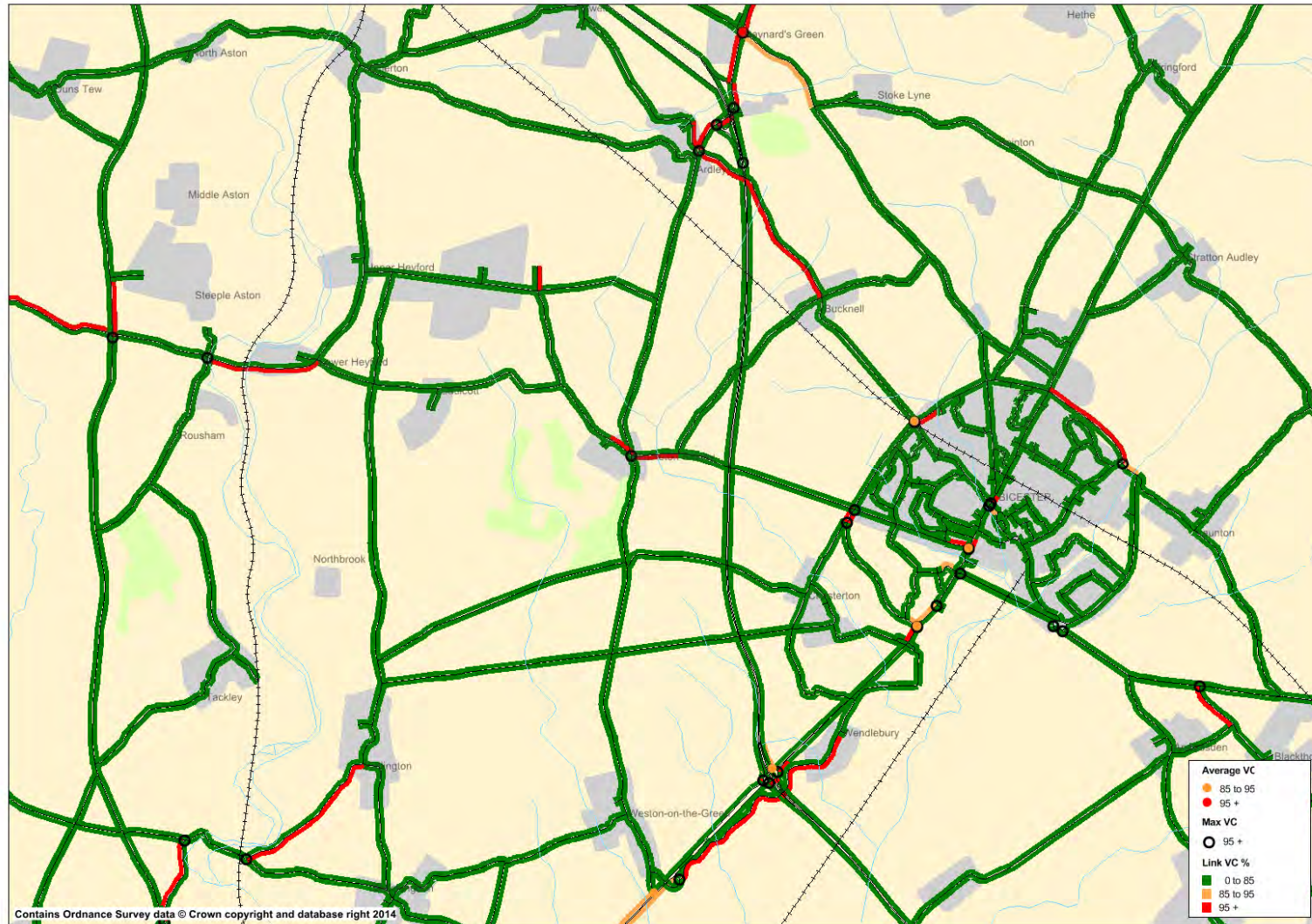
Link	Junction	Morning peak hour	Evening peak hour
			performs over capacity;
	Unnamed Road and B430 Junction	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below 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.

Technical note

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.

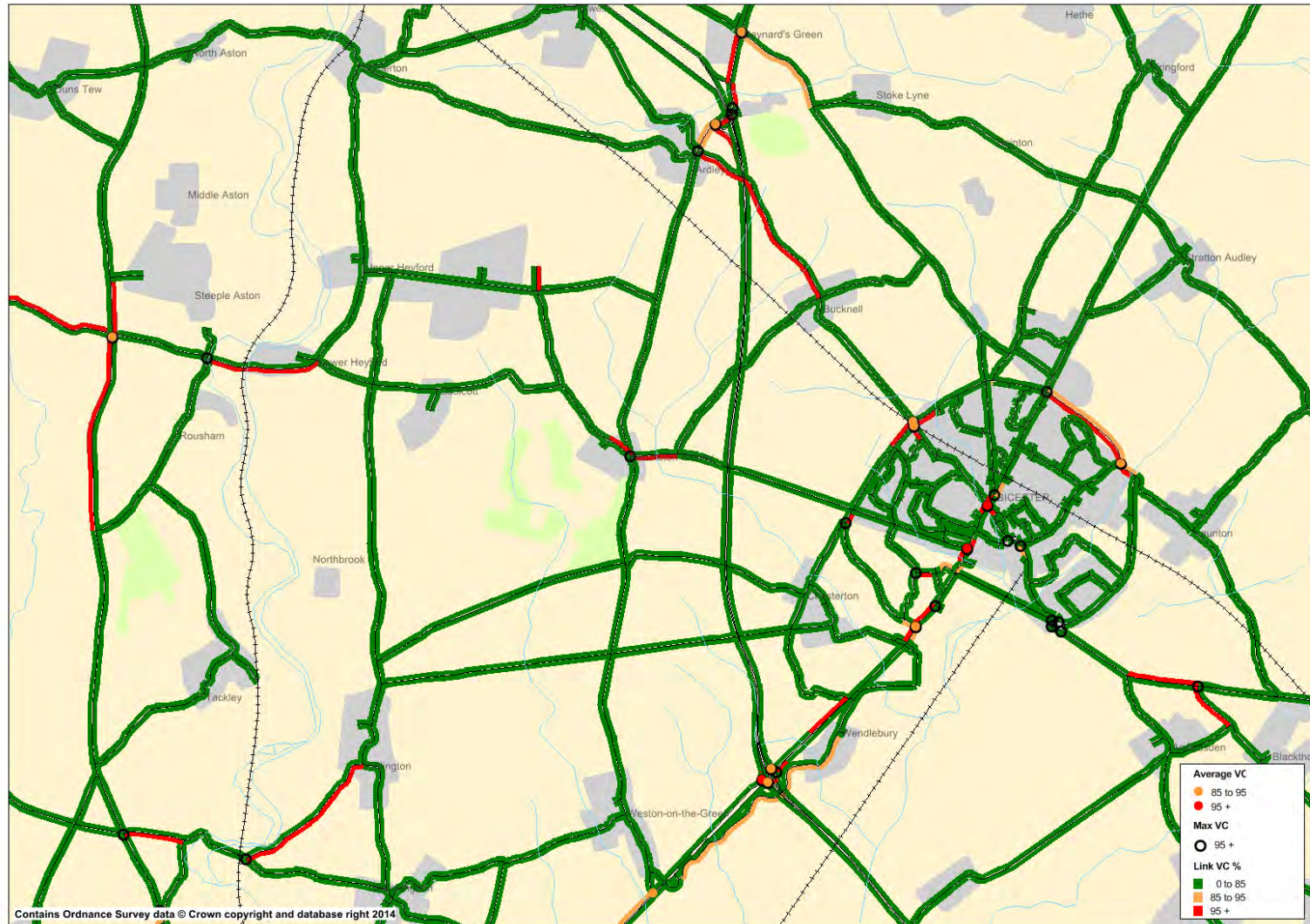
Technical note

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



Technical note

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



Technical note

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.

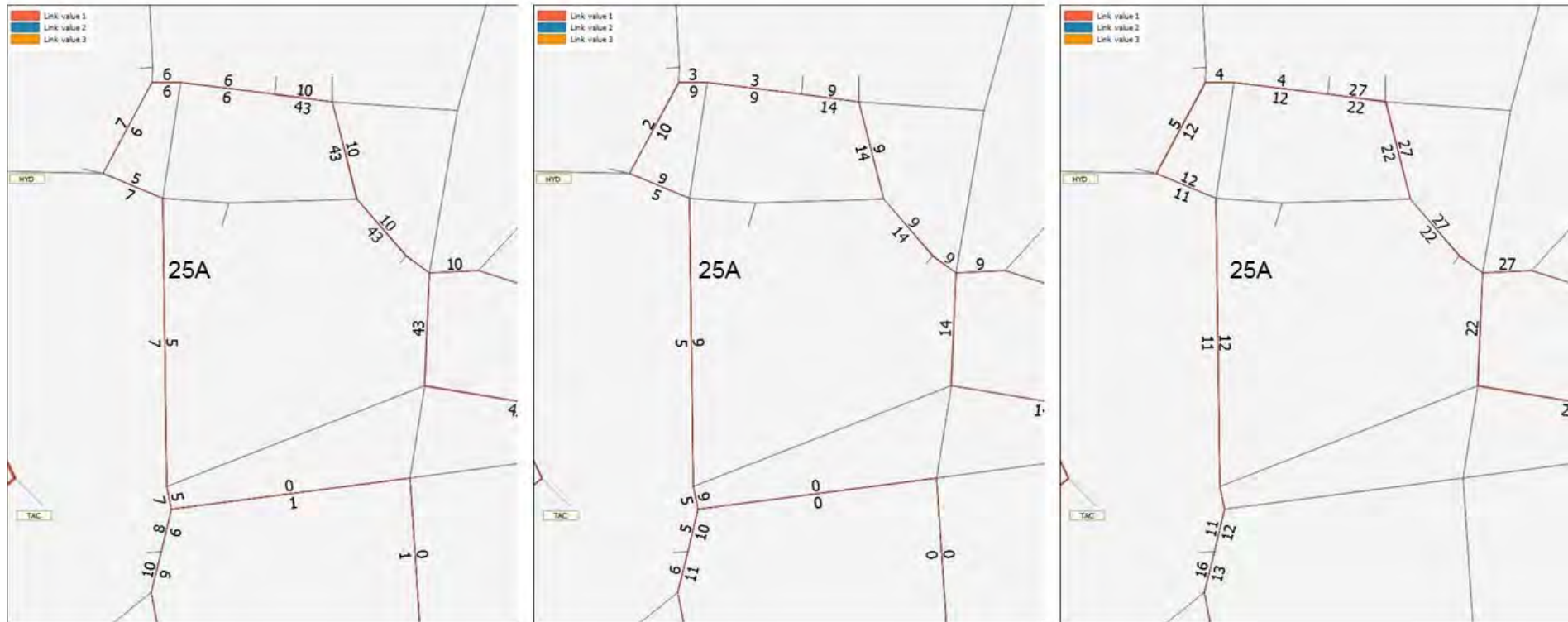
Technical note

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

Technical note

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

Technical note

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

Technical note

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

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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;

Technical note

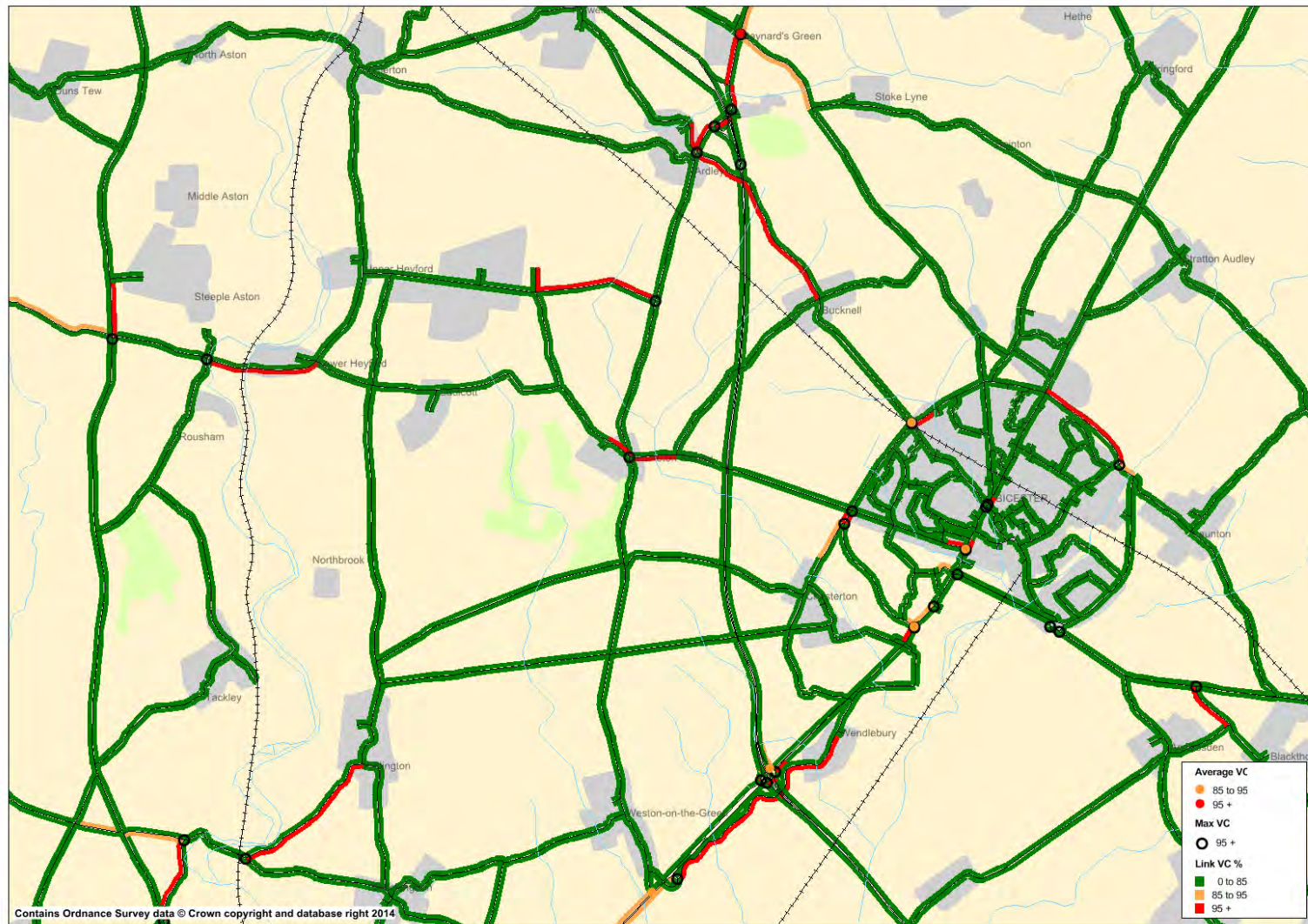
Link	Junction	Morning peak hour	Evening peak hour
	Middleton Stoney Junction	Overall the performance of this junction is below capacity. However 6 turns perform over capacity. With reference to the links entering this junction, the eastbound link performs over capacity; the westbound link performs over 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;

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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.

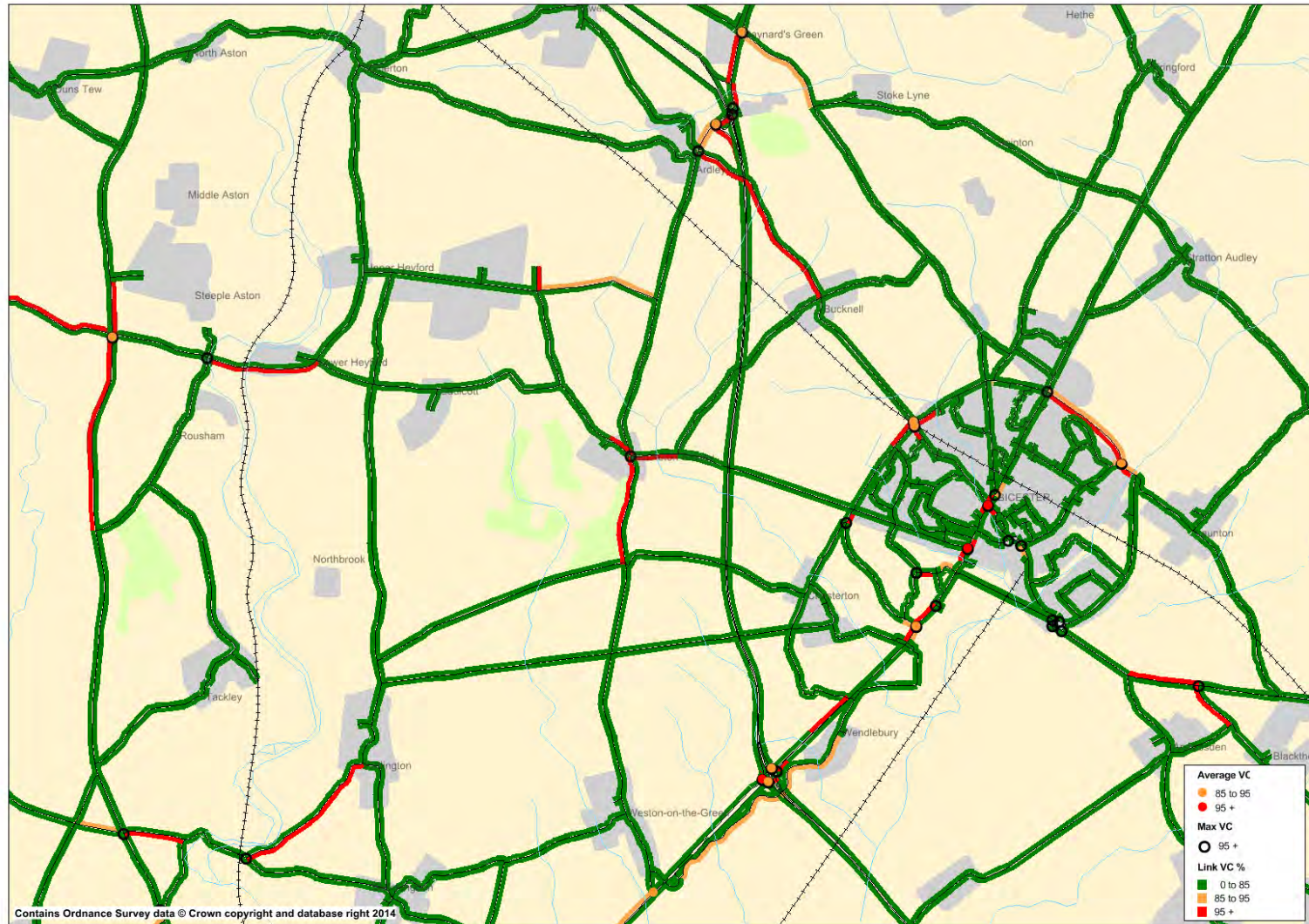
Technical note

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)



Technical note

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)



Technical note

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.

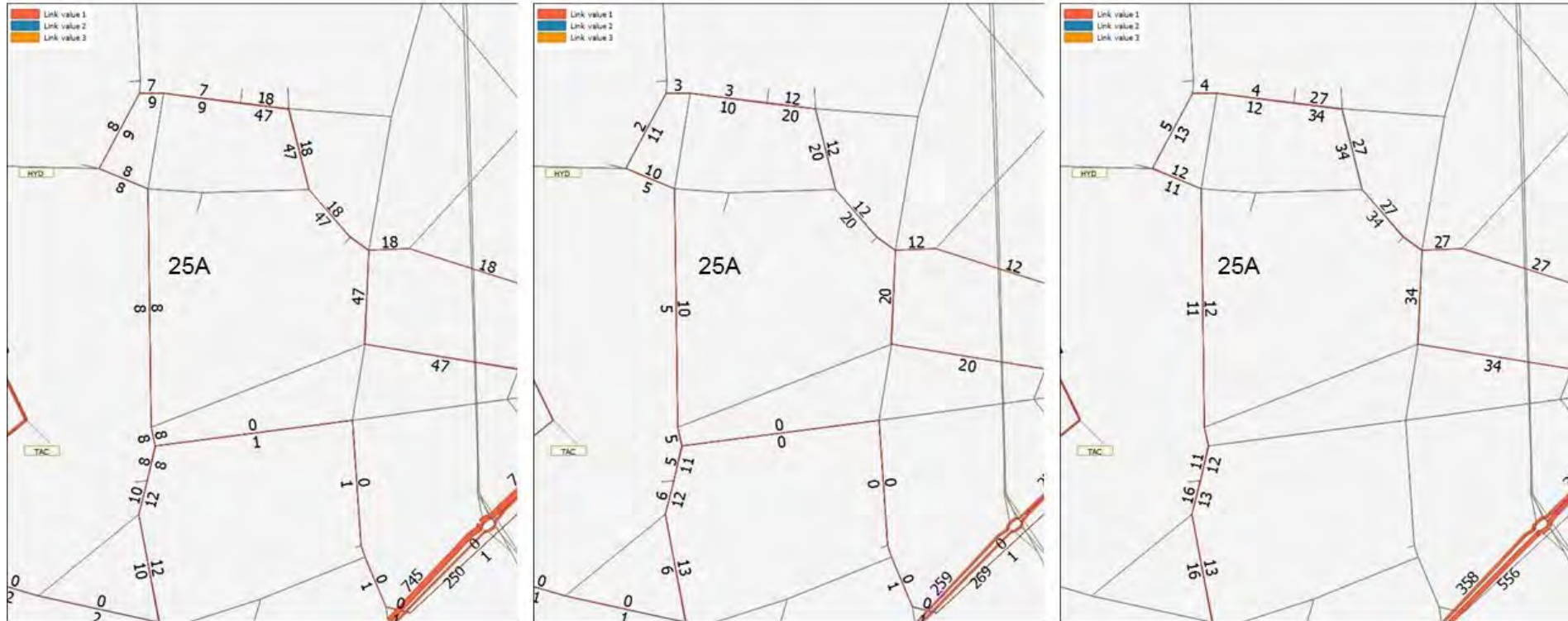
Technical note

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 6-1 and 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	<p>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.</p> <p>This results in 4 services per hour to Bicester, 3 to Oxford and 1 to Banbury (and the reverse to Upper Heyford).</p>	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.

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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.

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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.

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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

Technical note

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.

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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

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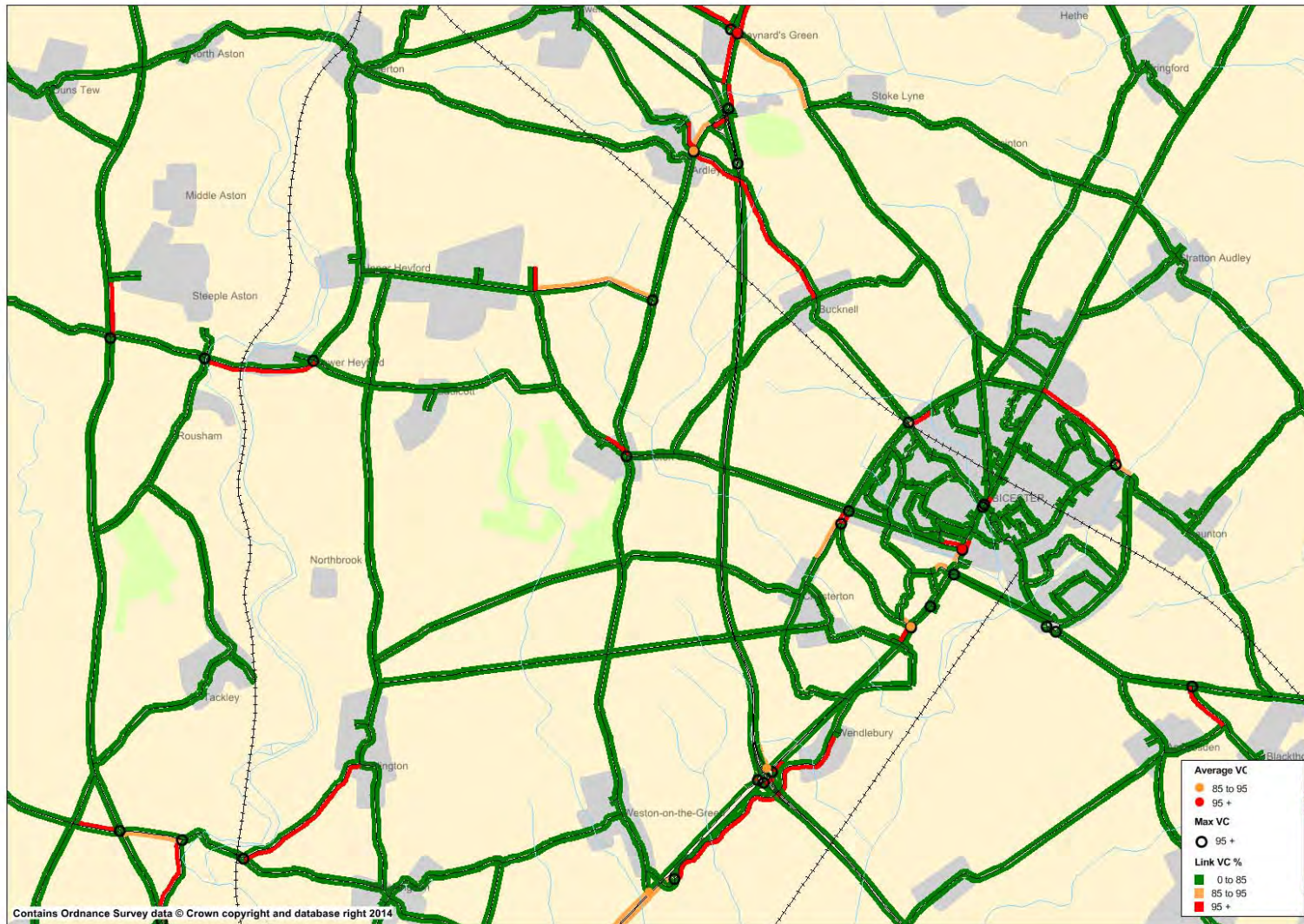
Link	Junction	Morning peak hour	Evening peak hour
			link performs over capacity;
	B430 and A4095 Junction	Overall the performance of this junction is below capacity. With reference to the links entering this junction, all links perform below capacity.	Overall the performance of this junction is below 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

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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.

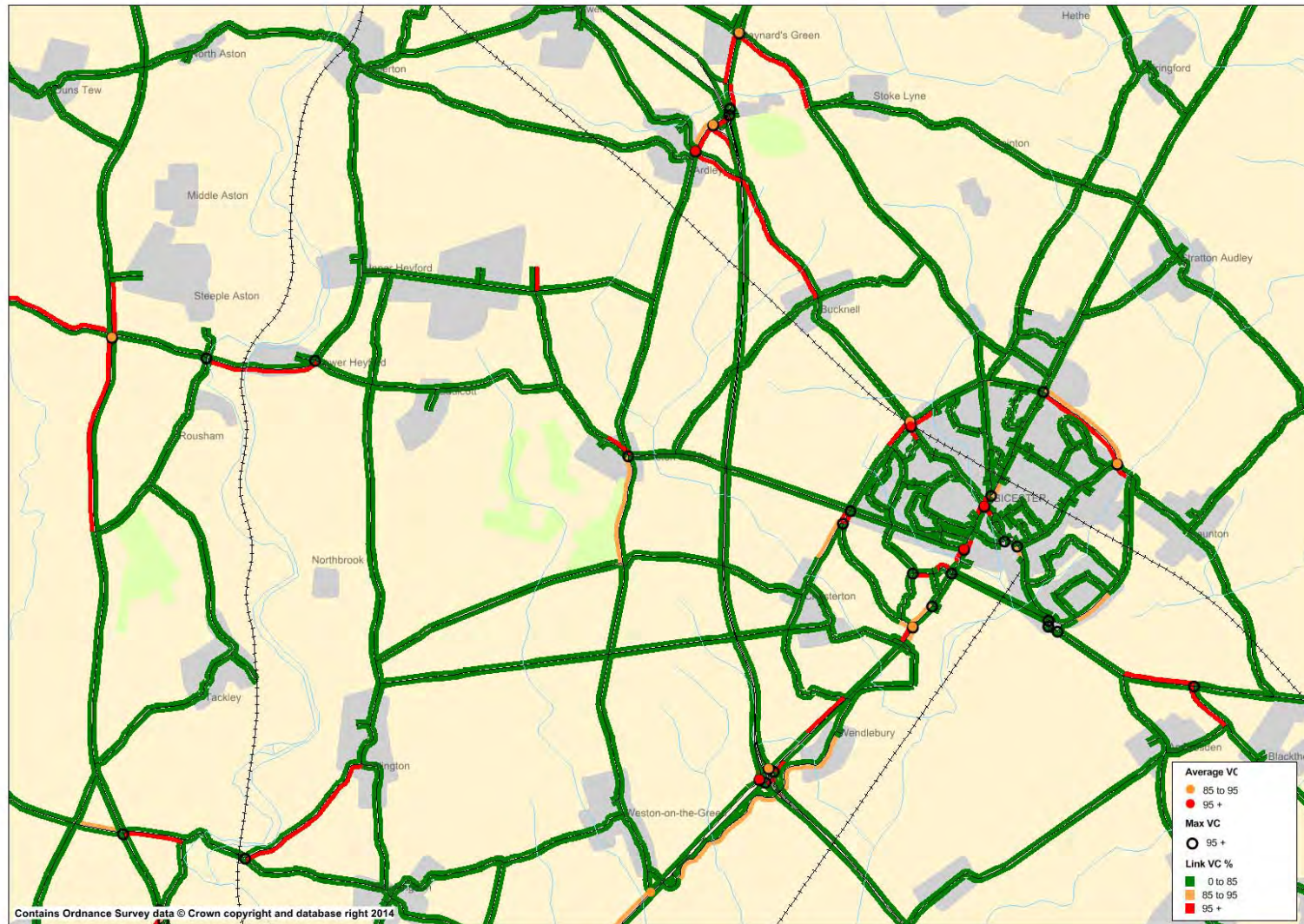
Technical note

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



Technical note

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



Technical note

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.

Technical note

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 be 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.

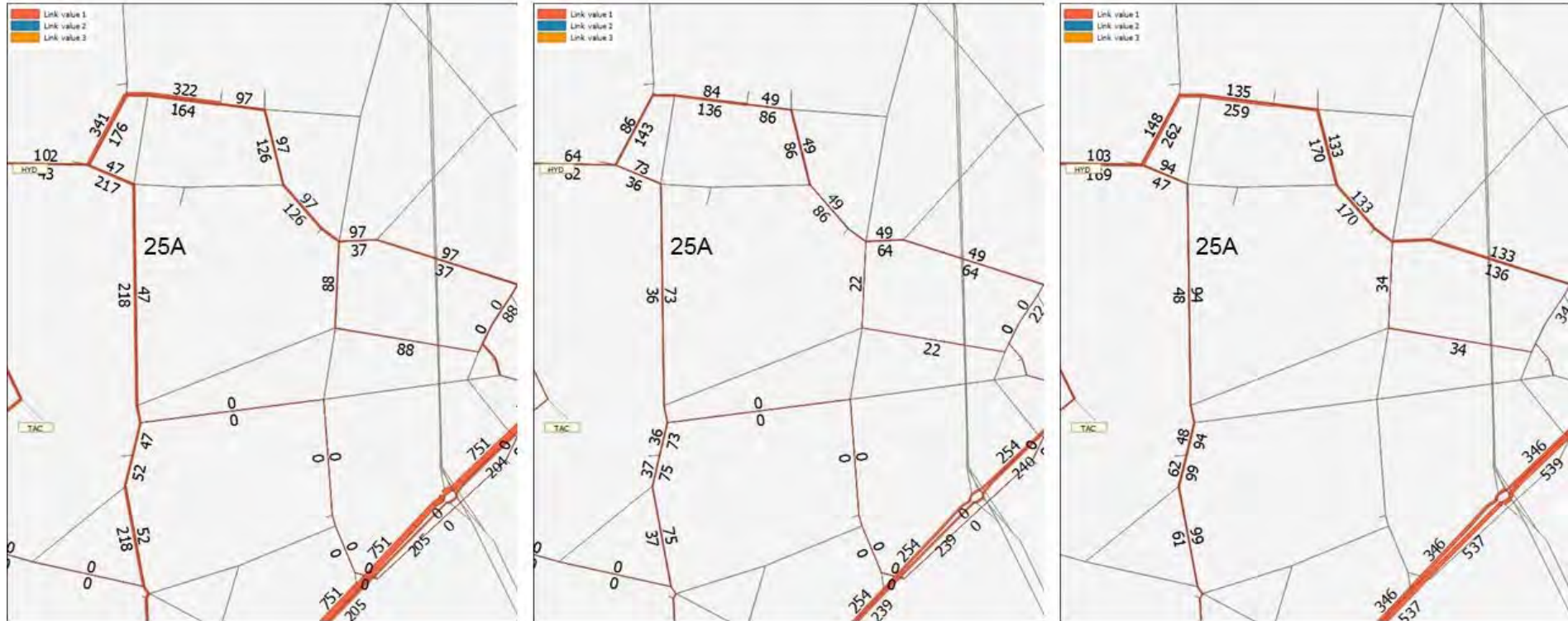
Technical note

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



Technical note

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

Mode	Scenario 1 Difference		Scenario 3 Difference		Scenario 4 Difference		Scenario 5 Difference	
	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,

Technical note

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.