

Banbury Highway Model Forecasting Report

Oxfordshire County Council

ATKINS

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Plan Design Enable

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1. Introduction

1.1. Background

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

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

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

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

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

1.2. Banbury Modelling System

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

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

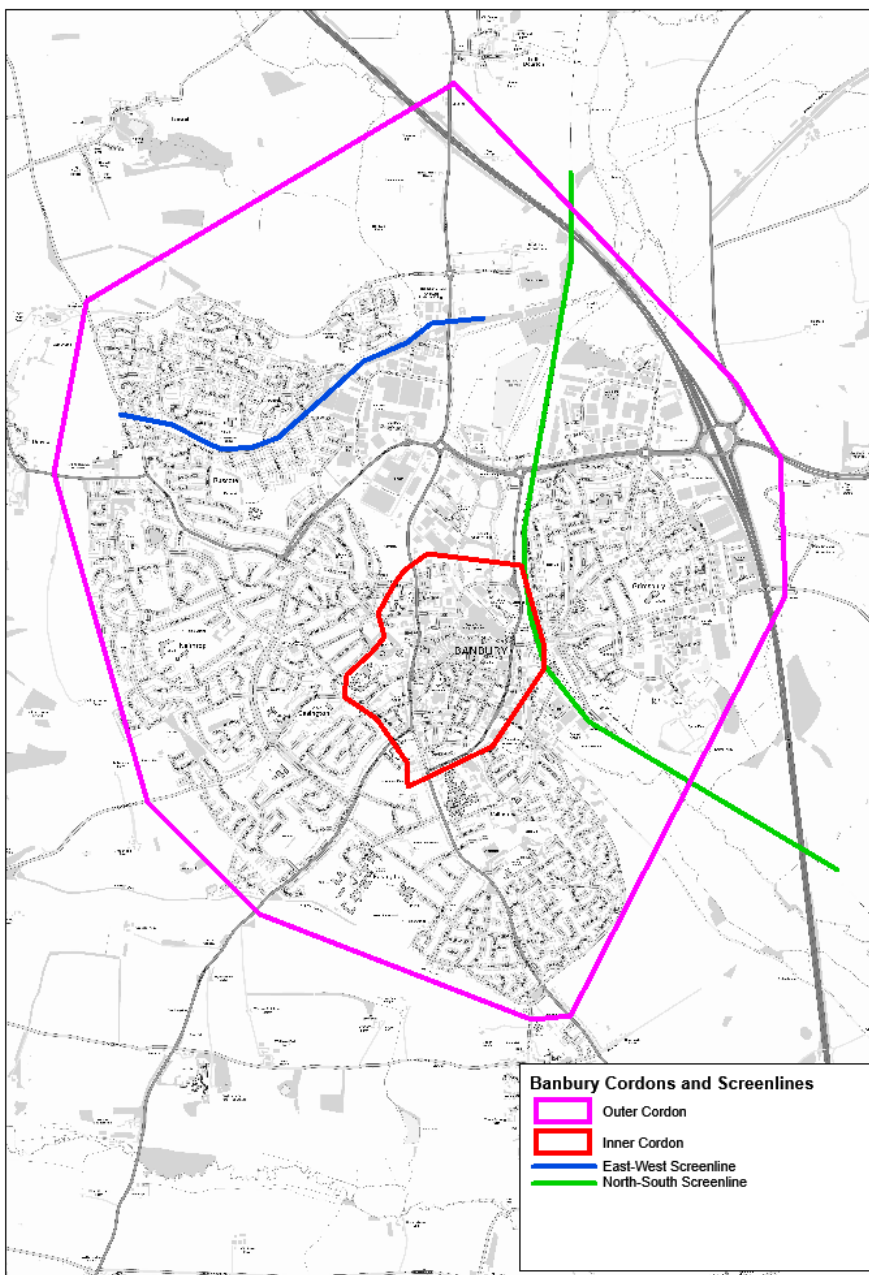
- Scenario 0 2031 'Without Intervention' Model; this represents the existing highway network from the 2014 base year model but with a growth in transport demand as discussed in Section 2
- Scenario 1 – Scenario 0 with the addition of a new link road between the A361 Bloxham Road and White Post Road.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

1.3. Scope of Report

This report is structured as follows:

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

Figure 1-1 Banbury Model Study Area



2. Developing the ‘Without Intervention’ Model

2.1. Introduction

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

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

2.2. Growth in Demand

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

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

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

2.2.1. Committed Development and Local Plan Main Modifications

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

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

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

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

Table 2-1: Banbury 6 Sensitivity Rates

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

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

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

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

*Various sites

2.2.2. TEMPRO

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

Table 2-3: TEMPro Growth Rates

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

2.2.3. Growth for HGVs

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

3. Without Intervention Scenario

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

3.1. Network Statistics

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

Table 3-1: Without Intervention Network Statistics

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

3.2. Link and Junction Capacity

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

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

3.3. Key Junction Performance

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

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

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

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

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

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

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

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

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

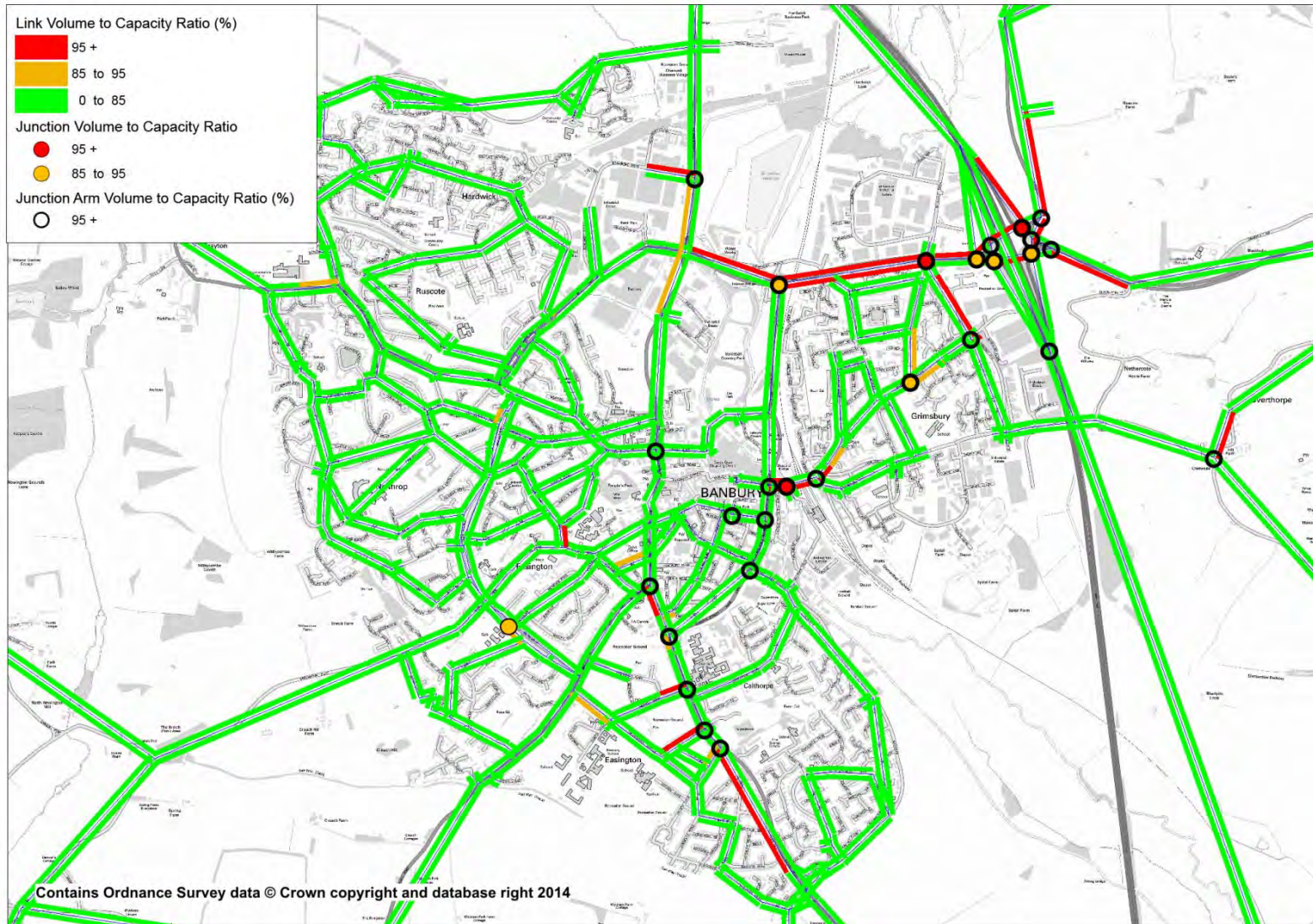


Figure 3-2 Link and Junction Volume to Capacity Output for NE Banbury 'Without intervention' Scenario

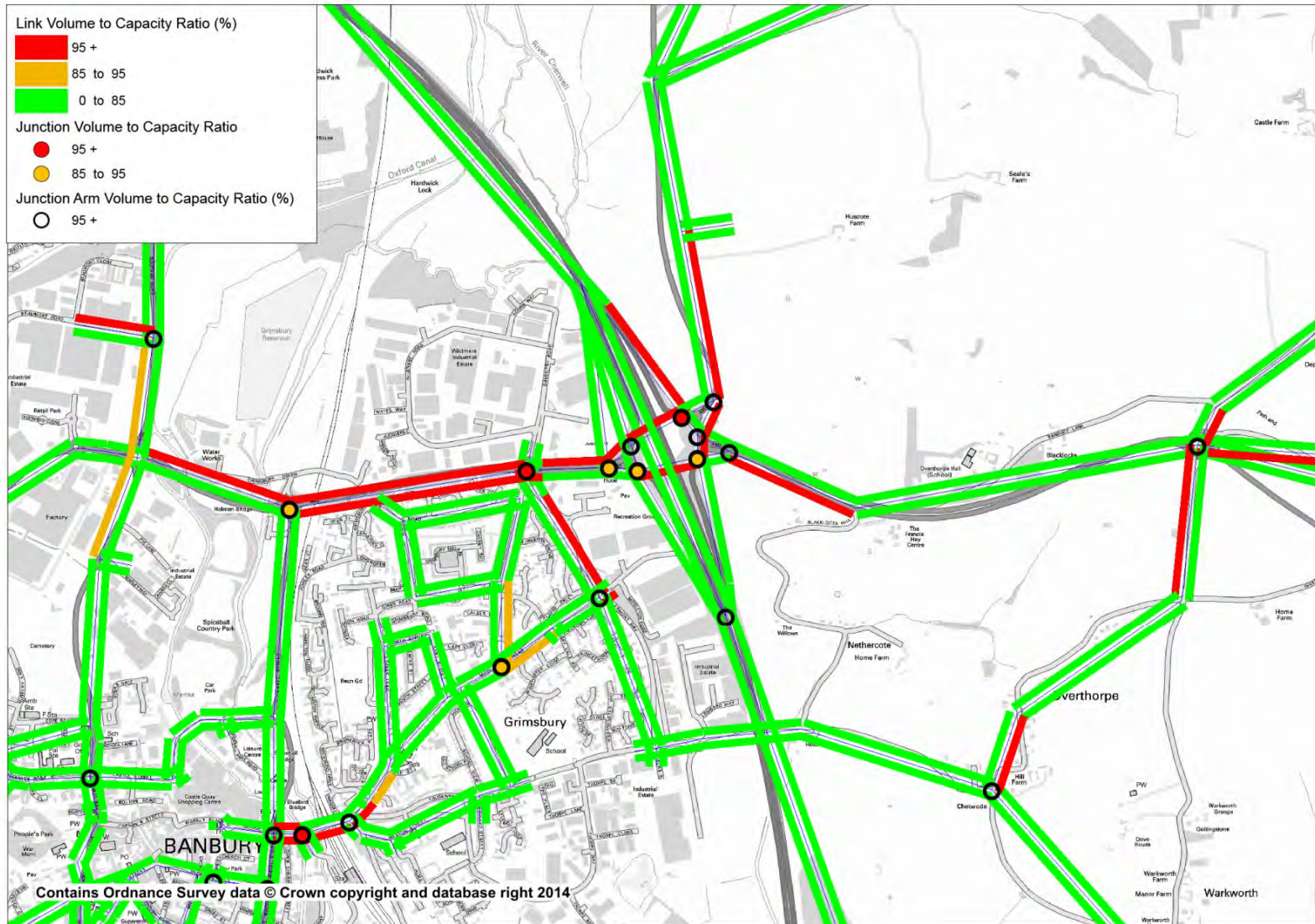
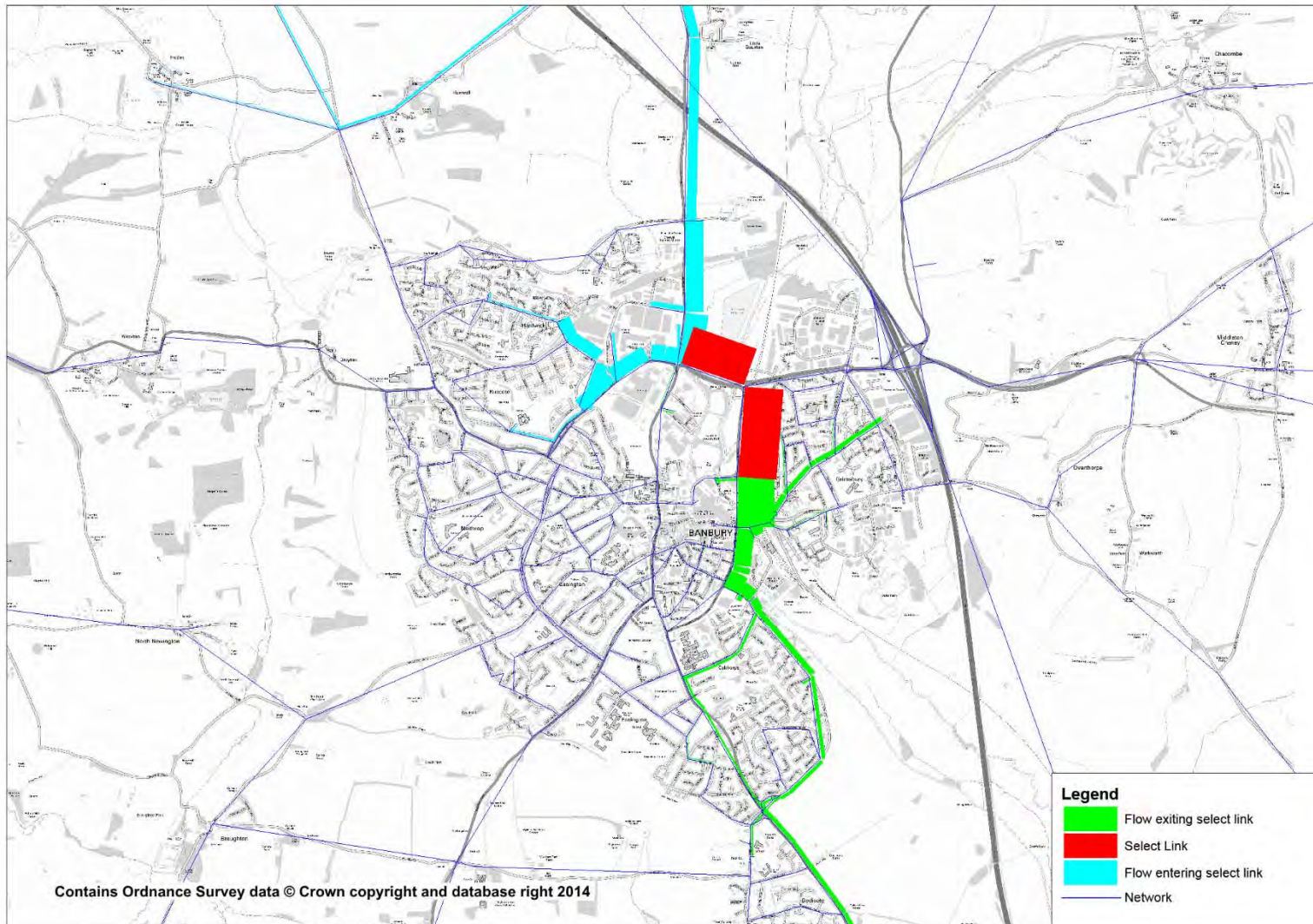


Figure 3-3 Select Link Analysis of eastbound right-turning traffic at the Hennef Way/Concord Avenue roundabout



4. Scenarios 1 to 6: The ‘With Intervention’ Scenarios

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

4.1.1. Scheme Overview

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

4.1.2. Network Statistics

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

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

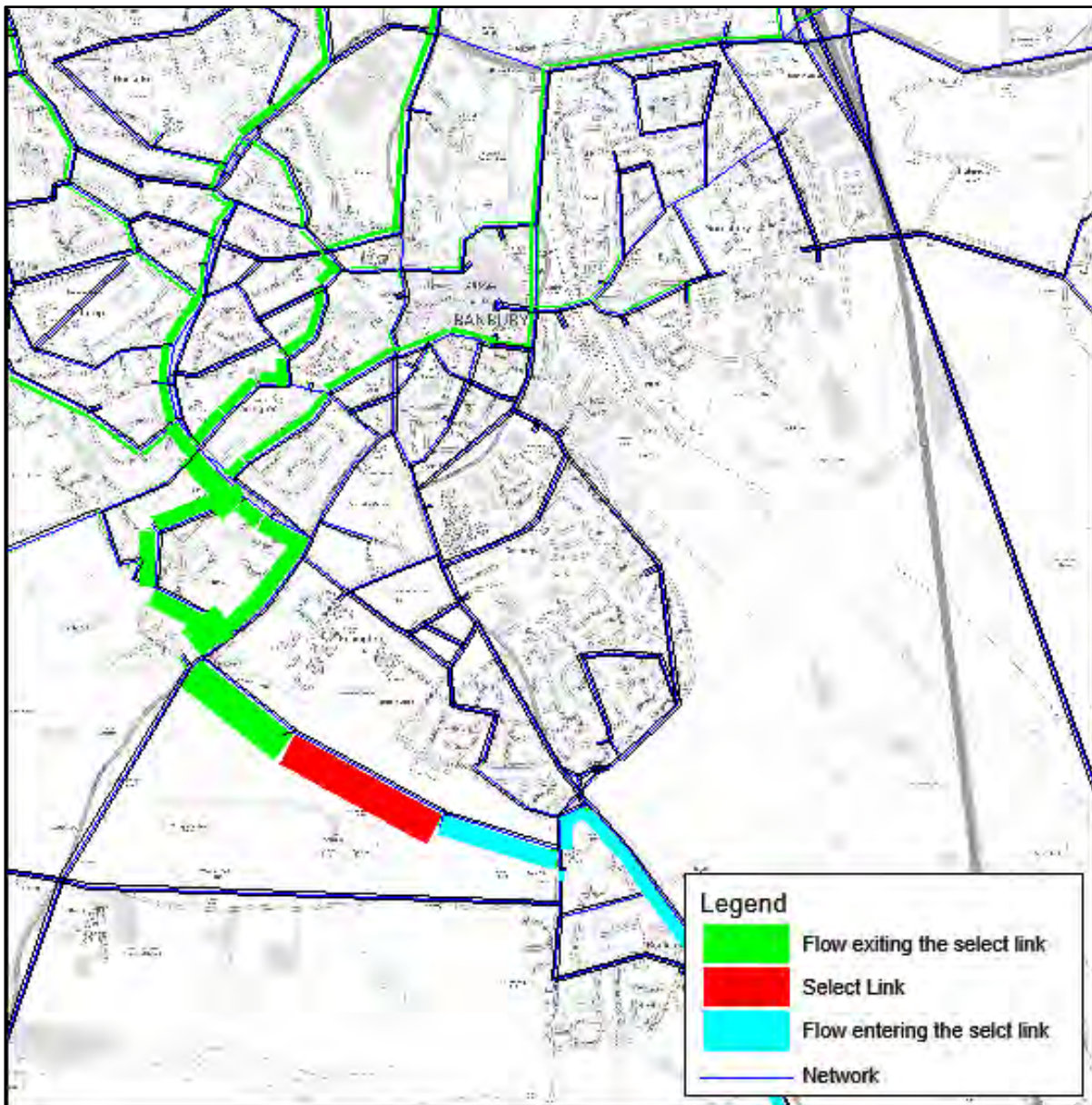
Metric	Scenario 1	Without Intervention	Units
Average journey time	9.82	10.00	Mins/pcu
Average total delay	3.74	3.81	Mins/pcu
Average distance travelled	6.41	6.41	km
Average Speed	39.2	38.6	km/h

4.1.3. Select Link Analysis

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

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

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

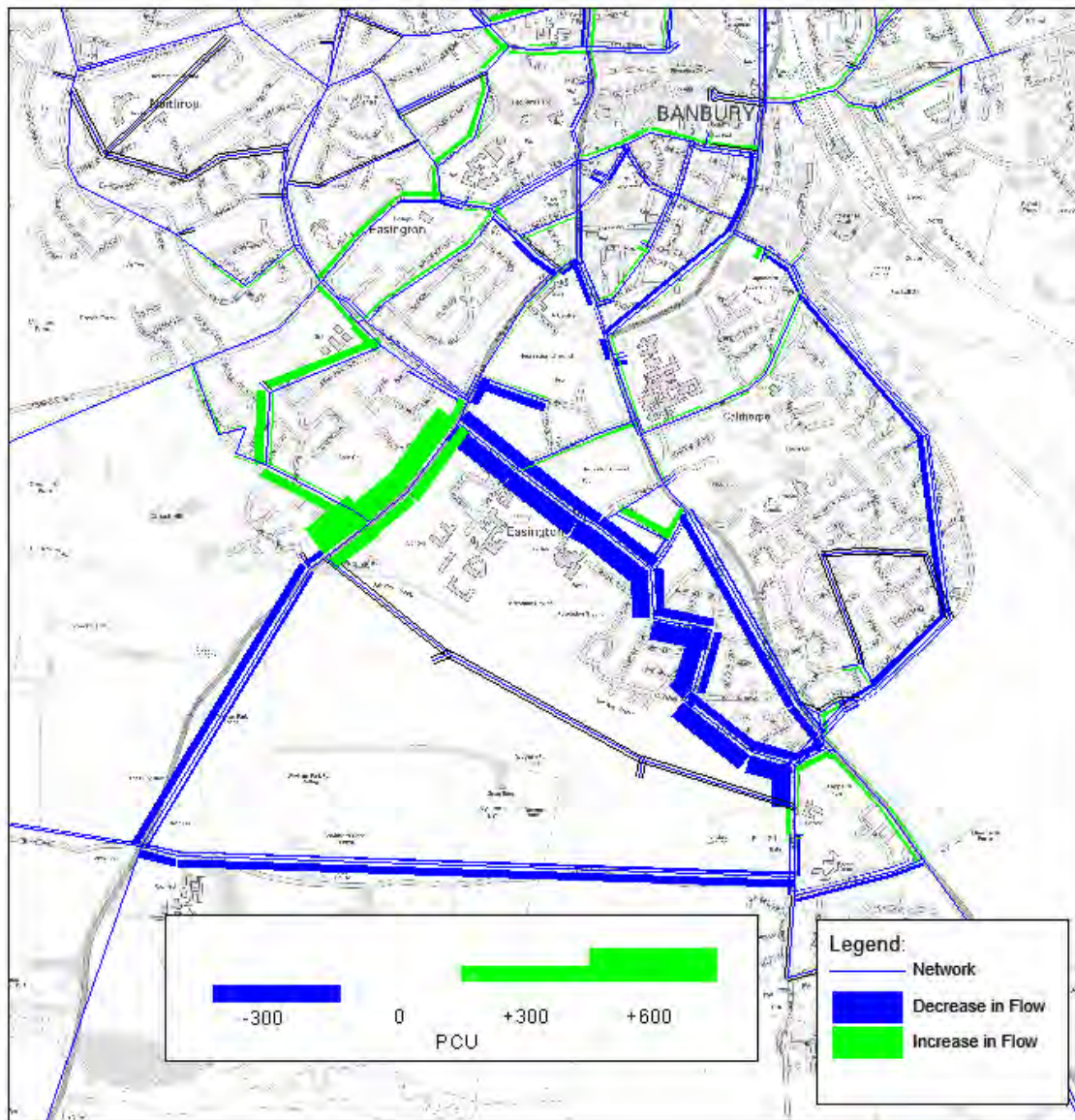


4.1.4. Flow Difference

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

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

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



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

4.1.5. Junction and Link Capacity

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

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

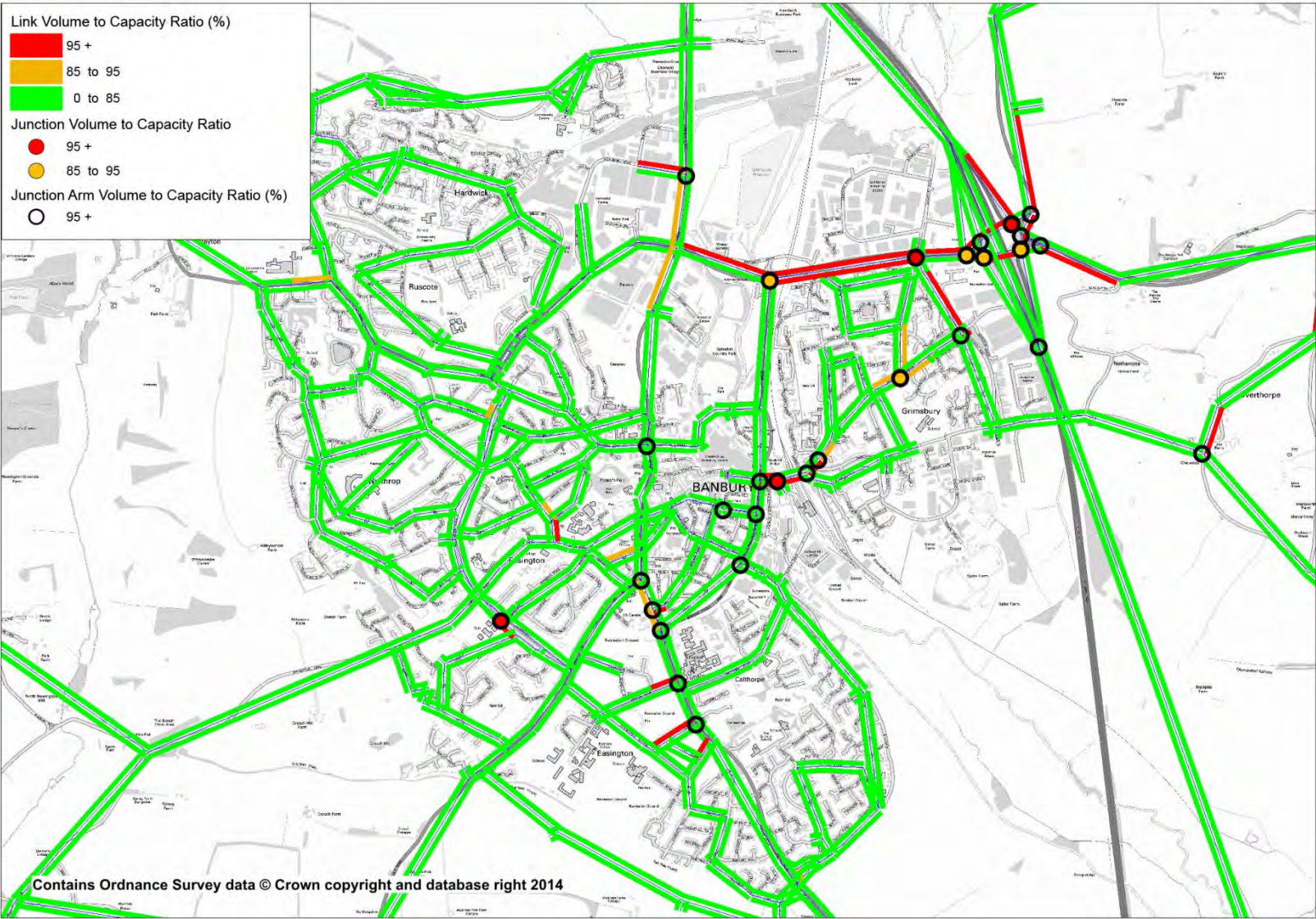
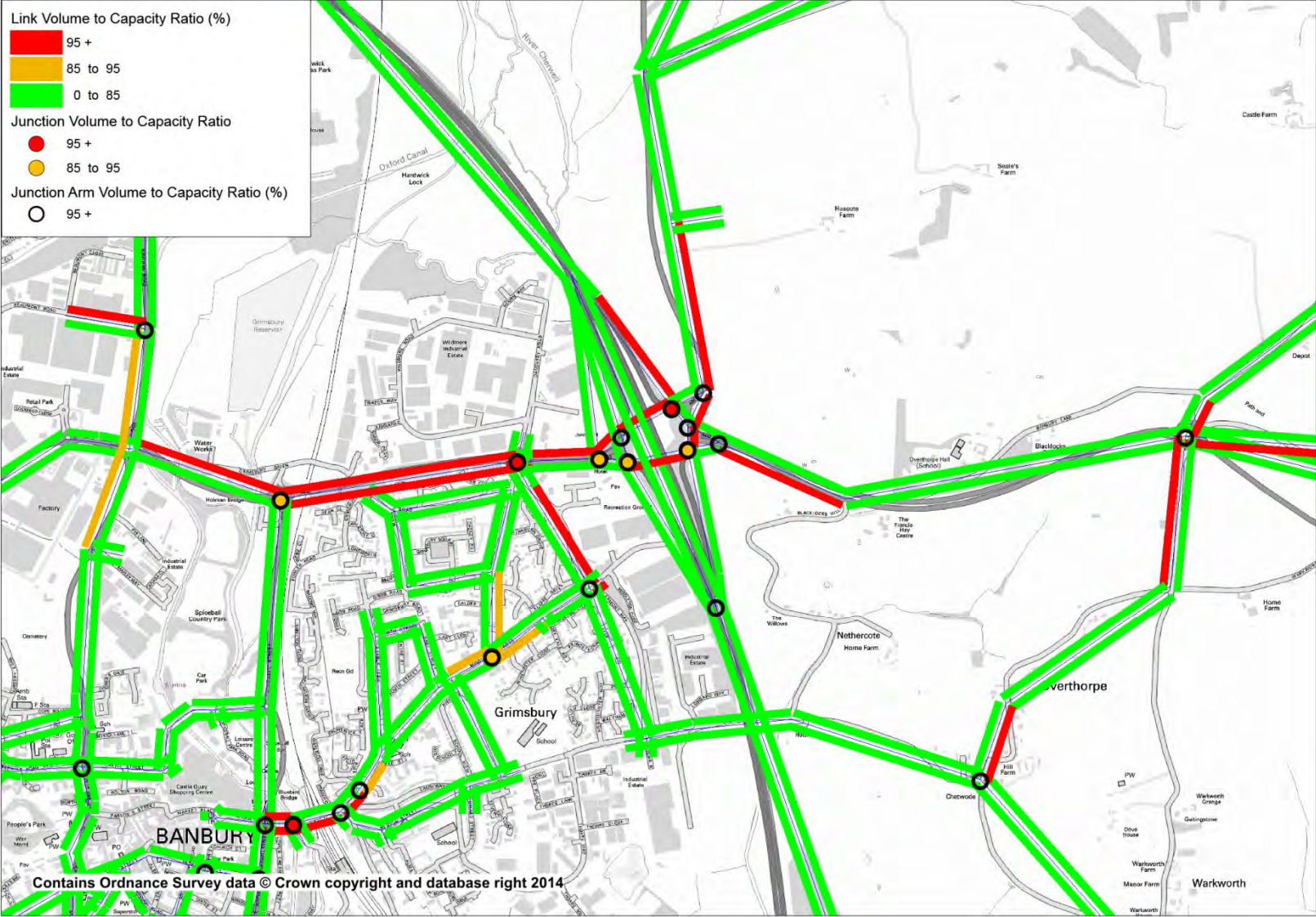


Figure 4-4: Scenario 1 - Link and Junction Volume to Capacity Output for NE Banbury



4.1.6. Changes in Delay

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

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

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

4.2. Scenario 2: Promotion of Bankside

4.2.1. Scheme Overview

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

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

4.2.2. Network Statistics

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

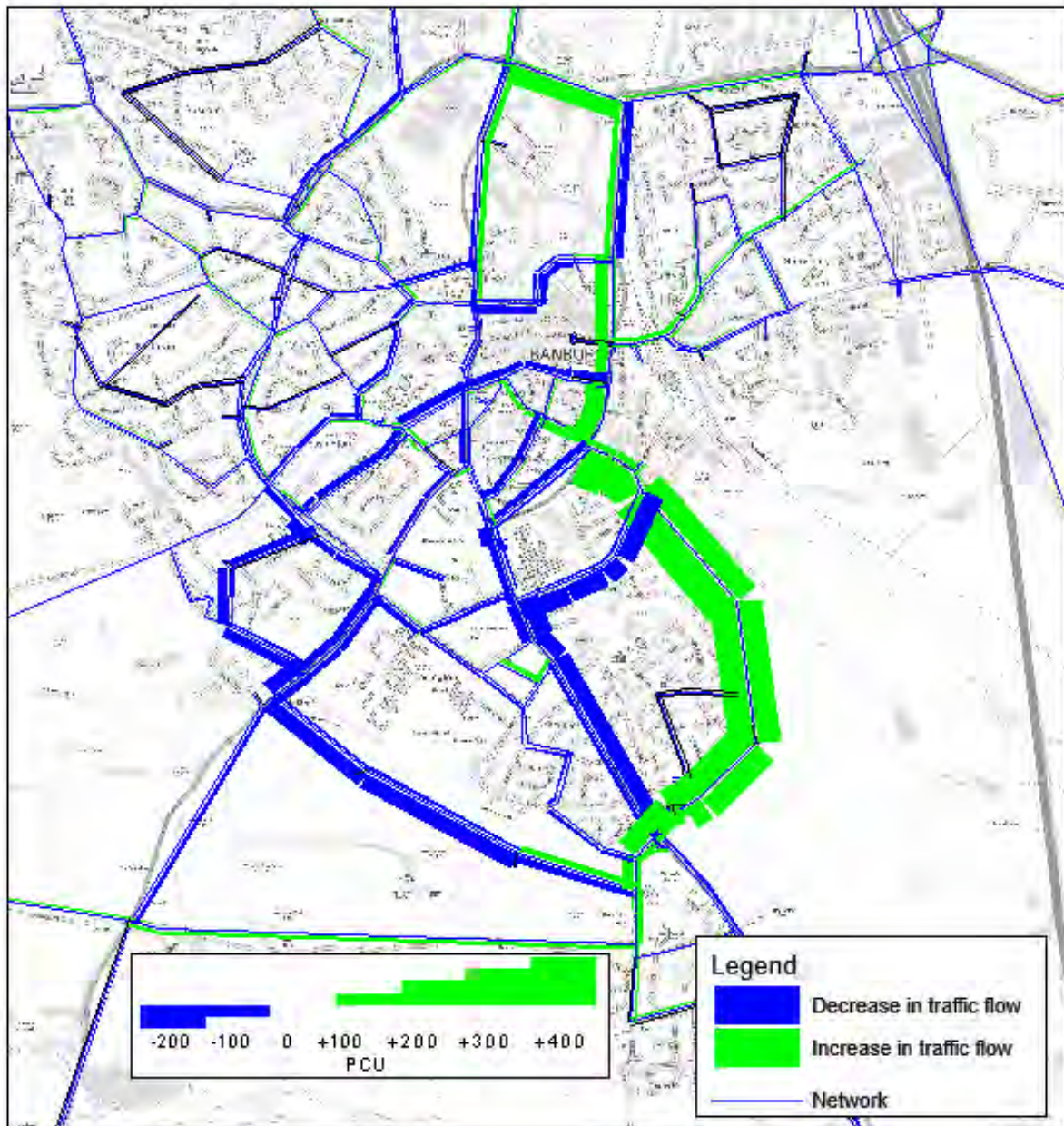
Table 4-3: Scenario 2 comparison with Scenario 1 Network Statistics

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

4.2.3. Flow Difference

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

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



4.2.4. Changes in Delay

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

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

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

4.2.5. Junction and Link Capacity

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

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

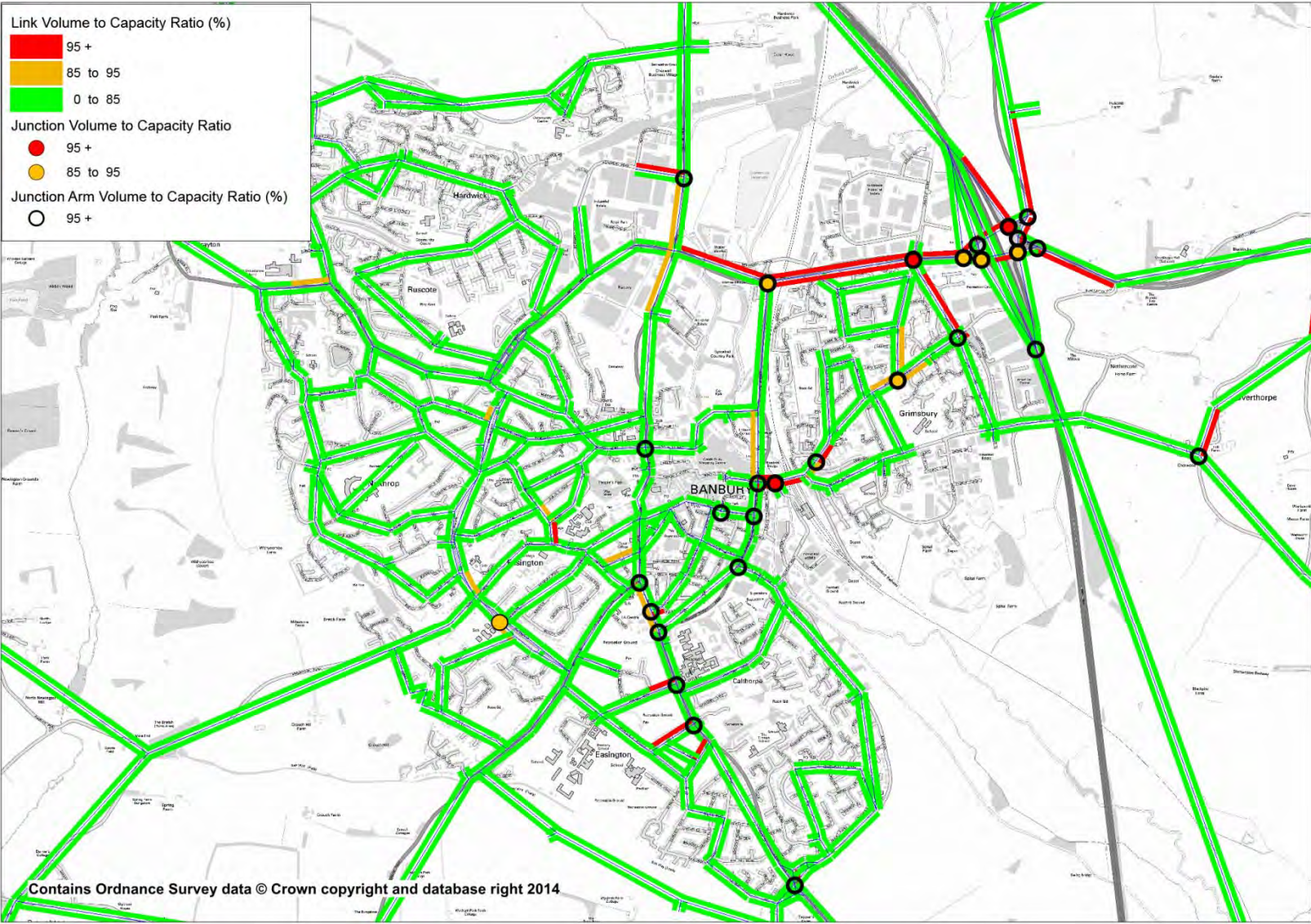
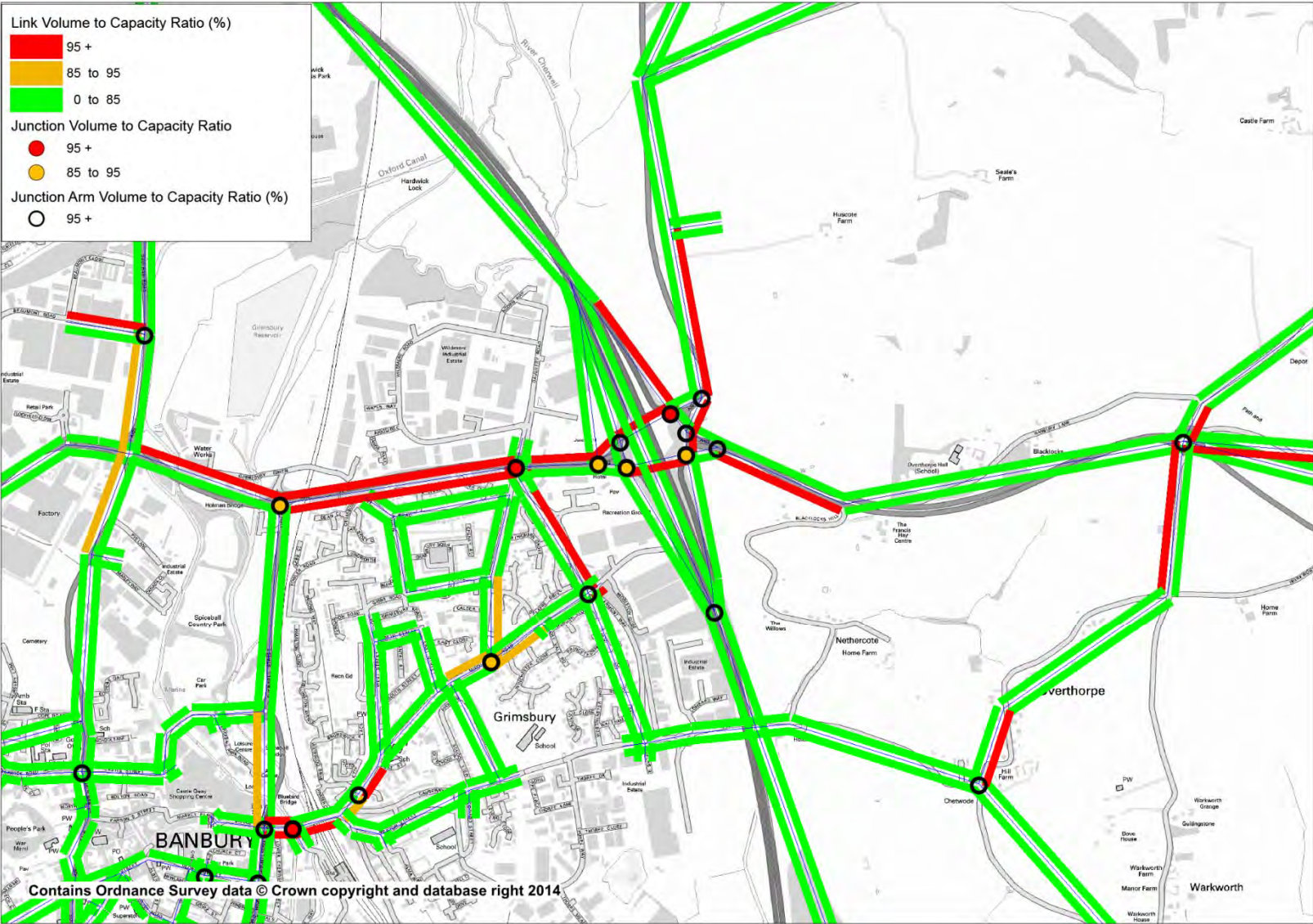


Figure 4-7: Scenario 2 - Link and Junction Volume to Capacity Output for NE Banbury



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

4.3.1. Scheme overview

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

4.3.2. Network statistics

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

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

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

4.3.3. Changes in Traffic Flow

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

4.3.4. Junction and Link Capacity

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

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

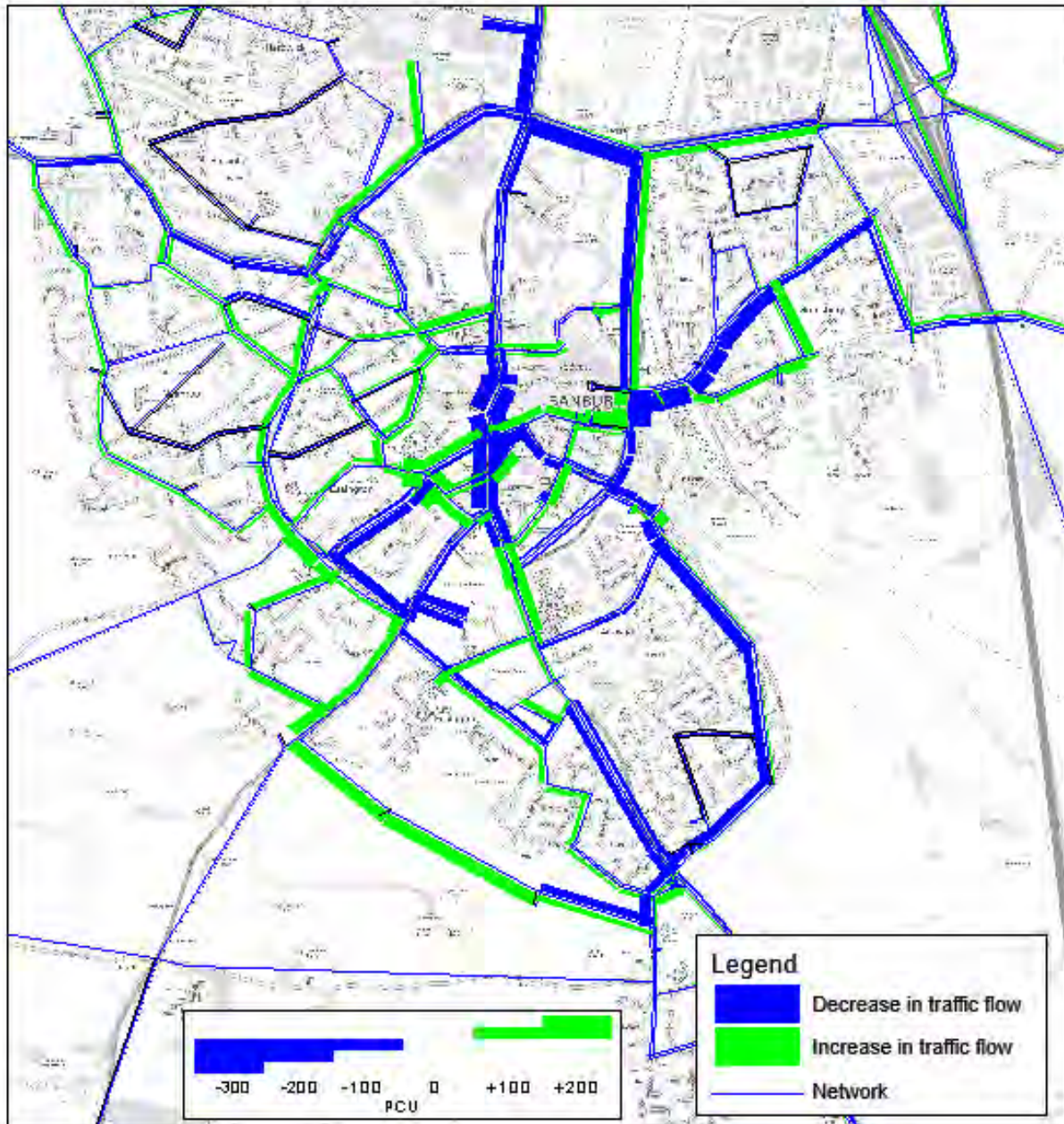


Figure 4-9: Scenario 3 - Link and Junction Volume to Capacity Output for Banbury

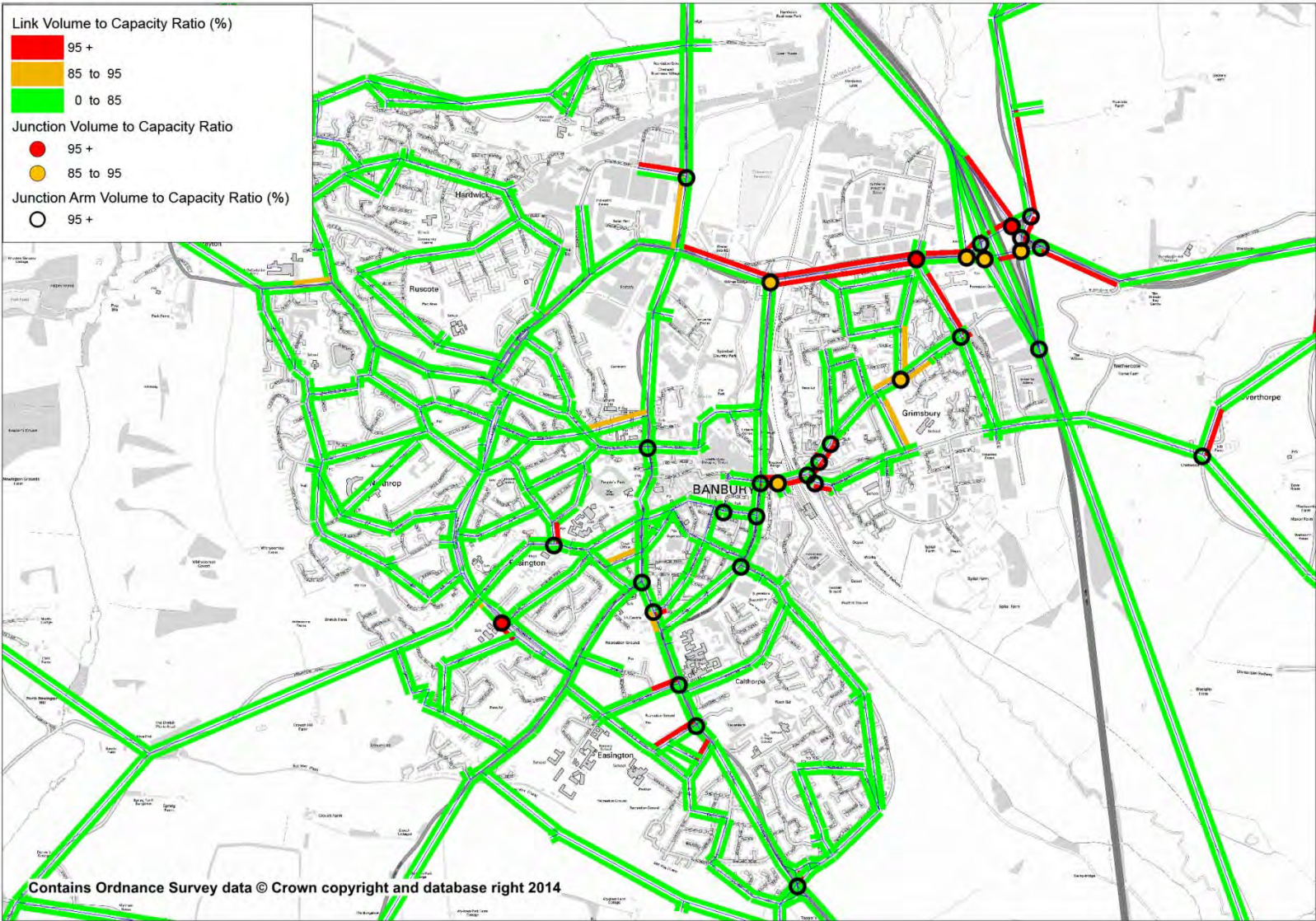
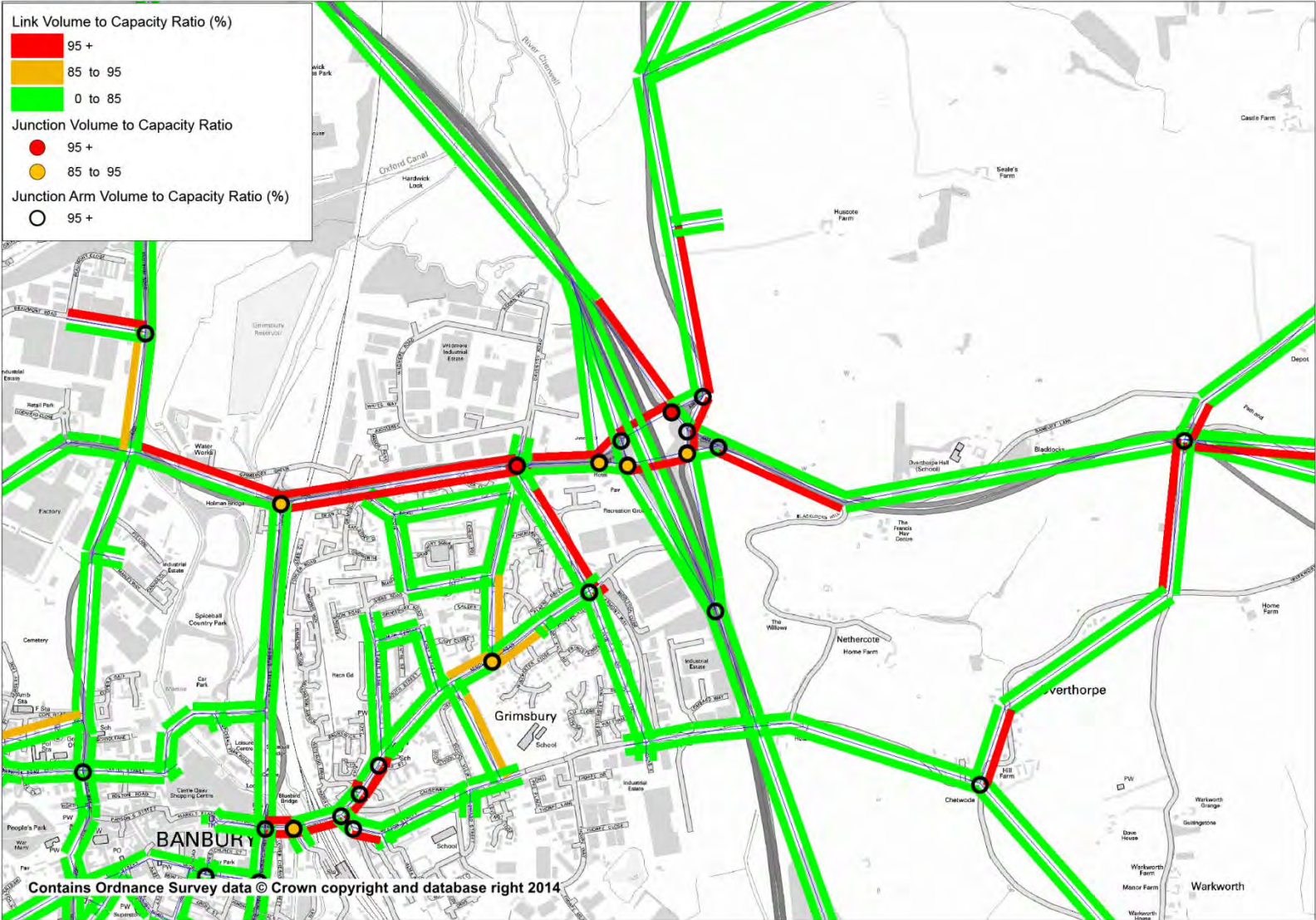


Figure 4-10: Scenario 3 - Link and Junction Volume to Capacity Output for NE Banbury



4.4. Scenario 4: Hennef Way/Ermont Way improvements

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

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

4.4.1. Network Statistics

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

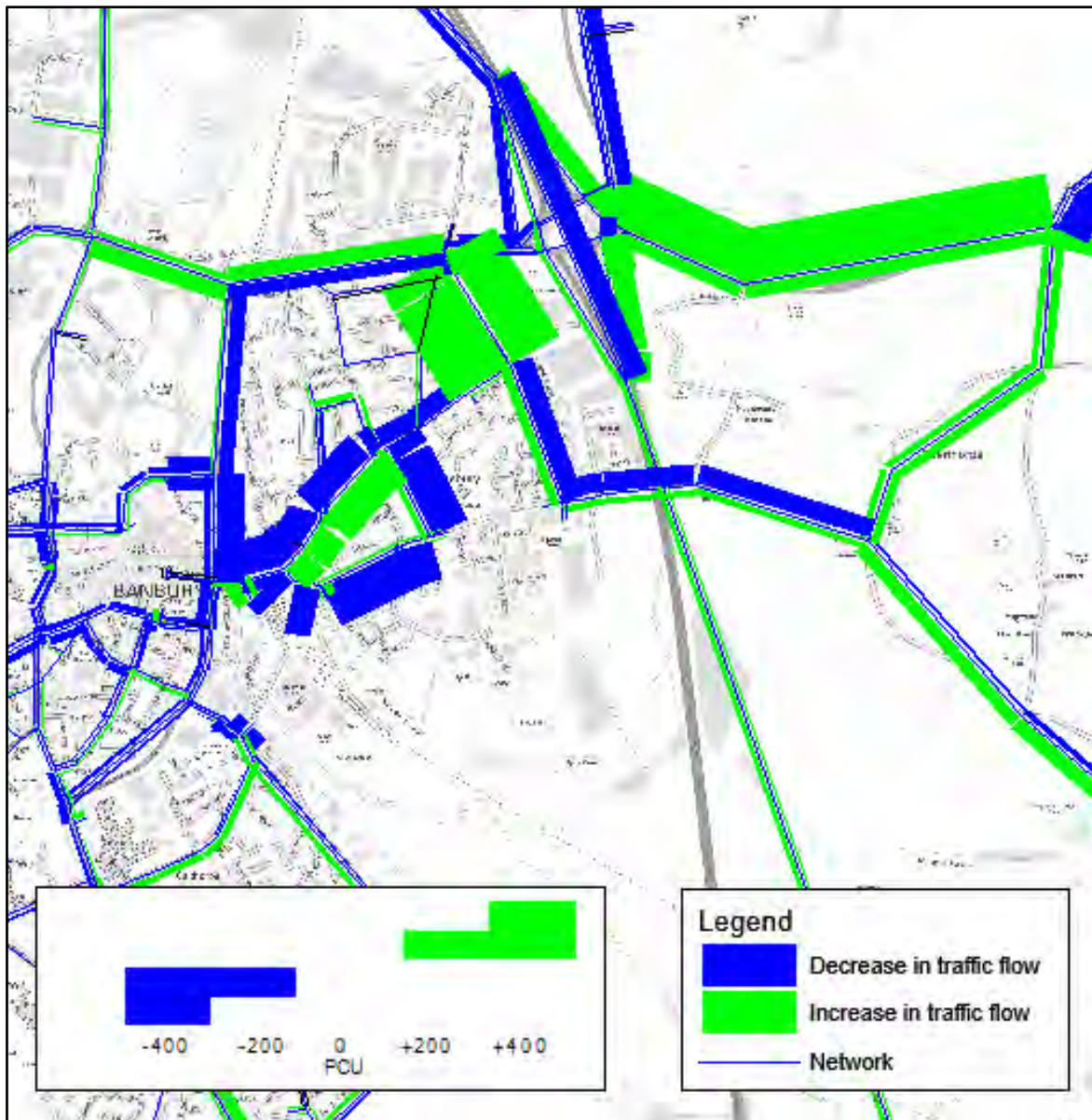
Table 4-6: Scenario 4 comparison with Scenario 3 Network Statistics

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

4.4.2. Changes to traffic flows

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

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



4.4.3. Changes to delay and queuing

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

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

4.4.4. Junction and Link Capacity

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

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



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

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

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

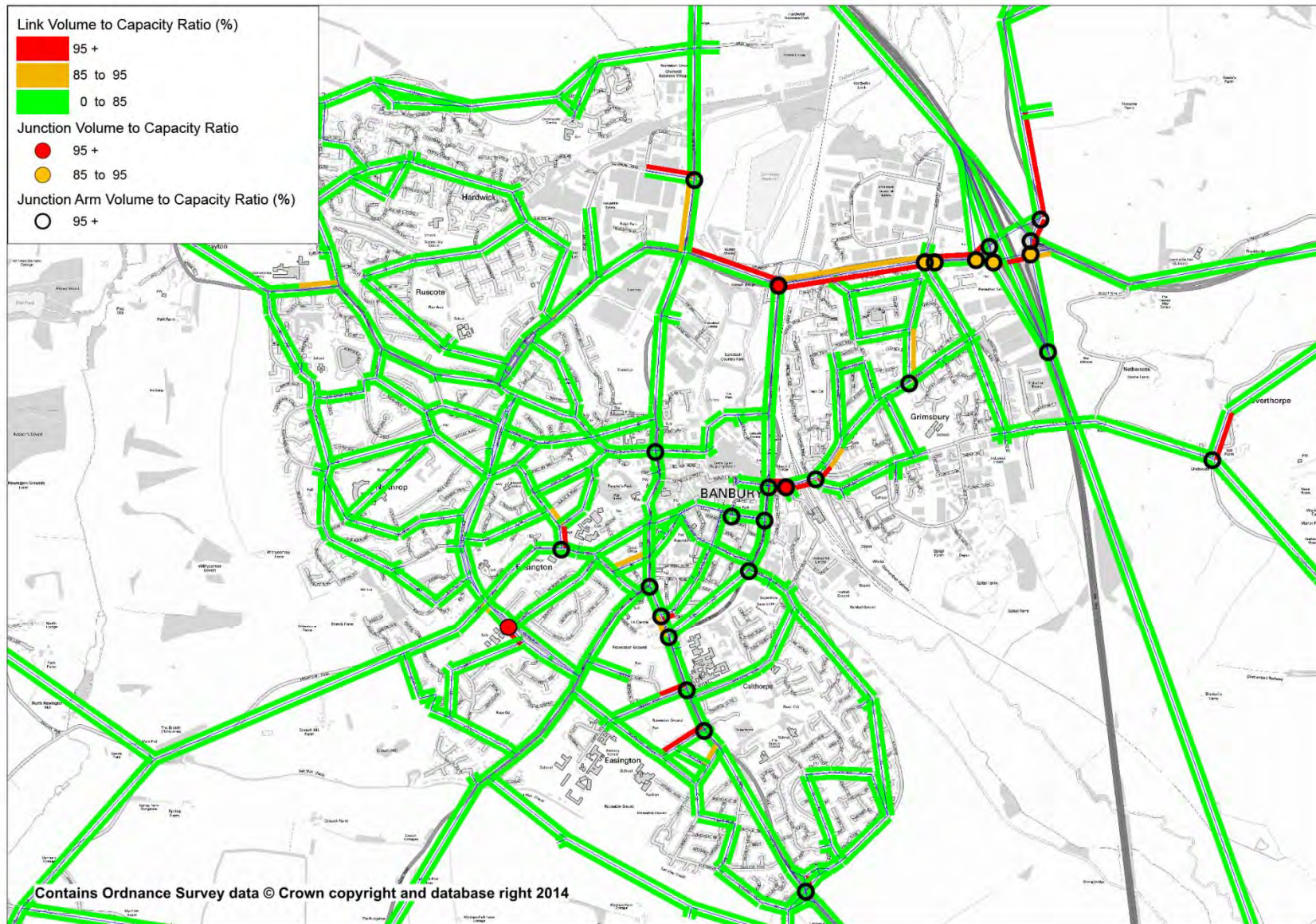
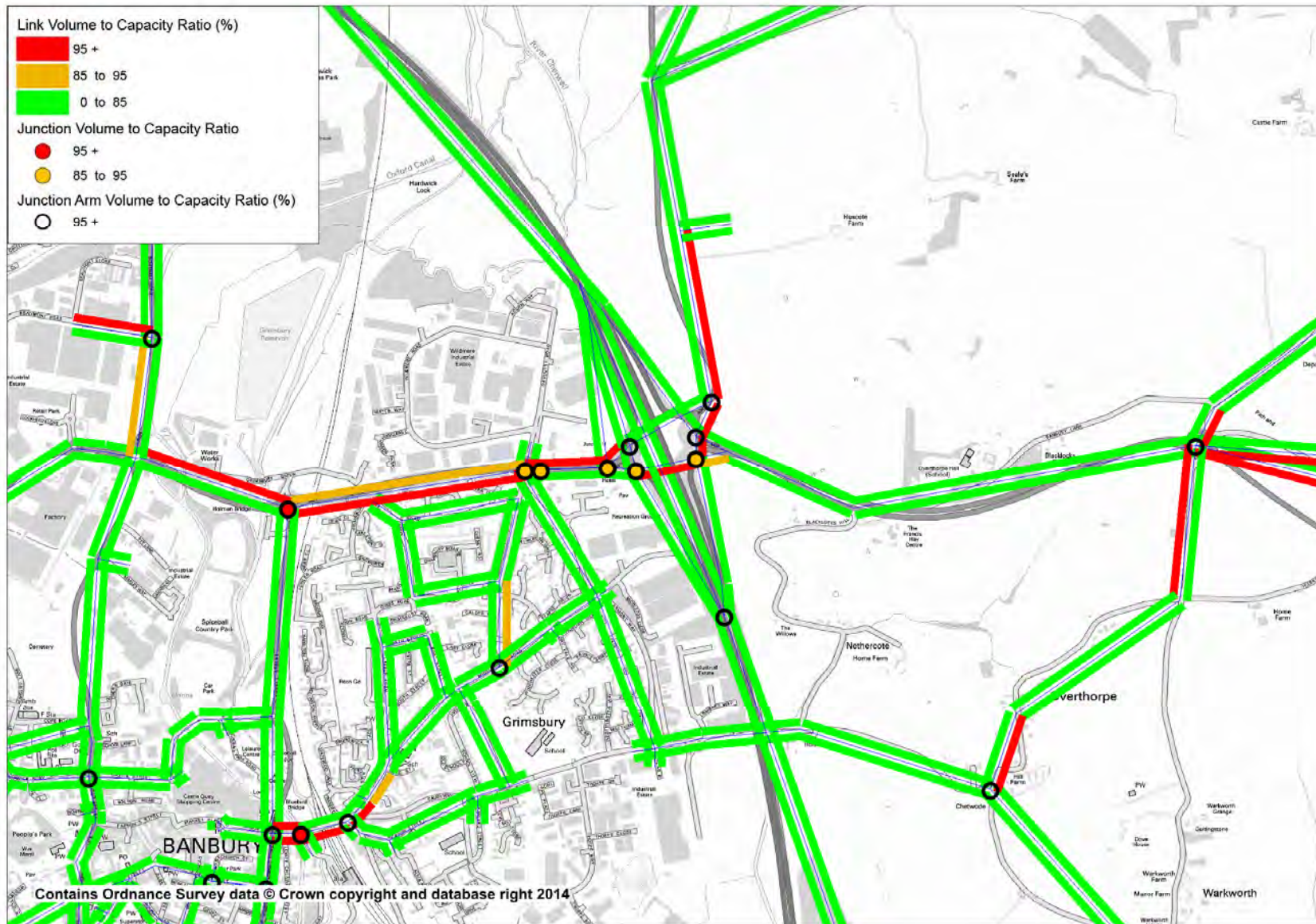


Figure 4-13: Scenario 4 - Link and Junction Volume to Capacity Output for NE Banbury



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

4.5.1. Scheme Overview

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

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

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

4.5.1. Network Statistics

Network statistics for the Scenario 5 model compared with Scenario 4 are set out in Table 4-8 below. Compared with Scenario 4, the model suggests that the new link road would bring significant benefit to the Banbury road network. Average delay falls by 23.5% whilst the average journey time would decrease by 9.6%. If a similar reduction in average delay is assumed for the PM, with no savings in the Inter Peak, the value of these benefits in 2031 is roughly estimated to be about £5m annually¹ (in 2010 prices and values) compared to Scenario 4.

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

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

4.5.2. Changes to traffic flows

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

4.5.3. Changes to Delay and Queuing

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

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

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

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

4.5.4. Junction and Link Capacity

Figures 4-15 and 4-16, show the junction and link capacity across the BHM network for Scenario 5. This scenario is focused on improving conditions in NE Banbury and it can be seen that some improvement has been achieved on the link connecting Overthrope Rd to the A422-B4525 roundabout, but at the expense of higher congestion on the southbound off slip² in J11. Further improvements are considered likely if the junctions were modelled in software such as TRANSYT that could link the traffic signals and create platoons that would result in better network performance.

4.5.5. Flow comparison with 2014

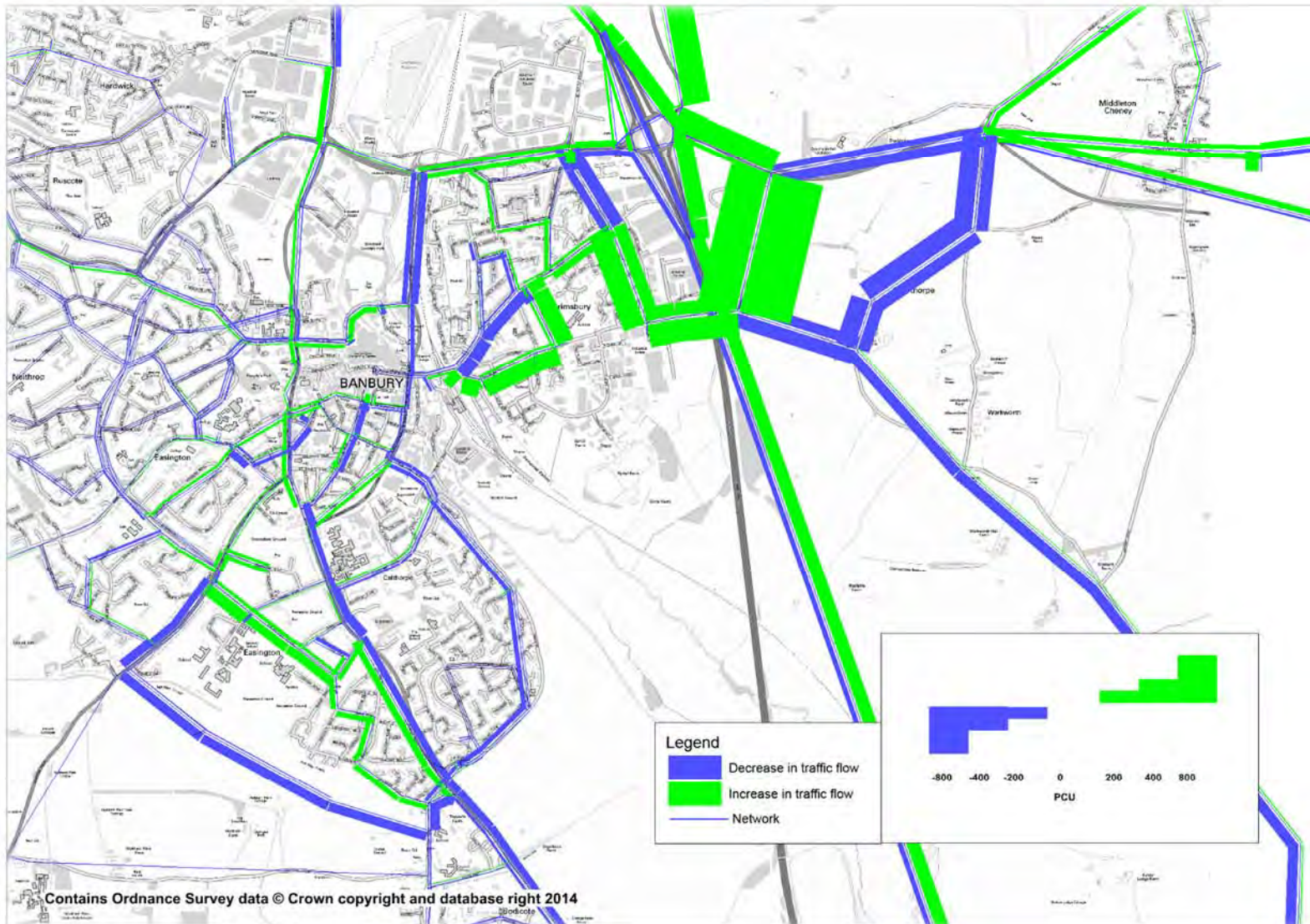
Table 4-9 shows the general increase in traffic flow (pcu) between Scenario 5 and the 2014 base year model, a (weighted) average of 42%.

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

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

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

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



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

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

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

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

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

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

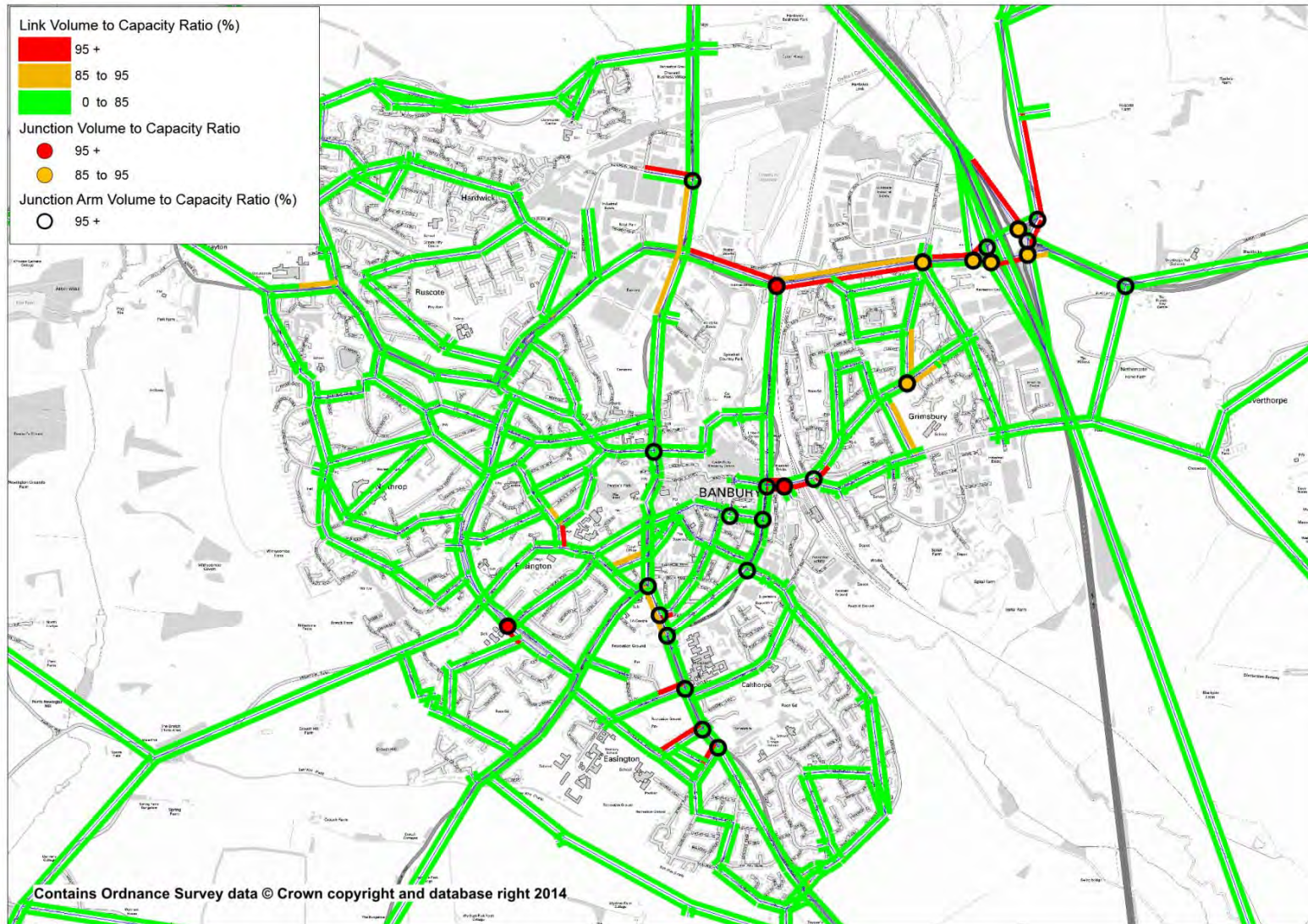
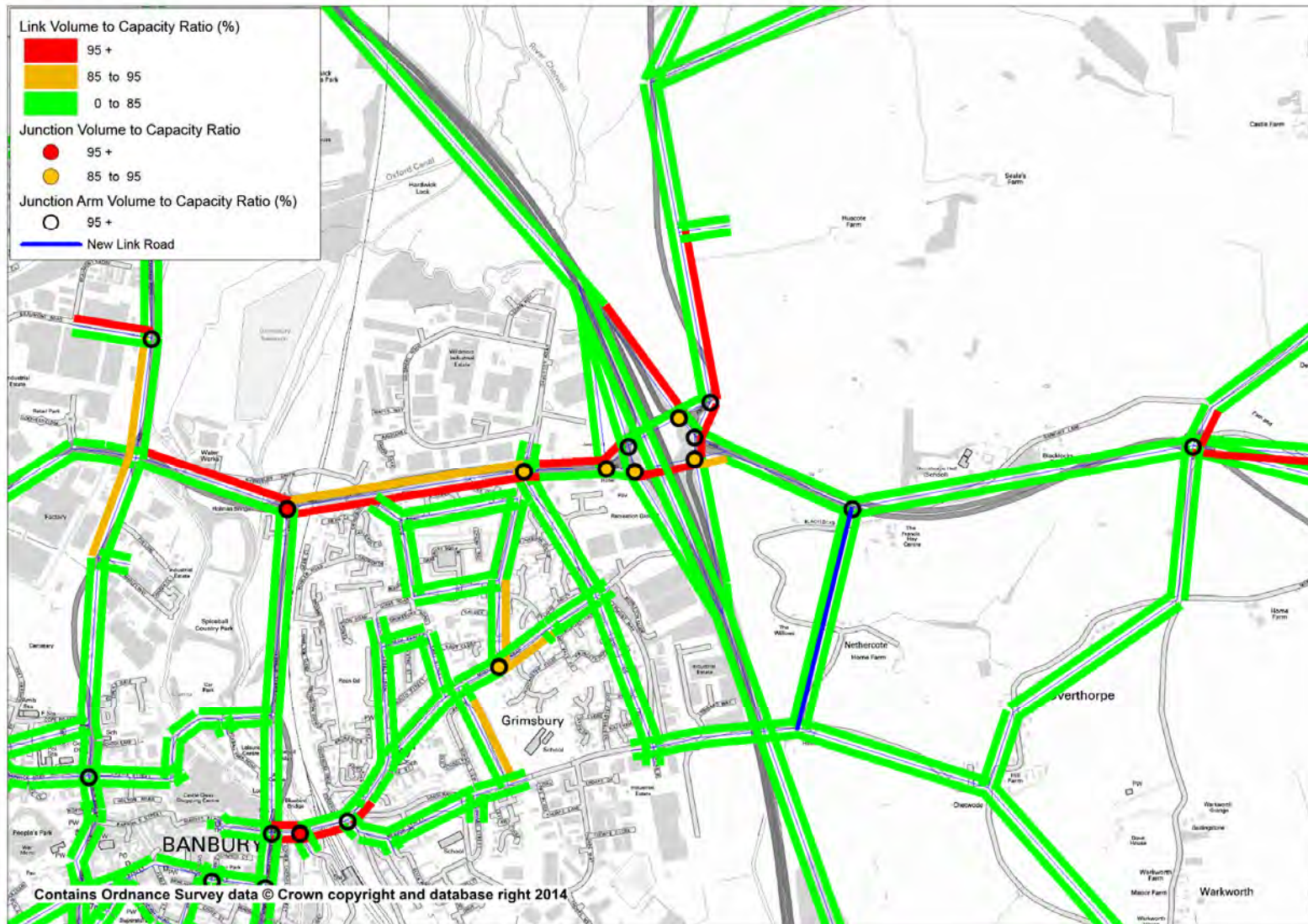


Figure 4-16: Scenario 5 - Link and Junction Volume to Capacity Output for NE Banbury

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



4.6. Scenario 6: Bankside / Ermont Way Link Road

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

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

4.6.1. Network Statistics

Network statistics for the Scenario 6 model compared with Scenario 4 are set out in Table 4-11 below. Compared with the Scenario 4, the average journey time decreases by 4.3%, average delay decreases by nearly 10% and the average speed increases by 4.8%. This suggests that the link road would bring a significant level of benefit to the road network. If a similar reduction in average delay is assumed for the PM, with no savings in the Inter Peak, the value of these benefits in 2031 is roughly estimated to be about £2.5m annually³ (in 2010 prices and values) compared to Scenario 4.

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

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

4.6.2. Flow Difference

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

4.6.3. Changes to Delay and Queuing

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

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

4.6.4. Junction and Link Capacity

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

4.6.5. Flow comparison with 2014

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

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

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

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

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

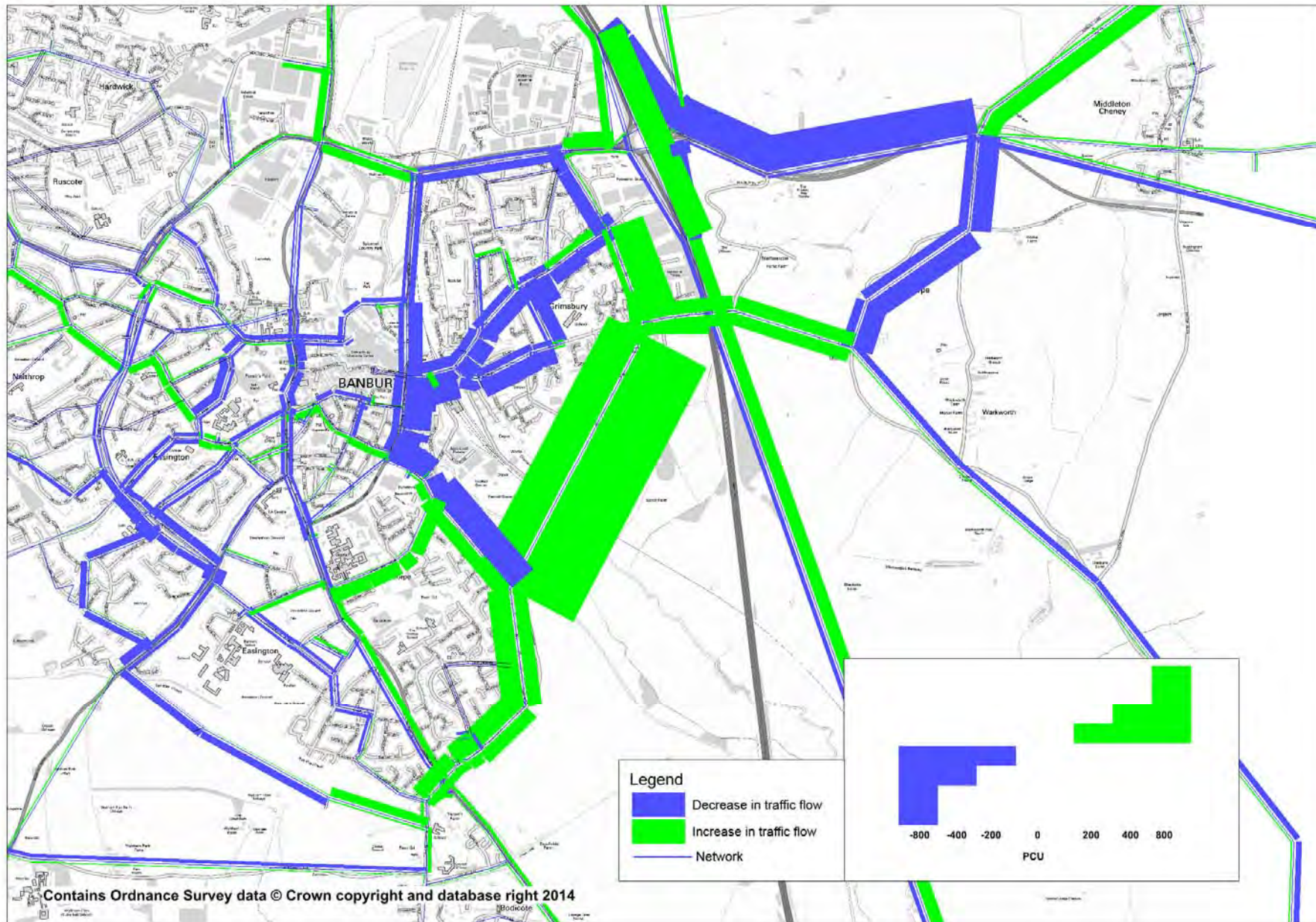


Table 4-13: Key Junction performance for 2031 Scenario 6 (compared with Scenario 4)

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

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

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

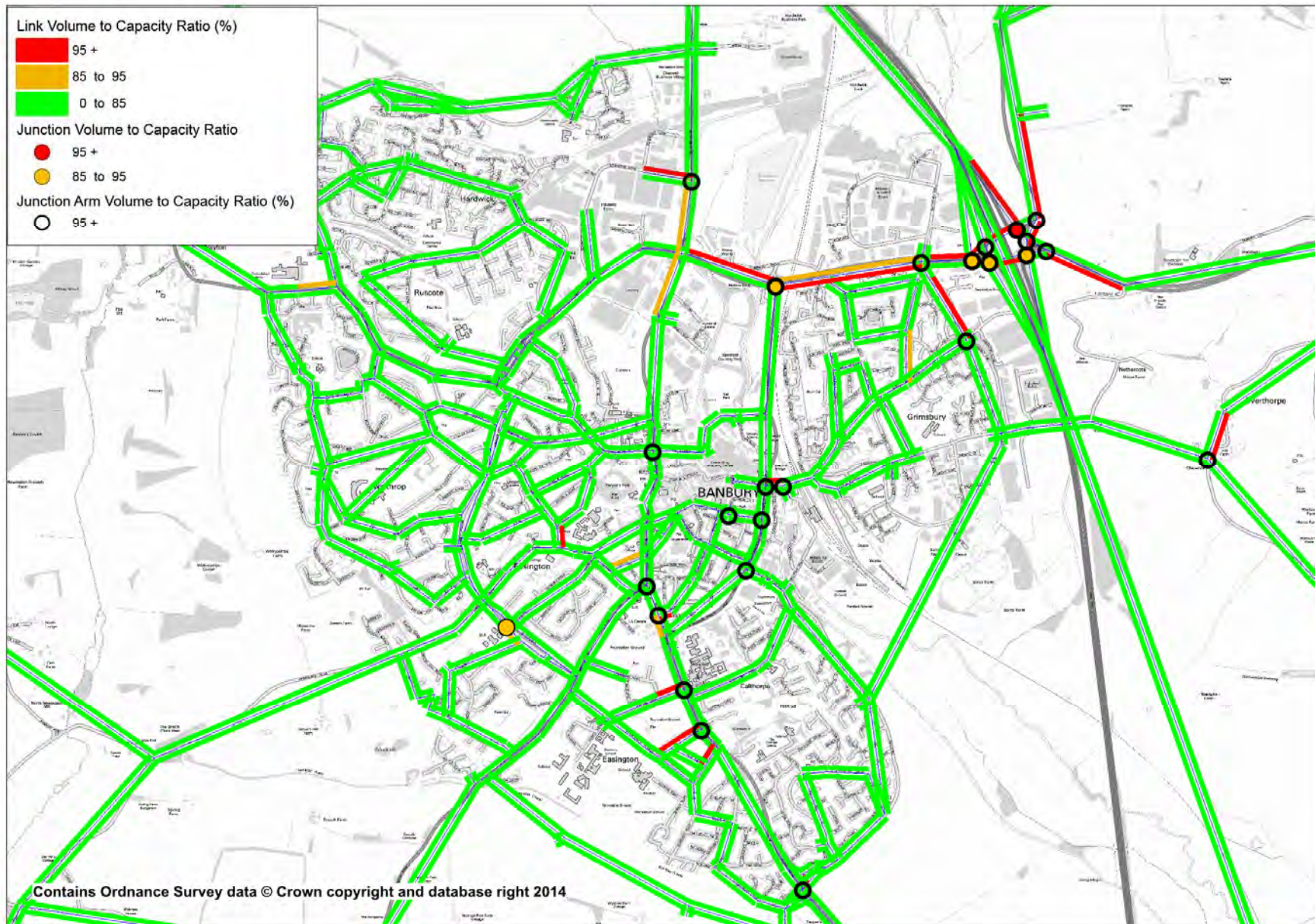
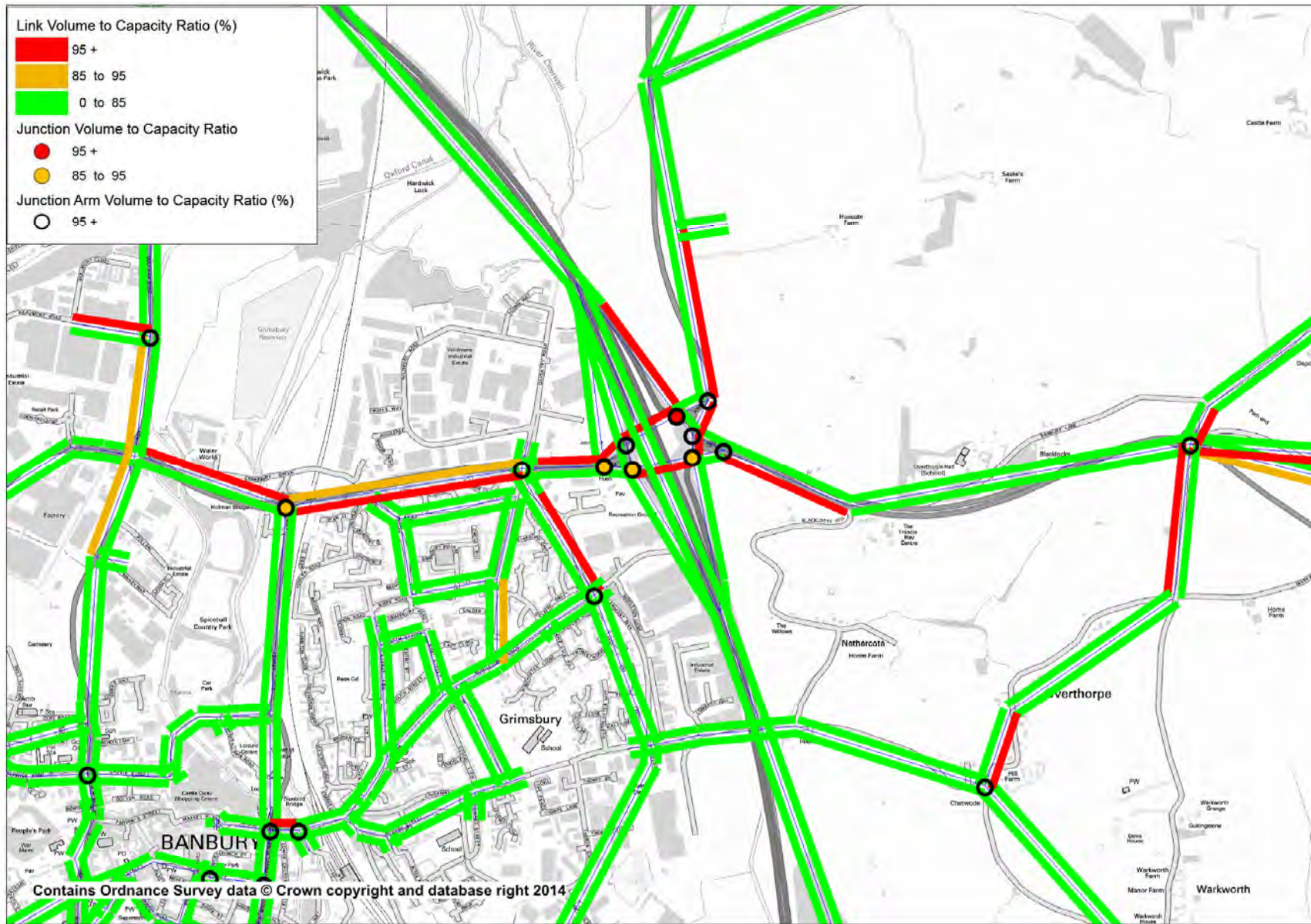


Figure 4-19: Scenario 6 - Link and Junction Volume to Capacity Output for NE Banbury



5. Summary

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

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

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

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

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

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

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

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

Further work required:

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

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