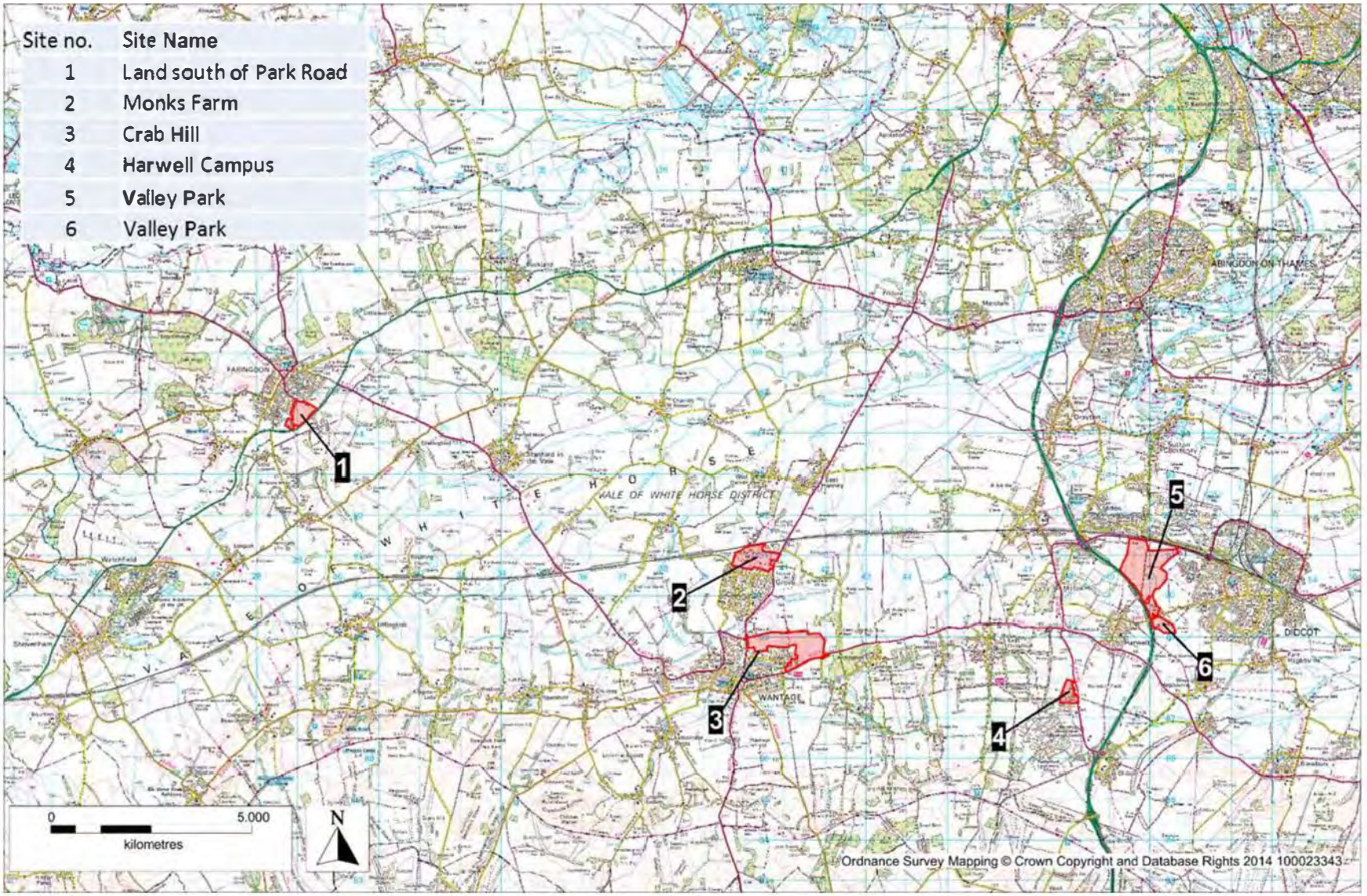
Appendices

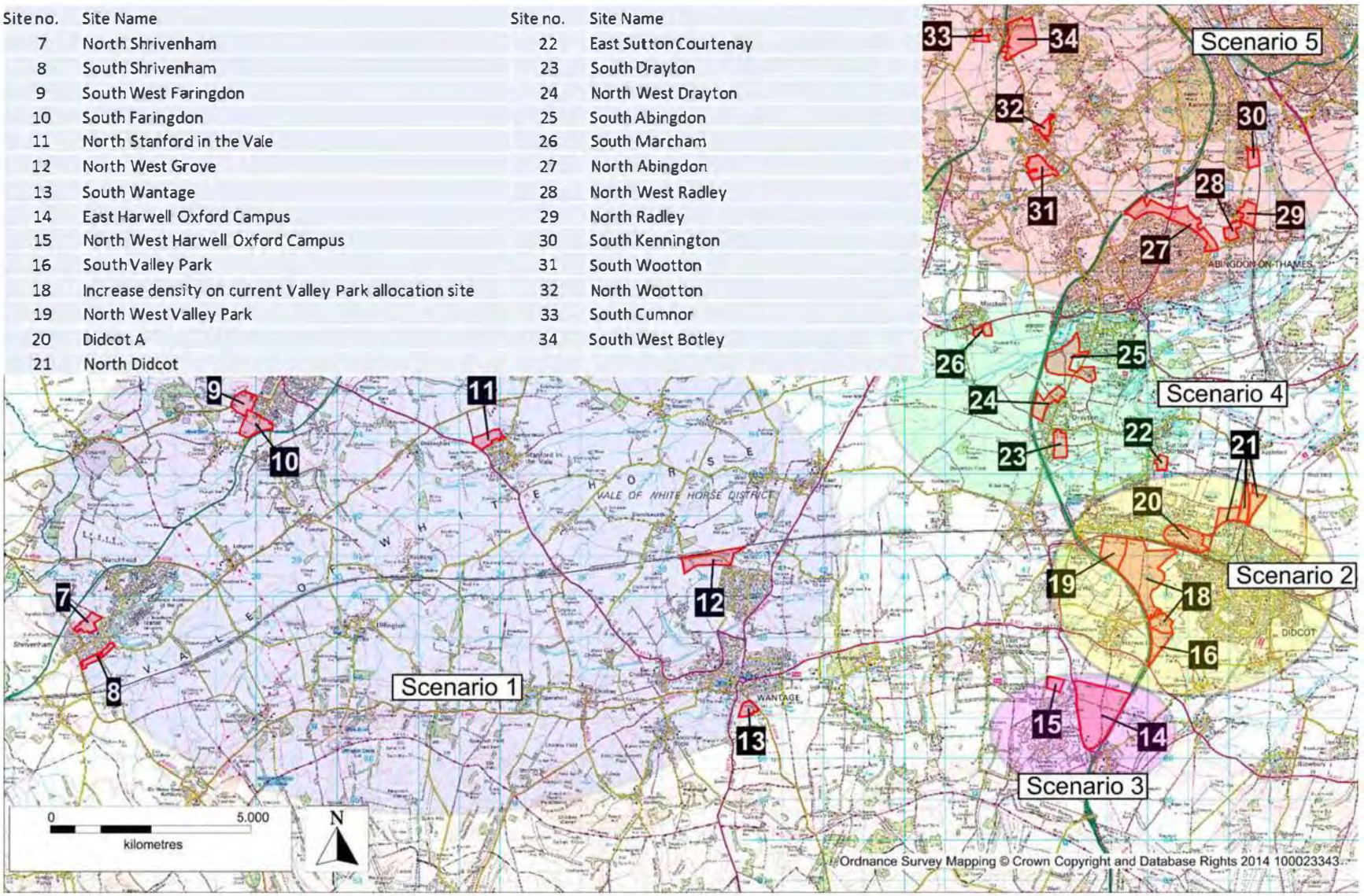
Appendix A. Land use assumptions

ETI Stage 1 housing distribution



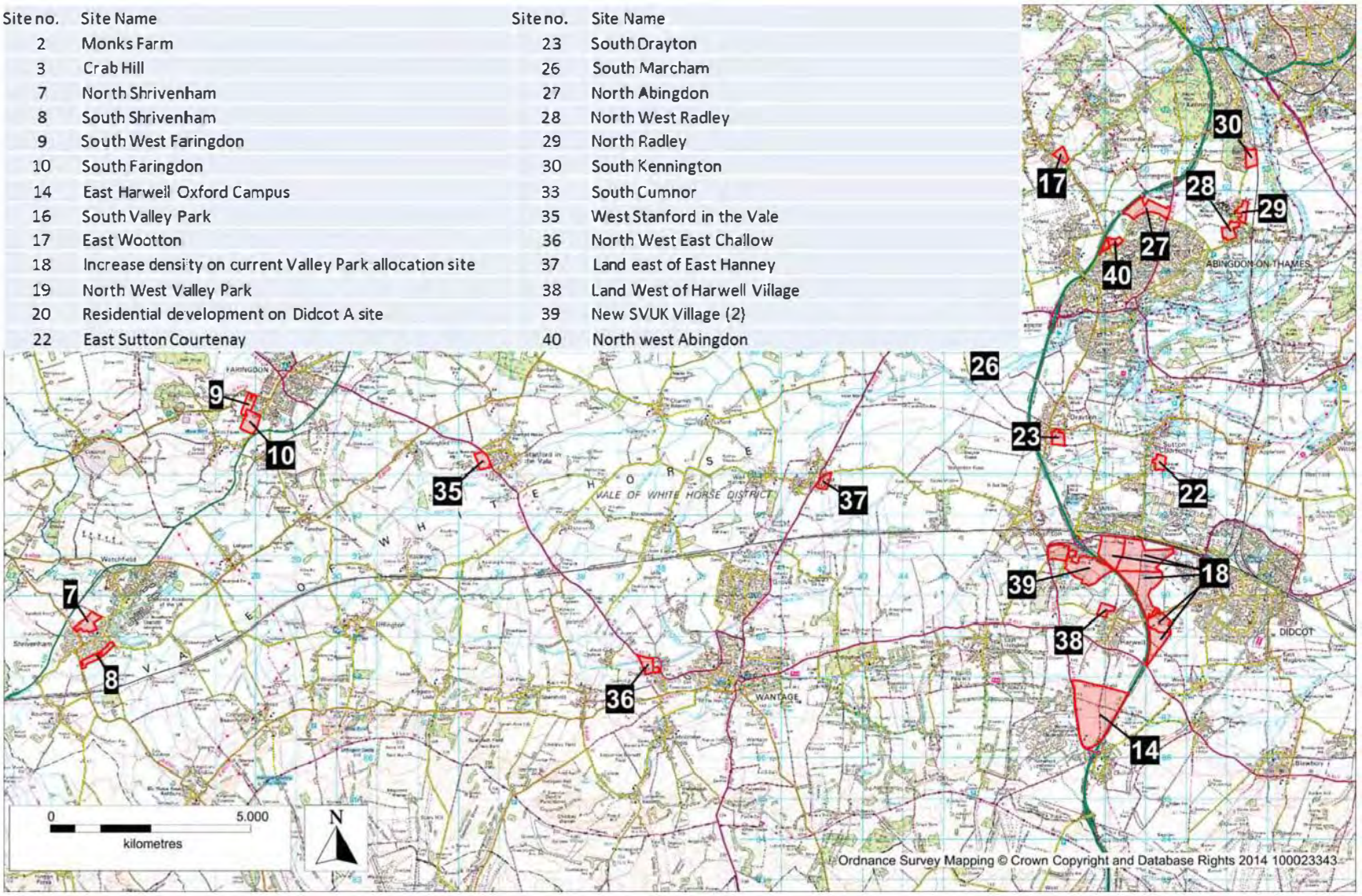
ETI Stage 2 housing distribution

Site no.	Site Name	Site no.	Site Name
7	North Shrivenham	22	East Sutton Courtenay
8	South Shrivenham	23	South Drayton
9	South West Faringdon	24	North West Drayton
10	South Faringdon	25	South Abingdon
11	North Stanford in the Vale	26	South Marcham
12	North West Grove	27	North Abingdon
13	South Wantage	28	North West Radley
14	East Harwell Oxford Campus	29	North Radley
15	North West Harwell Oxford Campus	30	South Kennington
16	South Valley Park	31	South Wootton
18	Increase density on current Valley Park allocation site	32	North Wootton
19	North West Valley Park	33	South Cumnor
20	Didcot A	34	South West Botley
21	North Didcot		

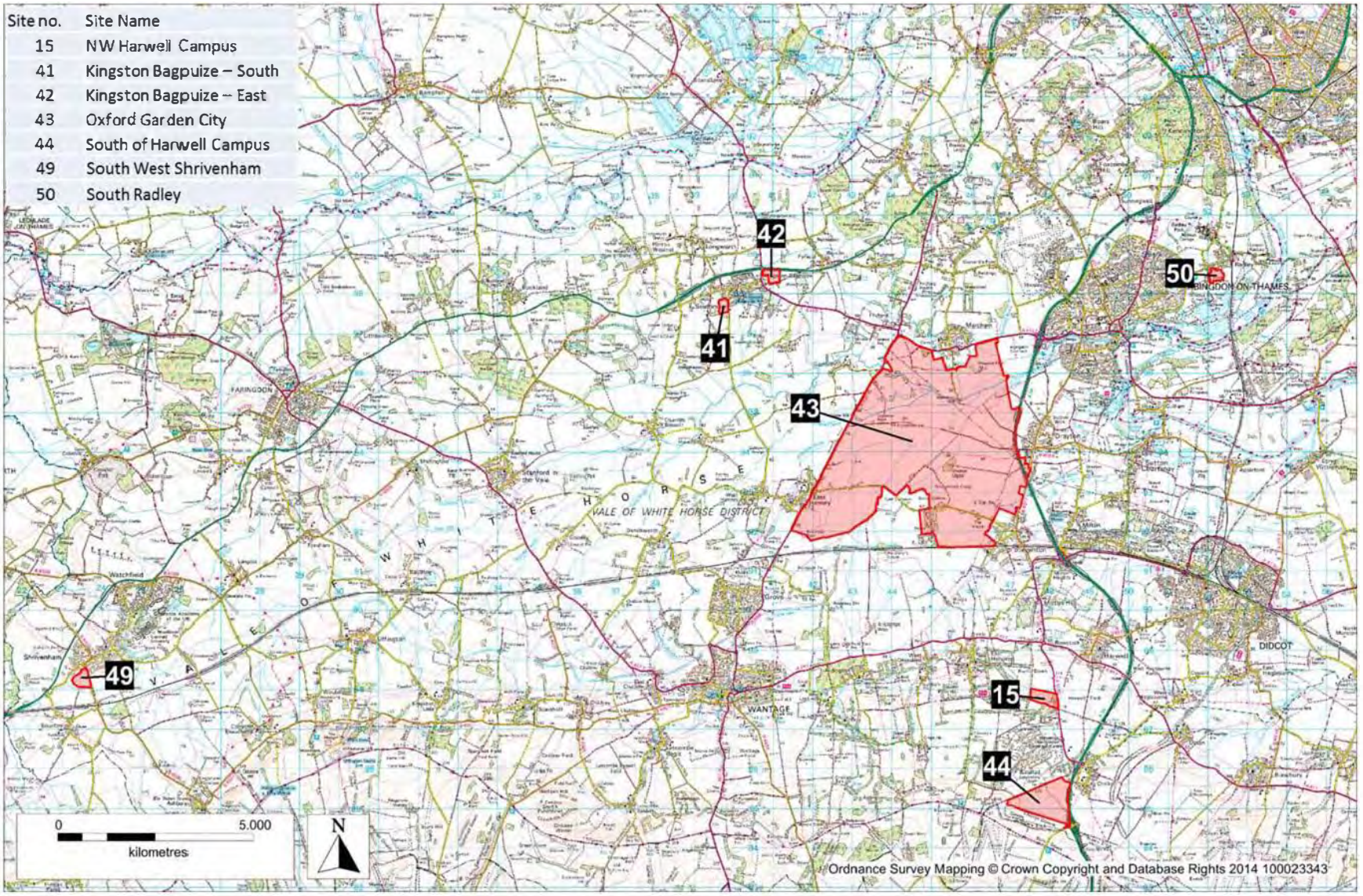


ETI Stage 3 housing distribution

Site no.	Site Name	Site no.	Site Name
2	Monks Farm	23	South Drayton
3	Crab Hill	26	South Marcham
7	North Shrivenham	27	North Abingdon
8	South Shrivenham	28	North West Radley
9	South West Faringdon	29	North Radley
10	South Faringdon	30	South Kennington
14	East Harwell Oxford Campus	33	South Cumnor
16	South Valley Park	35	West Stanford in the Vale
17	East Wootton	36	North West East Challow
18	Increase density on current Valley Park allocation site	37	Land east of East Hanney
19	North West Valley Park	38	Land West of Harwell Village
20	Residential development on Didcot A site	39	New SVUK Village (2)
22	East Sutton Courtenay	40	North west Abingdon

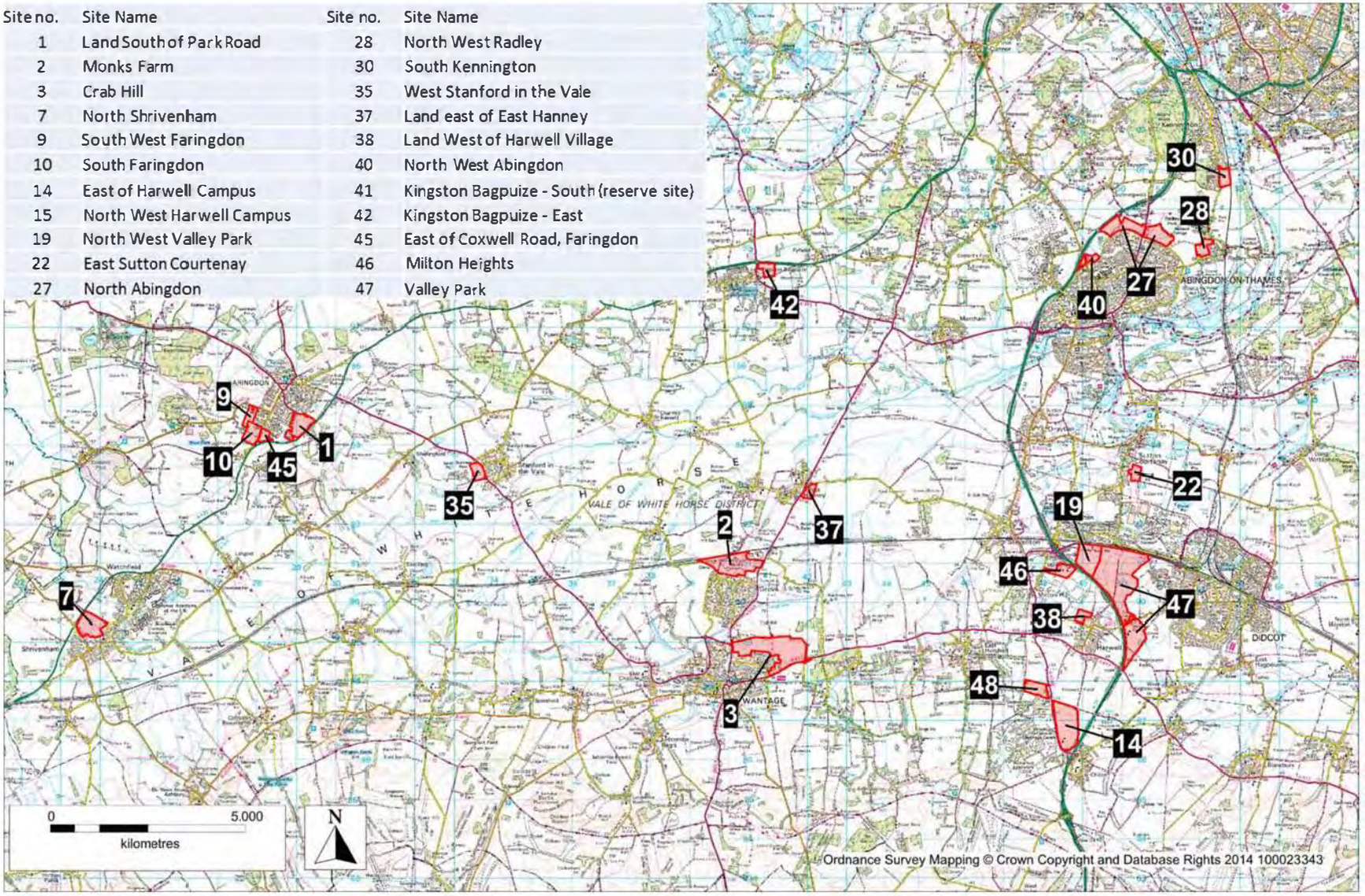


ETI Stage 4 housing distribution



ETI Stage 5 housing distribution

Site no.	Site Name	Site no.	Site Name
1	Land South of Park Road	28	North West Radley
2	Monks Farm	30	South Kennington
3	Crab Hill	35	West Stanford in the Vale
7	North Shrivenham	37	Land east of East Hanney
9	South West Faringdon	38	Land West of Harwell Village
10	South Faringdon	40	North West Abingdon
14	East of Harwell Campus	41	Kingston Bagpuize - South (reserve site)
15	North West Harwell Campus	42	Kingston Bagpuize - East
19	North West Valley Park	45	East of Coxwell Road, Faringdon
22	East Sutton Courtenay	46	Milton Heights
27	North Abingdon	47	Valley Park

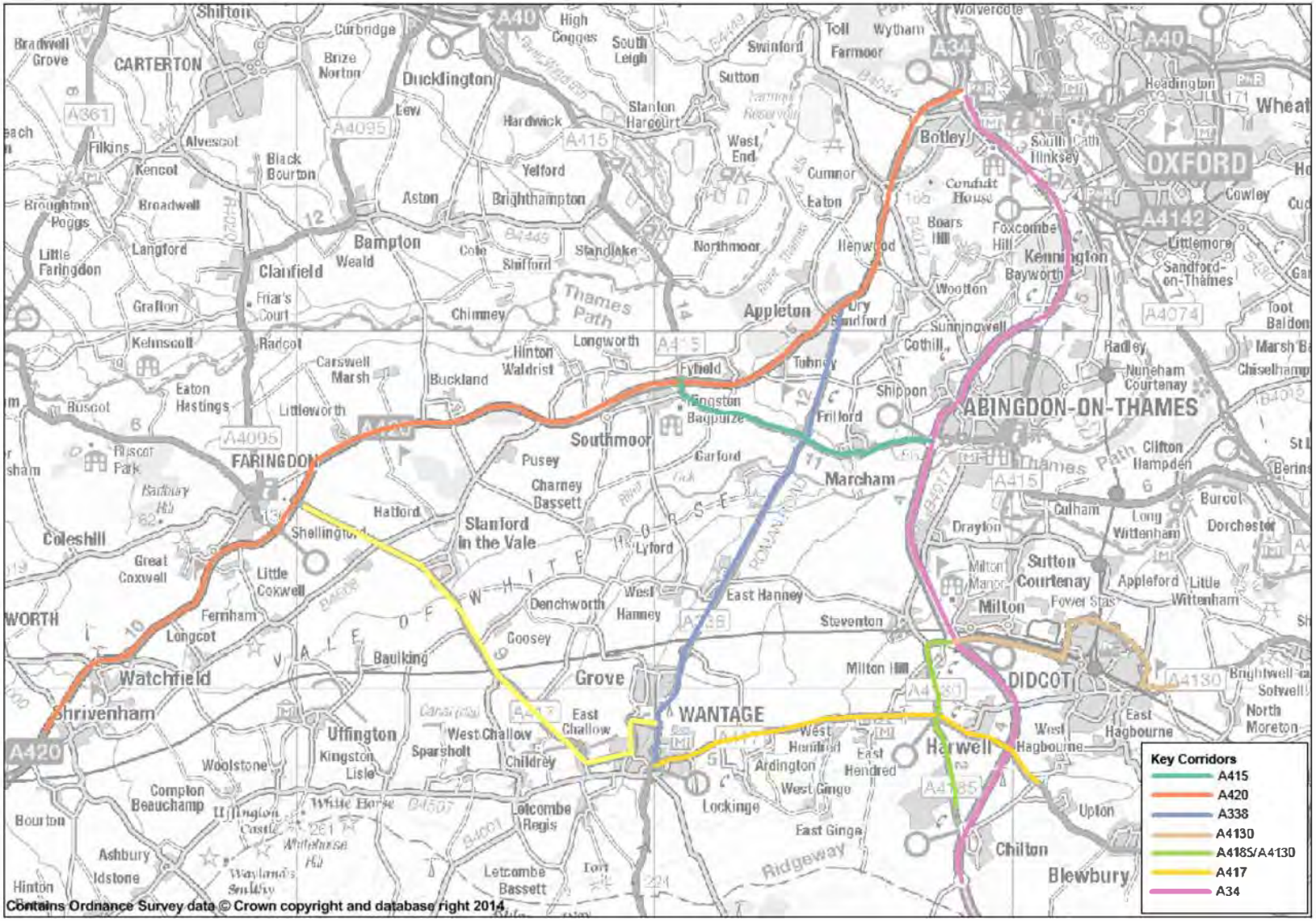


ETI Stage 5 employment distribution

Employment Stage 1 & 3		Employment Stage 5	
Location	**Jobs**	**Location**	**Jobs**
C1 Abingdon Business Park at Wyndyke Furlong	112	C1 Abingdon Business Park at Wyndyke Furlong	78
C2 Abingdon Science Park at Barton Lane	123	C2 Abingdon Science Park at Barton Lane	86
C9f Faringdon – land adjacent to A420 – '4&20' Site	545	C9f Faringdon – land adj to A420 – "4&20" site	490
C8 Cumnor Hill	50	C8 Cumnor Hill	35
C20 Wootton Business Park	247	C20 Wootton Business Park	173
C9b Faringdon – HCA business centre	30	C9b Faringdon – HCA business centre	21
C32 Wantage Monks Farm	1223	C32 North Grove Monks Farm	700
C10 Grove Technology Park	987	C10 Grove Technology Park	630
C33 FaringdonSouth Park Road	303	C33 Faringdon South Park Road	350
Didcot power station	2022	C29 Didcot A	2,131
		Existing Business Premises at Didcot Power Station not incl. vacant surplus land	1,500
Harwell SIC	4000	C16 Harwell Campus (within EZ or on adj. land)	2,600
NE Milton Park	181	C26 Milton Hill Bus. and Technology Centre[1][1]	1,306
Milton Park North	2090	Harwell Oxford Campus and Milton Park (EZ)	5,400
Milton Park South	1317		
		C13 Station Road, Grove (Williams F1)	500
		No B use land	
		Other retail (Botley)	200
		Induced multiplier indirect jobs (evenly distributed by settlement)	2,200
		Non B use jobs (evenly distributed by settlement)	4,600

Appendix B. Key Corridors

Key Corridors



Appendix C. Volume to Capacity Ratio Plots

Figure -C1 Impact on the traffic network – ETI Stage 1 AM Peak Hour

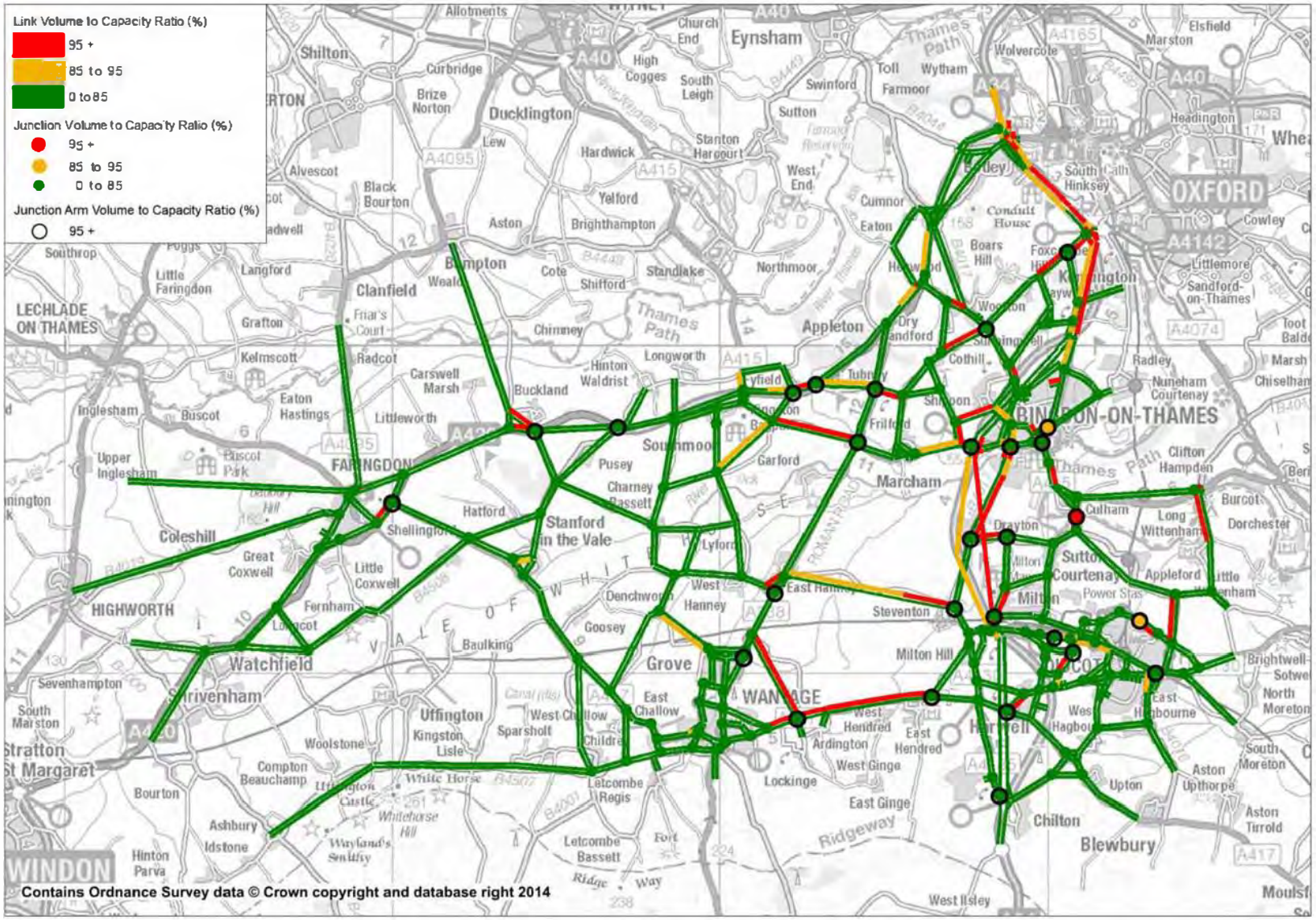


Figure -C2 Impact on the traffic network - ETI Stage 1 PM Peak Hour

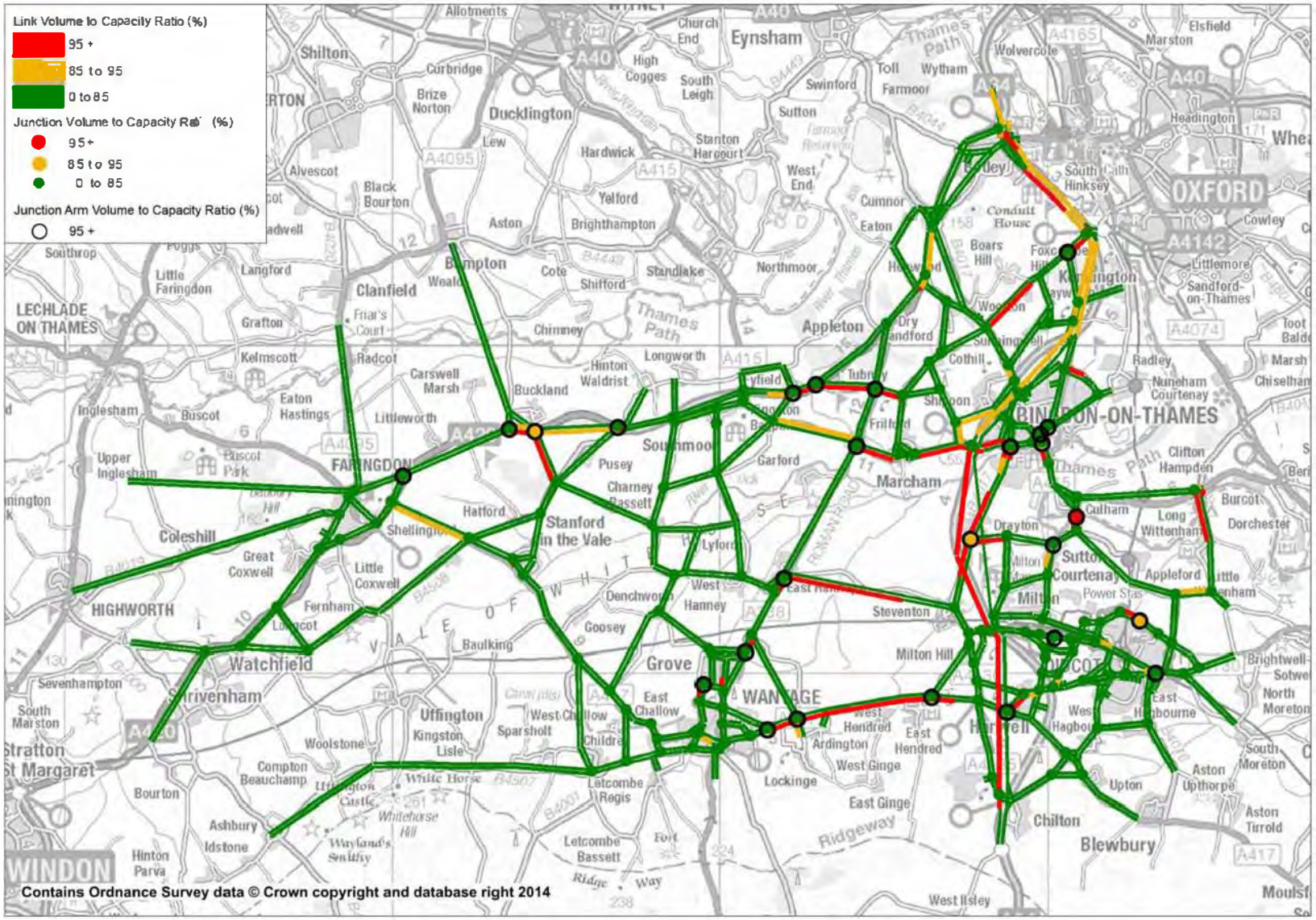


Figure -C3 Impact on the traffic network - ETI Stage 3 AM Peak Hour

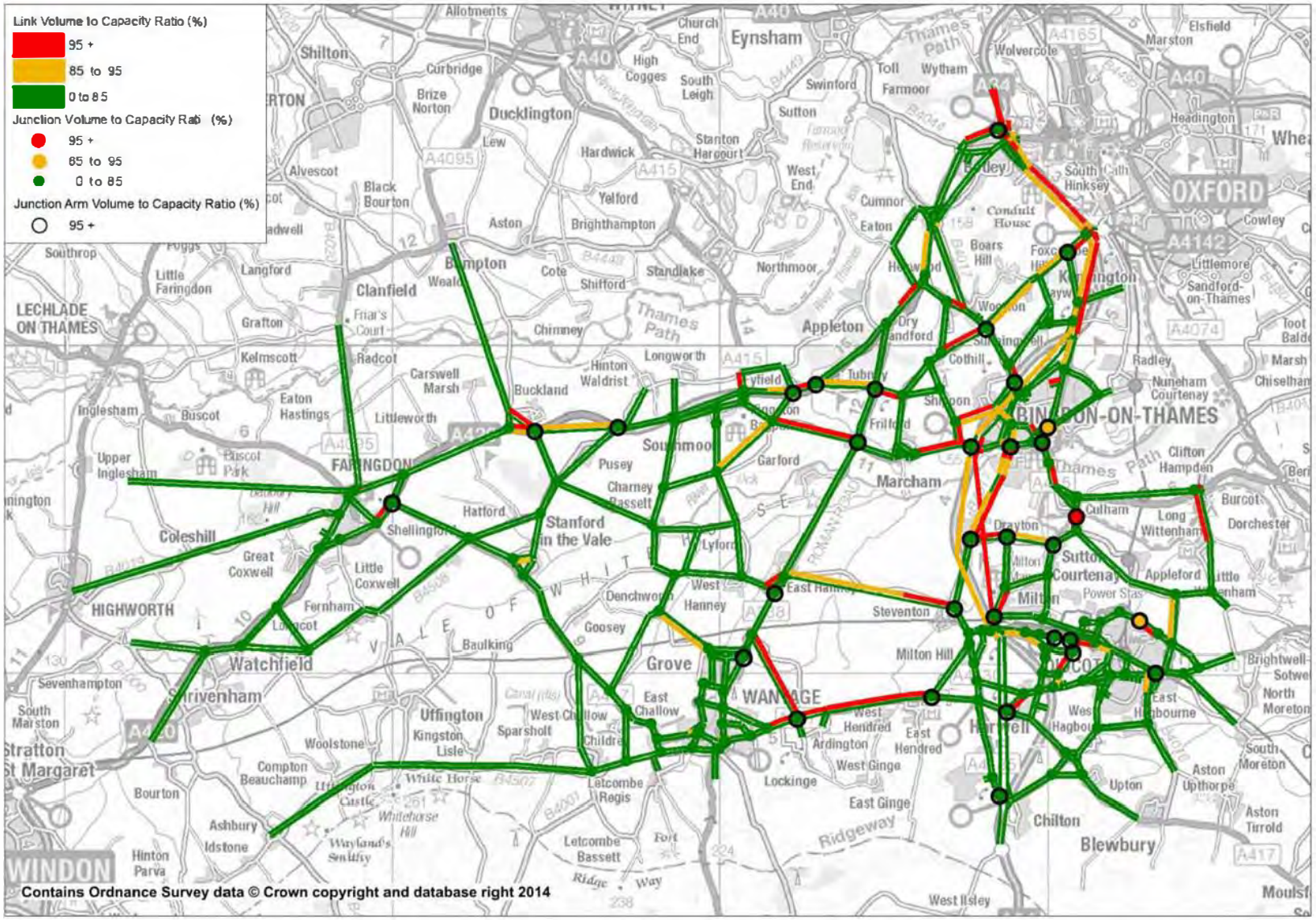


Figure -C4 Impact on the traffic network - ETI Stage 3 PM Peak Hour

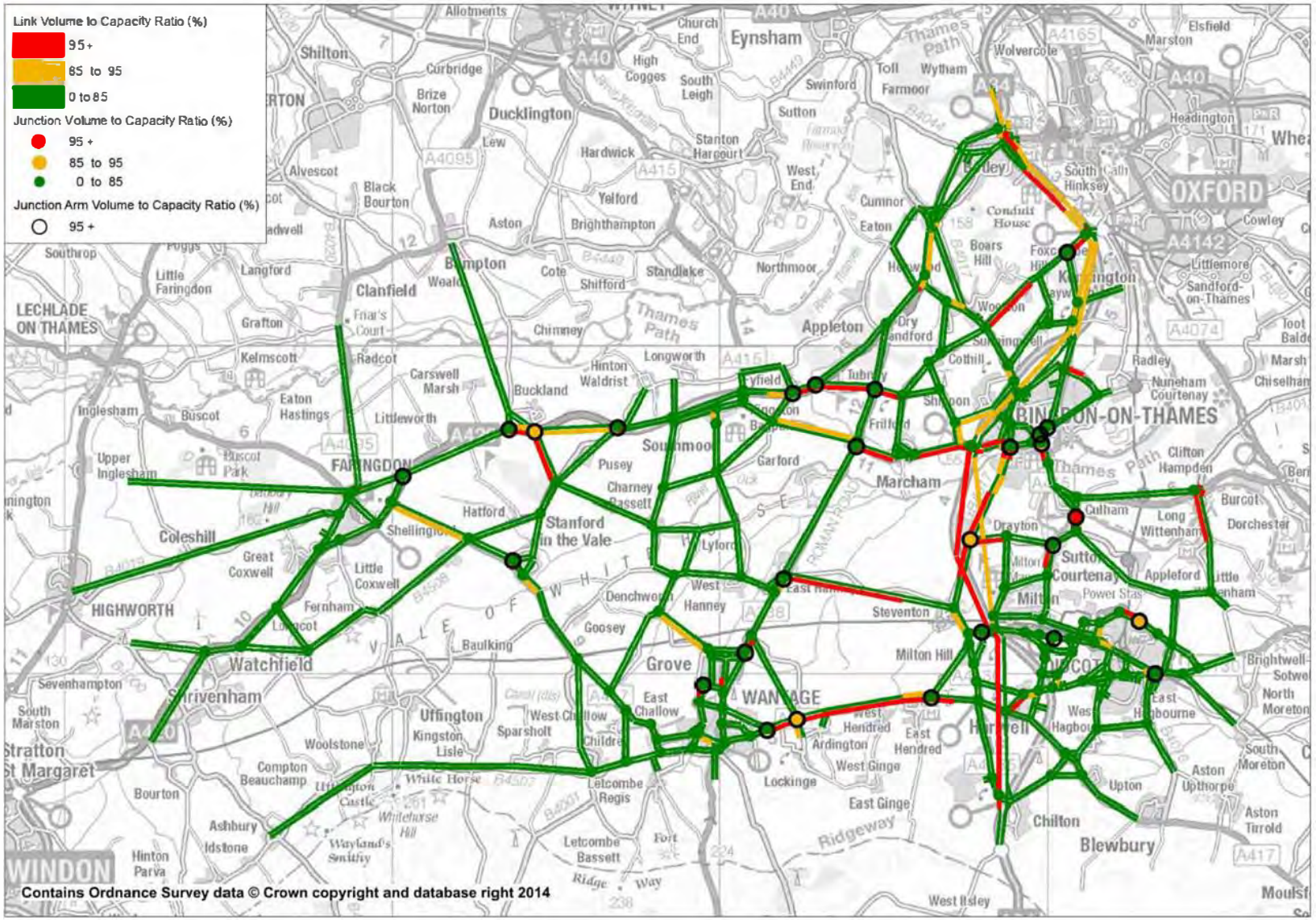


Figure -C5 Impact on the traffic network - ETI Stage 5 AM Peak Hour

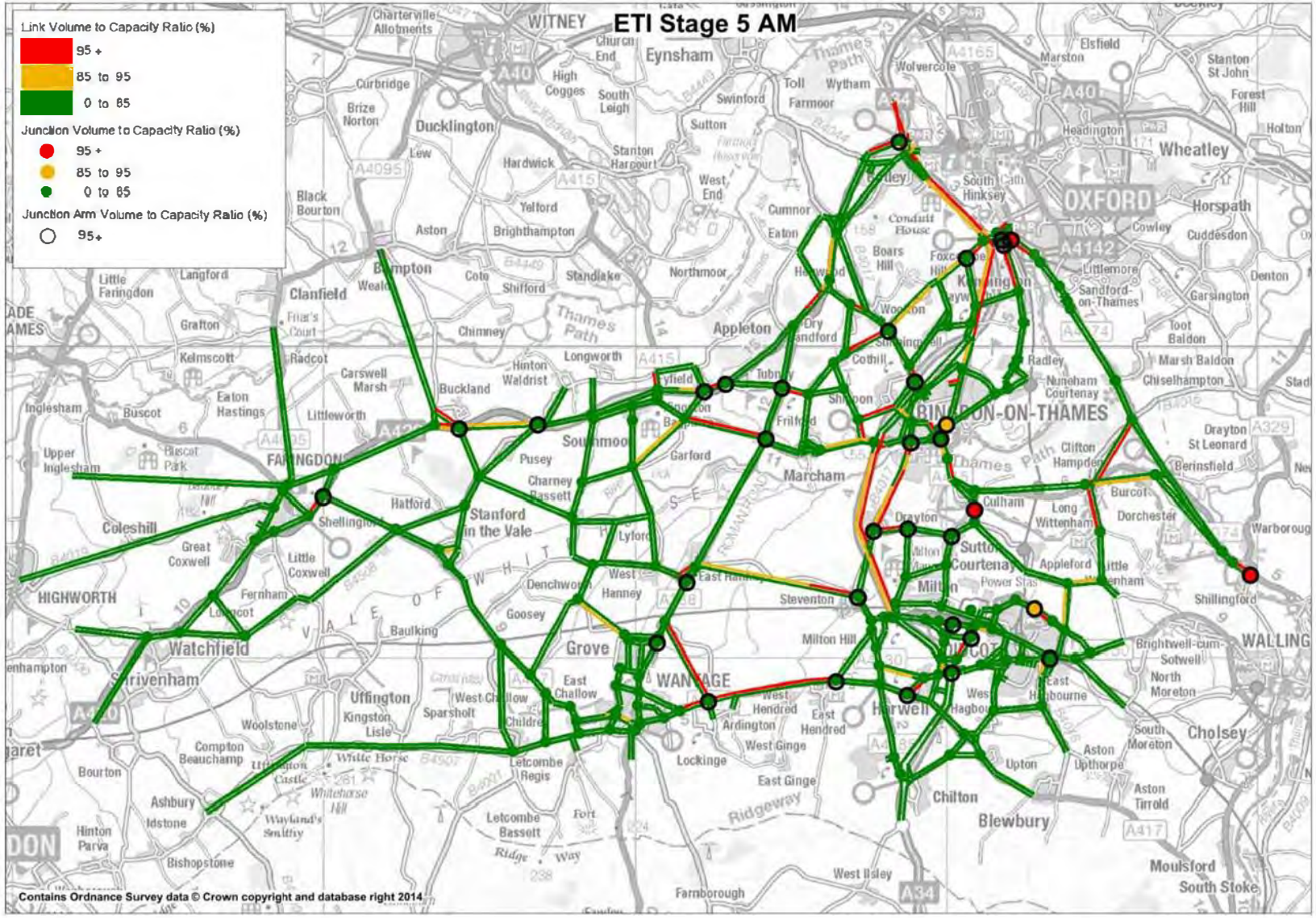


Figure -C6 Impact on the traffic network - ETI Stage 5 PM Peak Hour

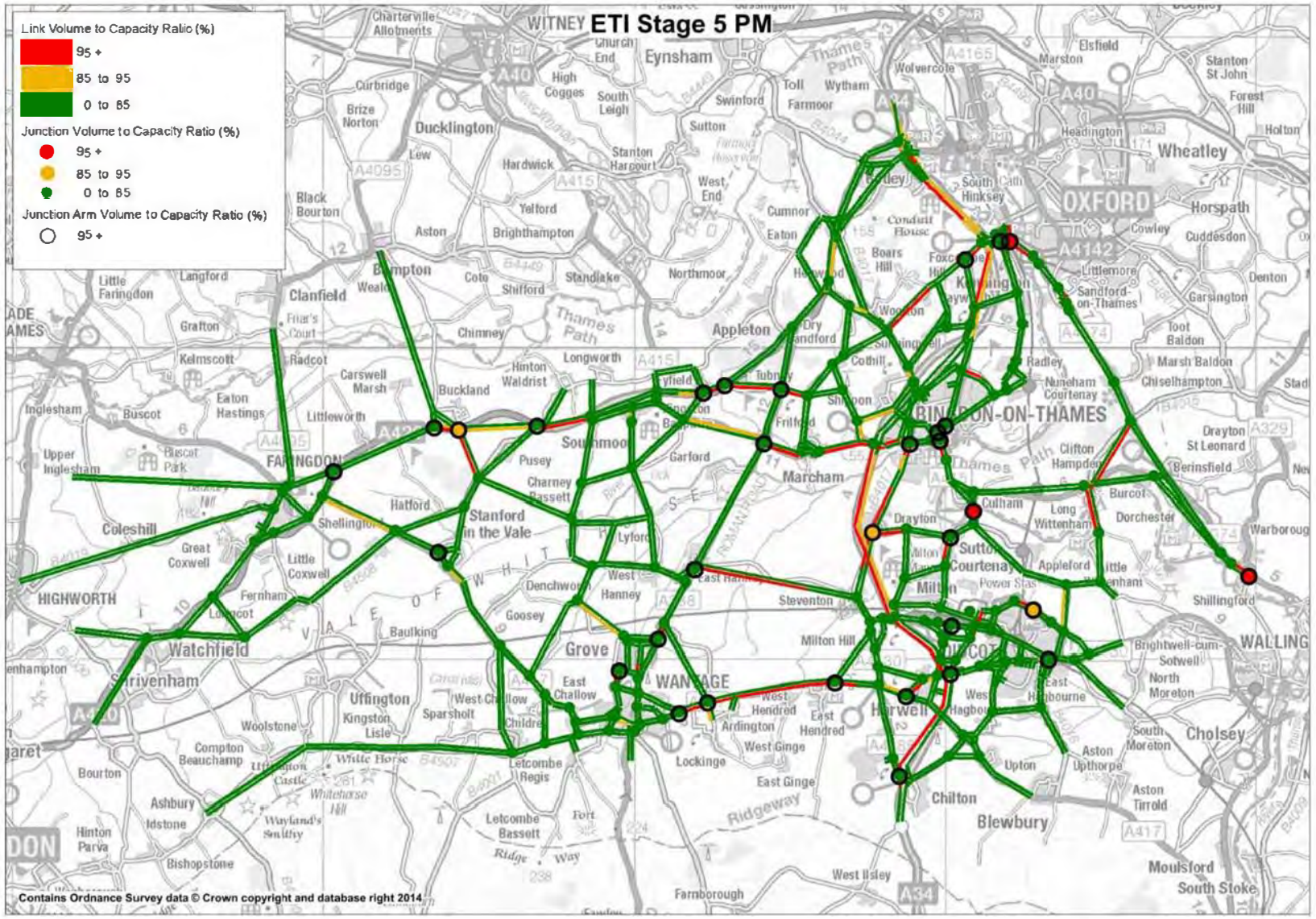


Figure -C7 Impact on the traffic network - ETI Stage 5a AM Peak Hour

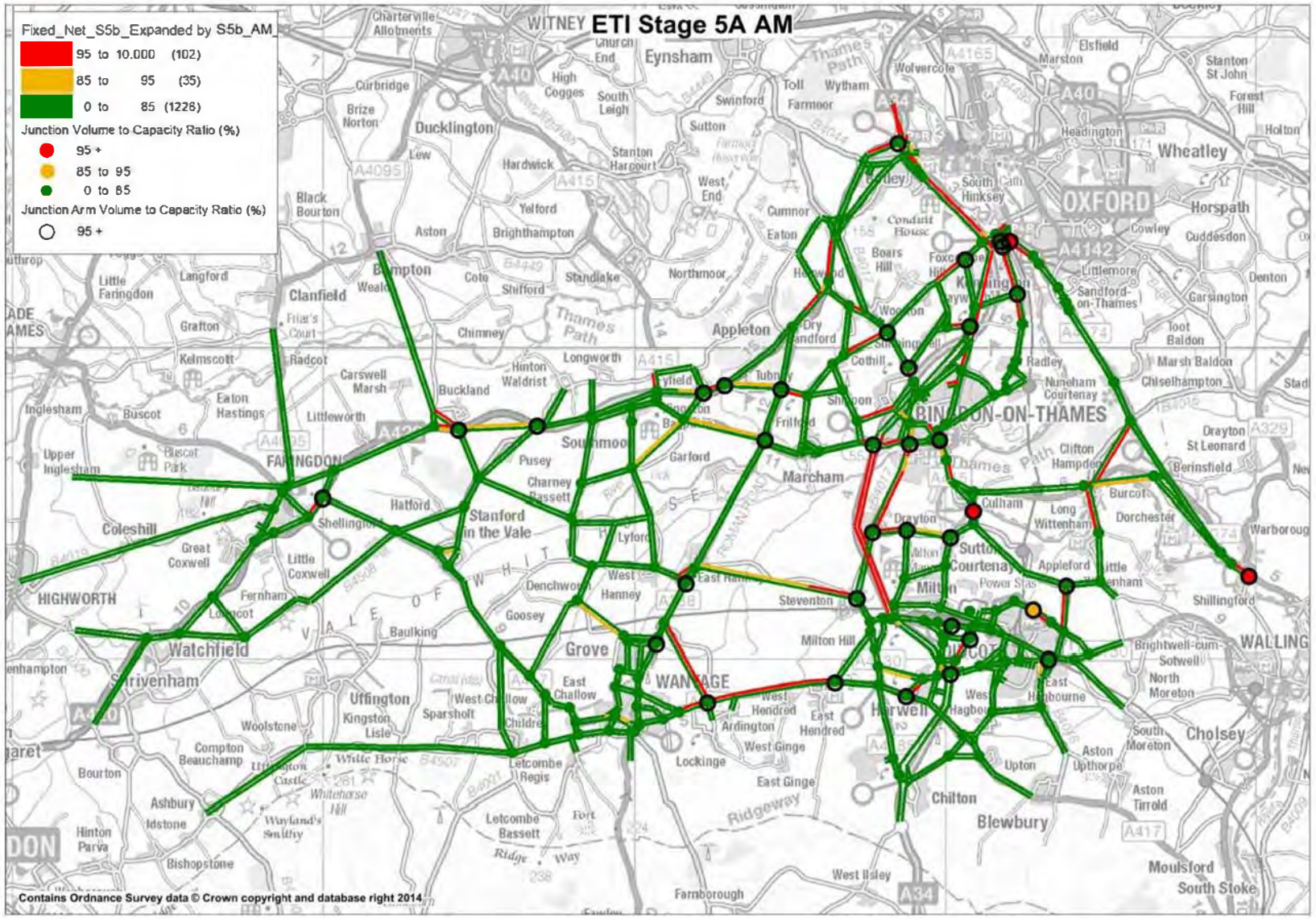


Figure -C8 Impact on the traffic network - ETI Stage 5a PM Peak Hour

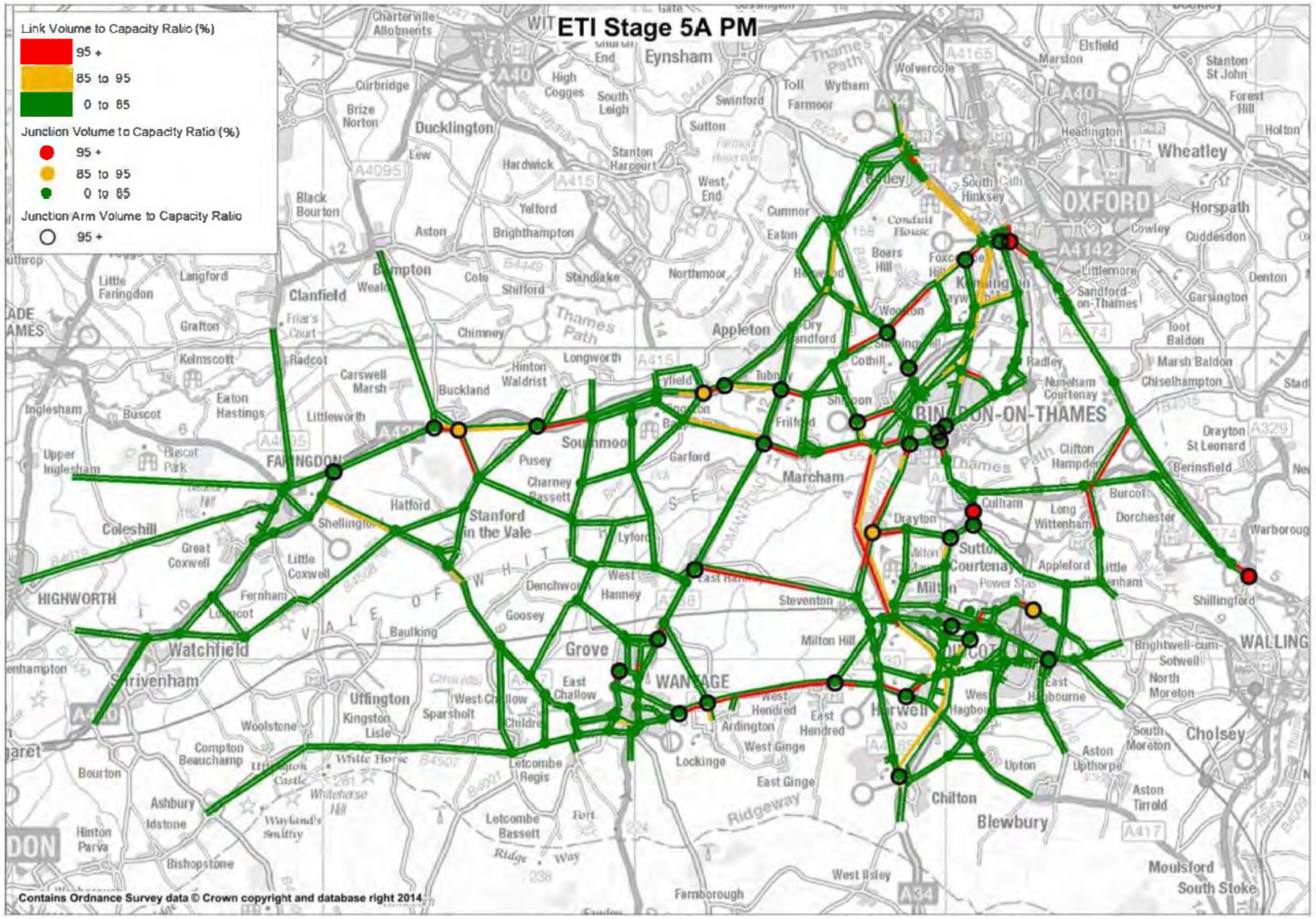


Figure -C9 Impact on the traffic network - ETI Stage 5b AM Peak Hour

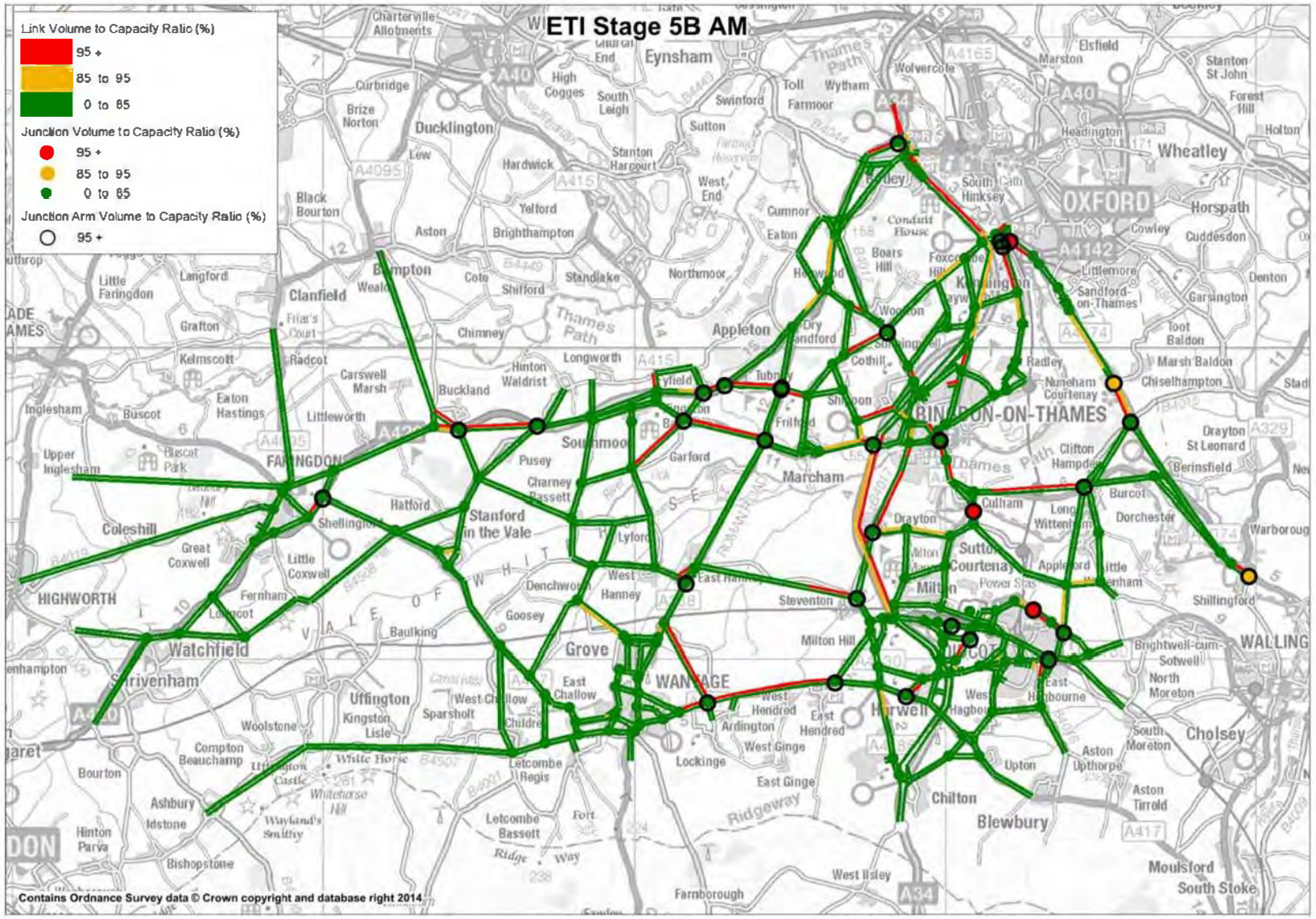


Figure -C10 Impact on the traffic network - ETI Stage 5b PM Peak Hour

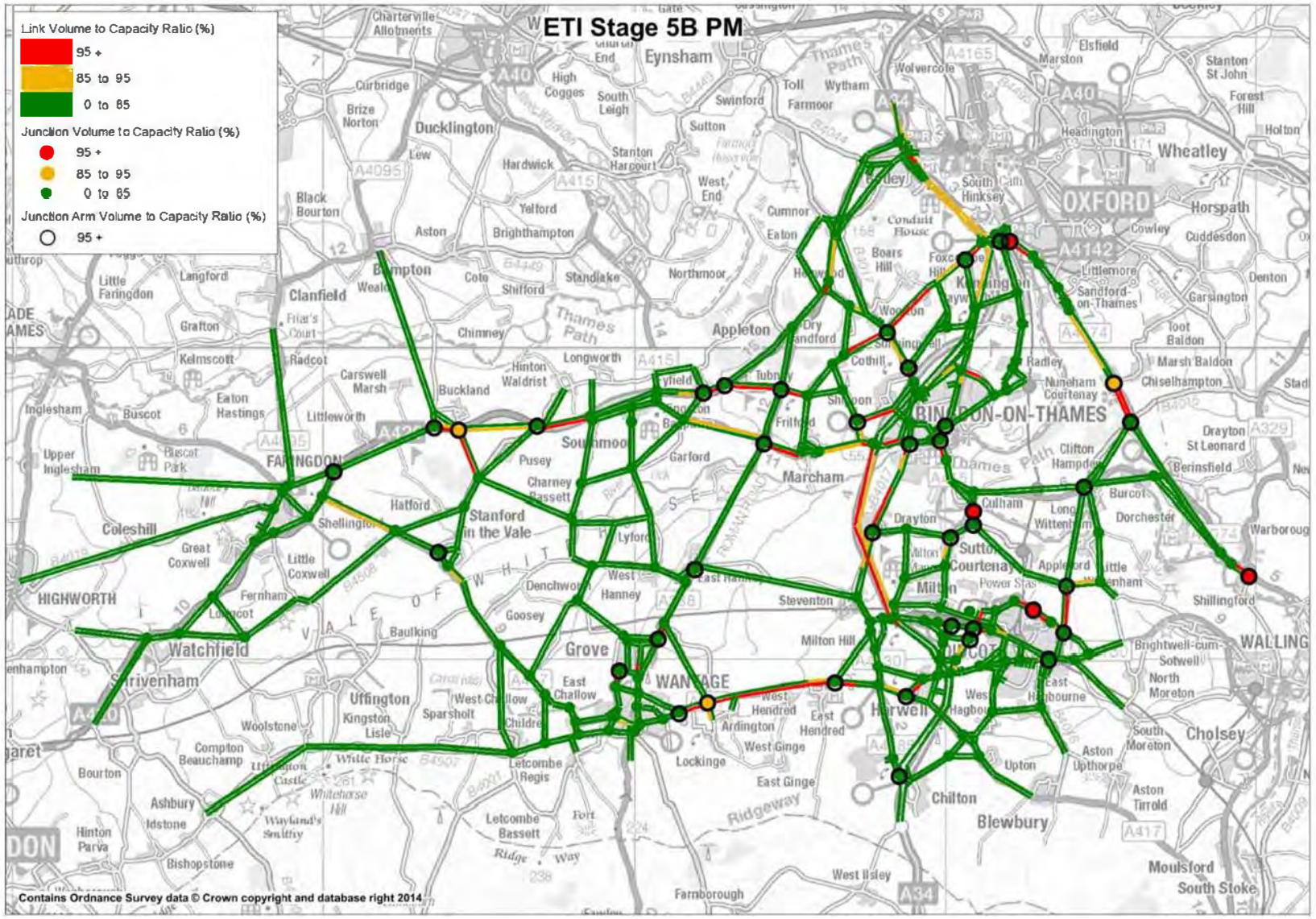


Figure -C11 Impact on the traffic network - ETI Stage 5c AM Peak Hour

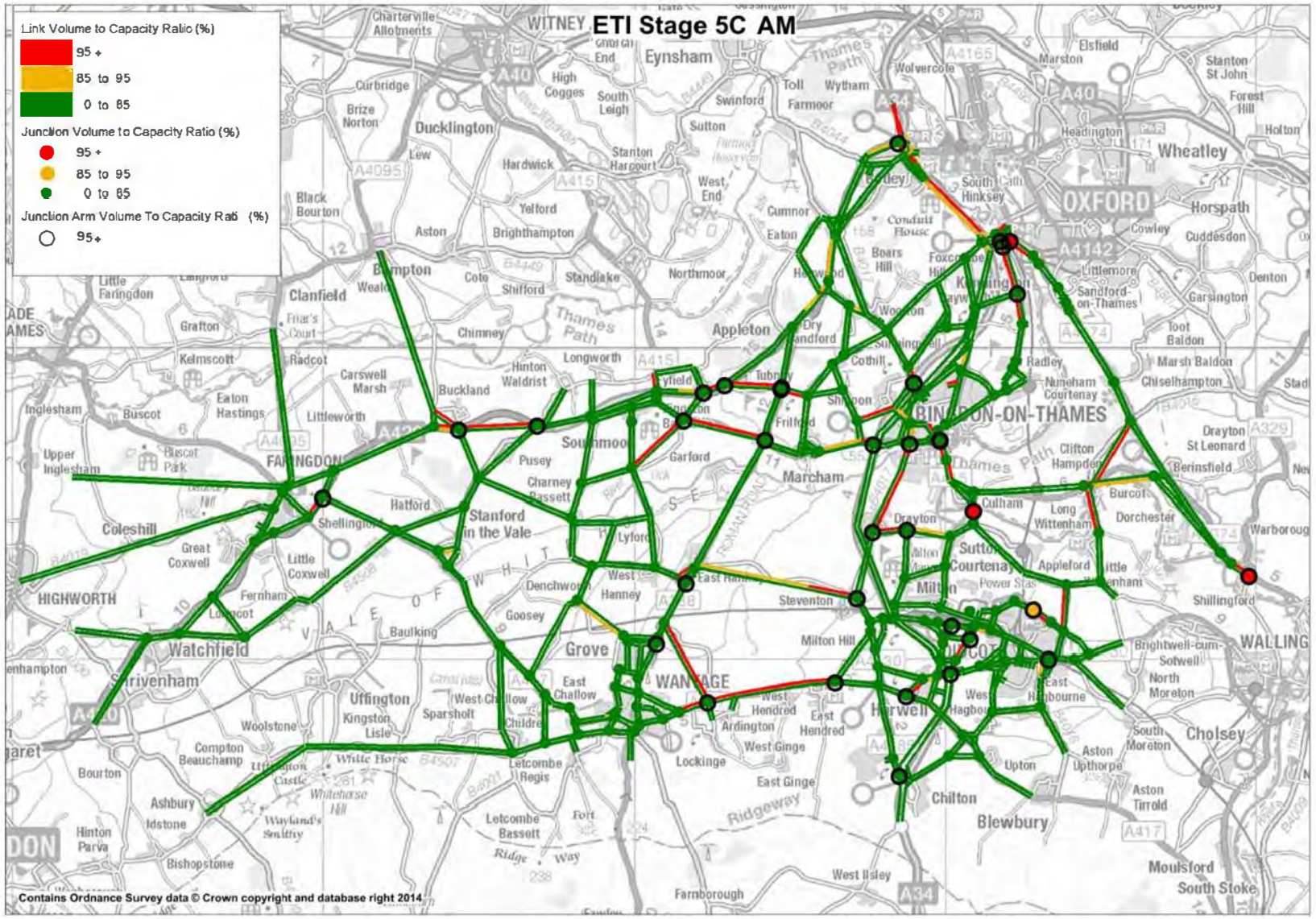
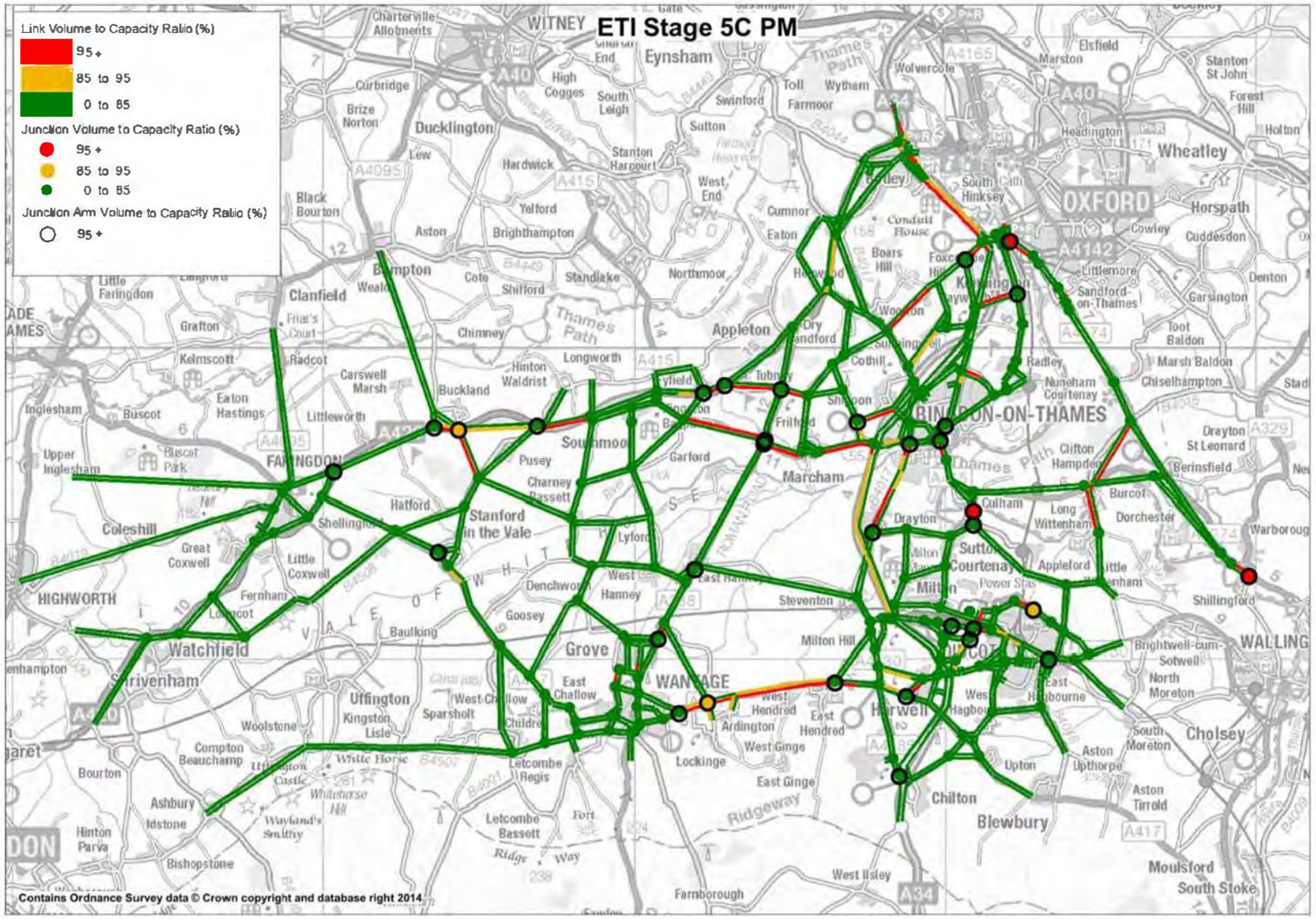


Figure -C12 Impact on the traffic network - ETI Stage 5c PM Peak Hour



Morning peak hour volume to capacity ratios in 2031

A338	Direction	Stage 1 V/C	Stage 5 V/C	Stage 5a V/C	Stage 5b V/C	Stage 5c V/C
Tubney	Northbound	39	39	41	41	40
	Southbound	23	22	21	21	22
North of Frilford	Northbound	74	75	77	82	83
	Southbound	18	18	25	17	18
South of Frilford	Northbound	74	75	74	77	77
	Southbound	39	40	45	37	41
East Hanney	Northbound	60	62	65	63	65
	Southbound	35	38	41	47	39
South of East Hanney	Northbound	69	70	71	71	71
	Southbound	61	62	64	62	62
Grove	Northbound	84	81	80	87	80
	Southbound	45	46	47	47	46
A34	**Direction**	**Stage 1 V/C**	**Stage 5 V/C**	**Stage 5a V/C**	**Stage 5b V/C**	**Stage 5c V/C**
North of Lodge Hill	Northbound	87	91	84	78	62
	Southbound	100	101	100	92	69
North of Milton Interchange	Northbound	93	93	98	89	73
	Southbound	105	105	106	105	84
South of Milton Interchange	Northbound	66	64	65	67	68
	Southbound	56	54	54	54	69
A4130	**Direction**	**Stage 1 V/C**	**Stage 5 V/C**	**Stage 5a V/C**	**Stage 5b V/C**	**Stage 5c V/C**
Start of B4493	Eastbound	66	57	53	58	59
	Westbound	87	90	73	79	89
Milton Hill	Northbound	36	48	46	43	44
	Southbound	42	47	53	50	39
Science Bridge	Northbound	97	85	84	83	95
	Southbound	13	22	22	20	21
A415	**Direction**	**Stage 1 V/C**	**Stage 5 V/C**	**Stage 5a V/C**	**Stage 5b V/C**	**Stage 5c V/C**
West of Frilford	Eastbound	98	97	93	100	101
	Westbound	20	22	24	26	24
East of Frilford	Eastbound	81	80	76	81	82
	Westbound	63	67	77	71	72
West of A34	Eastbound	104	95	102	107	105
	Westbound	33	32	76	73	70
A417	**Direction**	**Stage 1 V/C**	**Stage 5 V/C**	**Stage 5a V/C**	**Stage 5b V/C**	**Stage 5c V/C**
East of Wantage	Eastbound	134	137	128	120	110
	Westbound	57	62	61	63	62
West of Featherbed Lane	Eastbound	107	107	107	108	108
	Westbound	64	64	62	65	62
East of Featherbed Lane	Eastbound	70	73	73	73	73
	Westbound	47	51	50	50	50
East of A4130	Eastbound	62	70	71	67	71
	Westbound	59	80	79	78	74
A420	**Direction**	**Stage 1 V/C**	**Stage 5 V/C**	**Stage 5a V/C**	**Stage 5b V/C**	**Stage 5c V/C**
Botley Interchange	Eastbound	101	102	101	103	102
	Westbound	33	31	31	31	30
South of Cumnor	Eastbound	86	93	95	94	92
	Westbound	60	56	59	56	56
East of Appleton	Eastbound	93	98	96	94	94
	Westbound	51	50	48	49	49
South of Appleton	Eastbound	65	69	67	63	62
	Westbound	44	43	42	43	42
East of Fyfield	Eastbound	103	102	103	103	102
	Westbound	70	69	68	68	68
West of A415	Eastbound	61	62	62	62	62
	Westbound	25	25	26	25	25
East of Buckland	Eastbound	85	87	87	100	100
	Westbound	65	66	67	69	68
West of Buckland	Eastbound	108	107	107	106	107
	Westbound	83	86	92	89	88
North of A417	Eastbound	51	53	53	53	50
	Westbound	73	72	74	69	68
South of A417	Eastbound	100	100	100	100	100
	Westbound	52	55	55	54	53

	>95%
	85%-95%
	<85%

Evening peak hour volume to capacity ratios in 2031

A338	Direction	Stage 1 V/C	Stage 5 V/C	Stage 5a V/C	Stage 5b V/C	Stage 5c V/C
Tubney	Northbound	35	35	36	34	32
	Southbound	36	36	36	37	36
North of Frilford	Northbound	41	41	48	43	27
	Southbound	34	34	35	35	36
South of Frilford	Northbound	54	54	56	53	47
	Southbound	67	68	68	66	67
East Hanney	Northbound	42	49	49	46	42
	Southbound	97	85	92	93	79
South of East Hanney	Northbound	72	73	74	72	69
	Southbound	63	65	65	66	67
Grove	Northbound	67	68	69	68	65
	Southbound	99	100	100	101	101
A34	**Direction**	**Stage 1 V/C**	**Stage 5 V/C**	**Stage 5a V/C**	**Stage 5b V/C**	**Stage 5c V/C**
North of Lodge Hill	Northbound	95	98	91	87	74
	Southbound	86	87	85	80	61
North of Milton Interchange	Northbound	100	100	101	104	91
	Southbound	84	87	91	85	62
South of Milton Interchange	Northbound	100	101	92	76	84
	Southbound	67	66	61	61	63
A4130	**Direction**	**Stage 1 V/C**	**Stage 5 V/C**	**Stage 5a V/C**	**Stage 5b V/C**	**Stage 5c V/C**
Start of B4493	Eastbound	36	35	37	37	35
	Westbound	83	65	73	97	101
Milton Hill	Northbound	32	34	27	46	49
	Southbound	30	44	46	38	44
Science Bridge	Northbound	20	13	13	12	13
	Southbound	92	57	59	50	49
A415	**Direction**	**Stage 1 V/C**	**Stage 5 V/C**	**Stage 5a V/C**	**Stage 5b V/C**	**Stage 5c V/C**
West of Frilford	Eastbound	88	91	90	90	96
	Westbound	51	51	51	52	54
East of Frilford	Eastbound	48	50	46	45	48
	Westbound	98	98	99	99	100
West of A34	Eastbound	64	65	59	60	68
	Westbound	101	101	104	106	107
A417	**Direction**	**Stage 1 V/C**	**Stage 5 V/C**	**Stage 5a V/C**	**Stage 5b V/C**	**Stage 5c V/C**
East of Wantage	Eastbound	74	79	78	83	87
	Westbound	101	101	102	101	102
West of Featherbed Lane	Eastbound	80	85	84	89	94
	Westbound	101	101	101	102	101
East of Featherbed Lane	Eastbound	58	63	64	60	62
	Westbound	100	99	99	98	95
East of A4130	Eastbound	82	93	96	88	91
	Westbound	63	74	74	71	68
A420	**Direction**	**Stage 1 V/C**	**Stage 5 V/C**	**Stage 5a V/C**	**Stage 5b V/C**	**Stage 5c V/C**
Botley Interchange	Eastbound	105	105	105	105	105
	Westbound	48	48	48	48	48
South of Cumnor	Eastbound	66	66	70	70	65
	Westbound	94	94	94	93	91
East of Appleton	Eastbound	66	66	72	70	63
	Westbound	82	82	83	83	83
South of Appleton	Eastbound	45	46	50	50	43
	Westbound	72	72	72	72	71
East of Fyfield	Eastbound	73	74	78	78	72
	Westbound	100	100	100	100	100
West of A415	Eastbound	48	49	51	50	47
	Westbound	36	36	35	36	36
East of Buckland	Eastbound	73	75	79	80	75
	Westbound	89	89	89	88	88
West of Buckland	Eastbound	85	90	92	92	91
	Westbound	98	98	98	98	98
North of A417	Eastbound	78	77	79	79	74
	Westbound	47	51	51	51	48
South of A417	Eastbound	76	79	81	81	77
	Westbound	66	71	71	70	70

	>95%
	85%-95%
	<85%

Appendix D. Flow Difference Plots

Figure D1 AM Flow Differences: S5a - S5 (pcu)

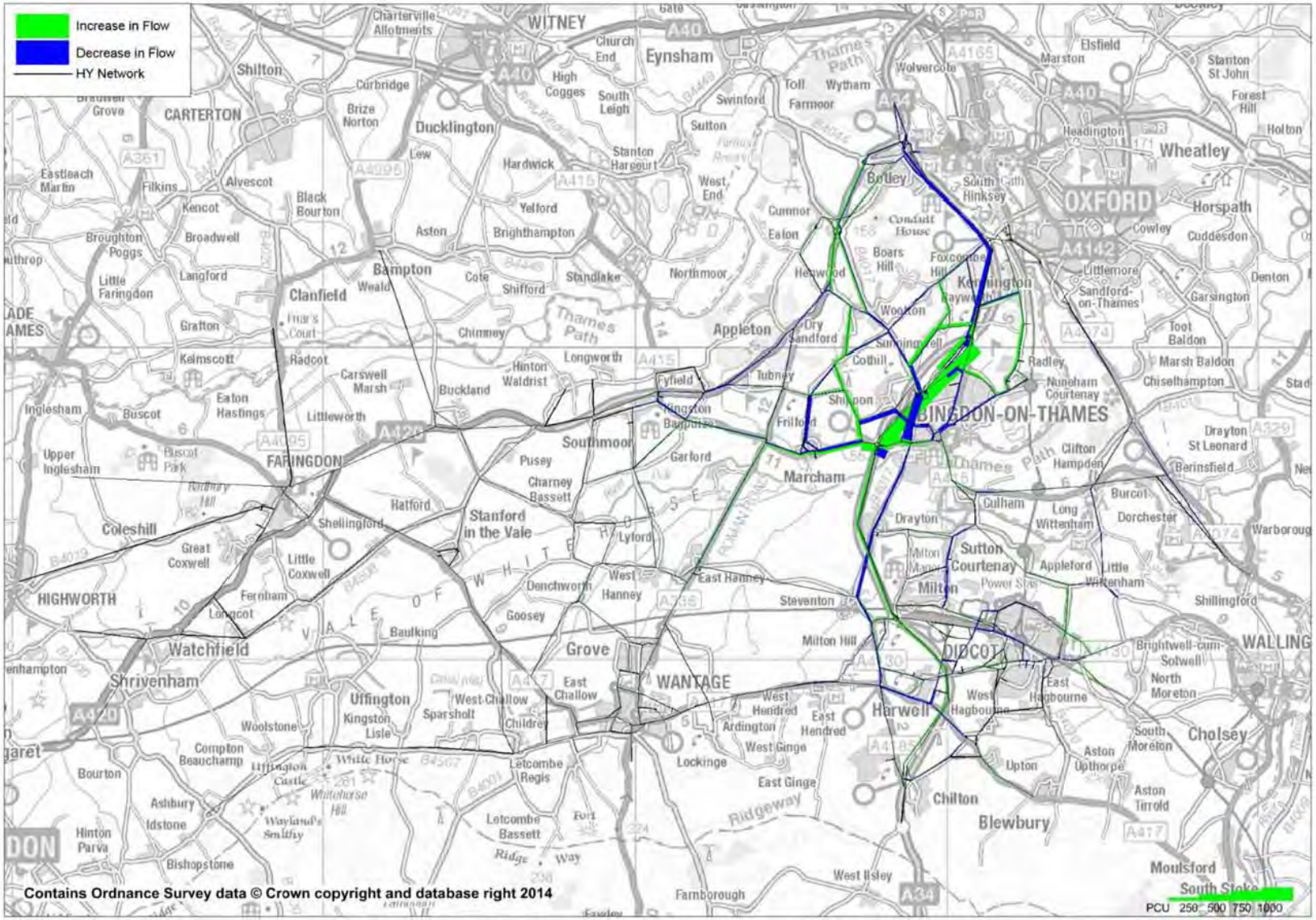


Figure D2 PM Flow Differences: S5a - S5 (pcu)

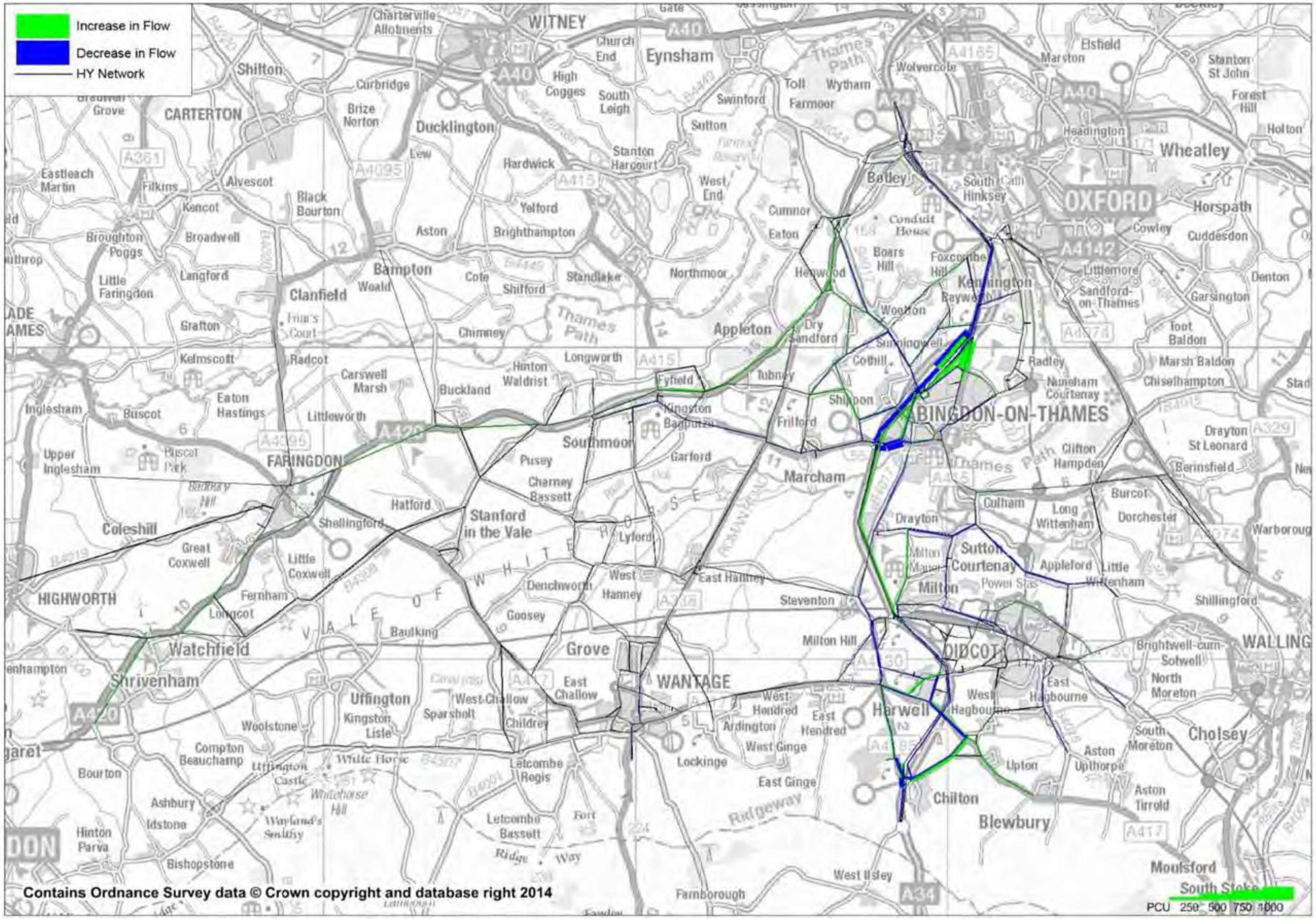


Figure D3 AM Flow Differences: S5b - S5 (pcu)

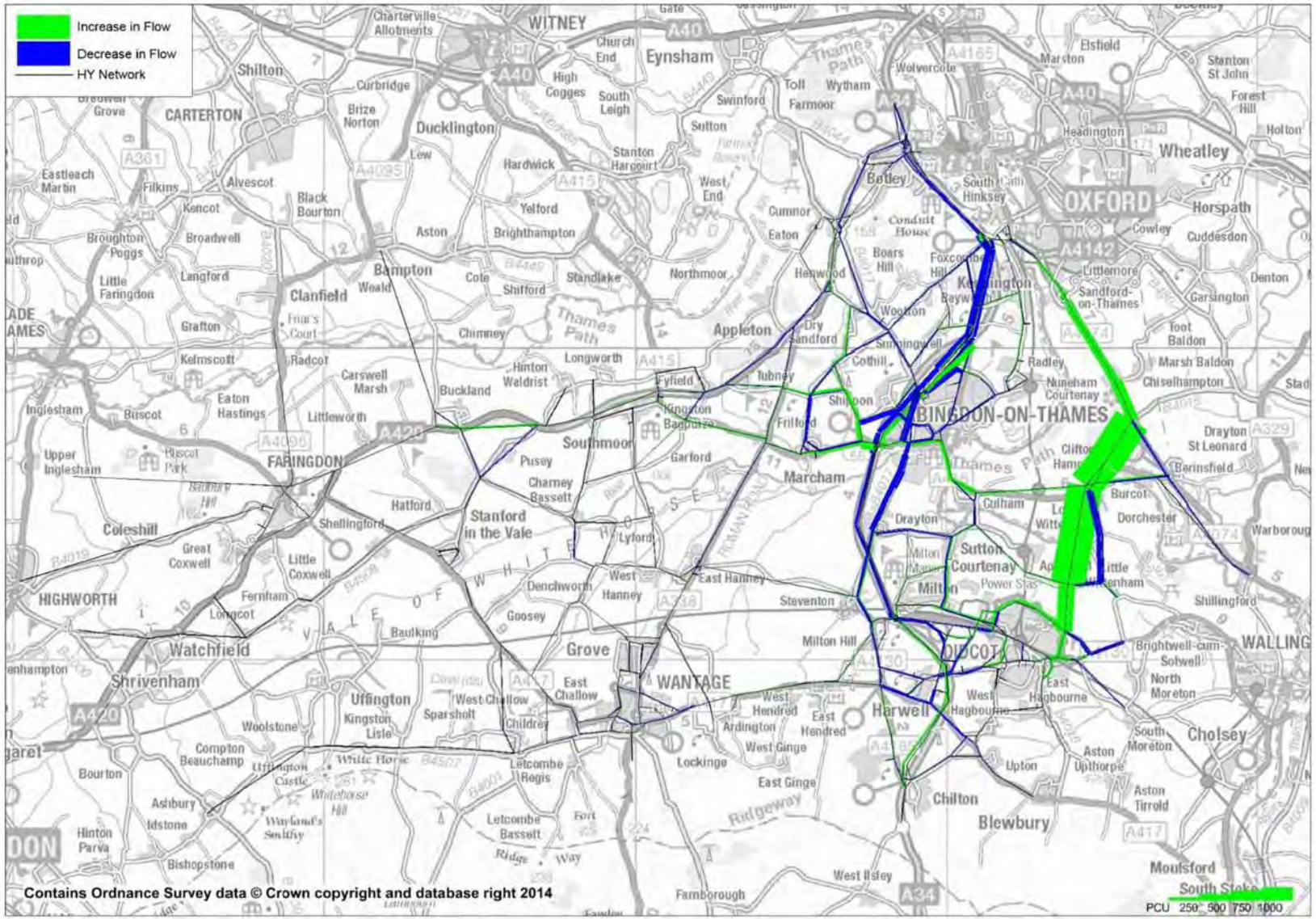


Figure D4 PM Flow Differences: S5b - S5 (pcu)

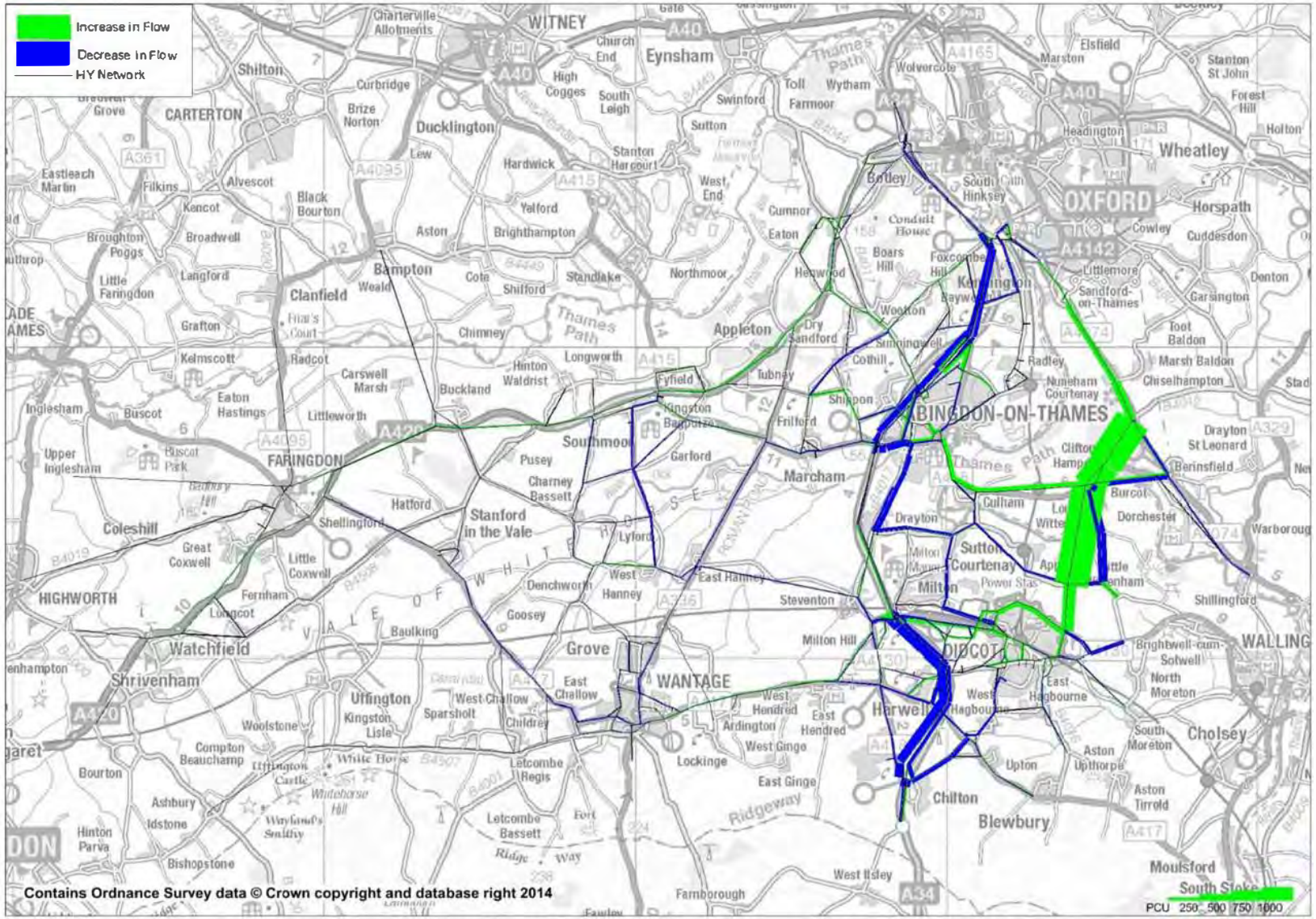


Figure D5 AM Flow Differences: S5c - S5 (pcu)

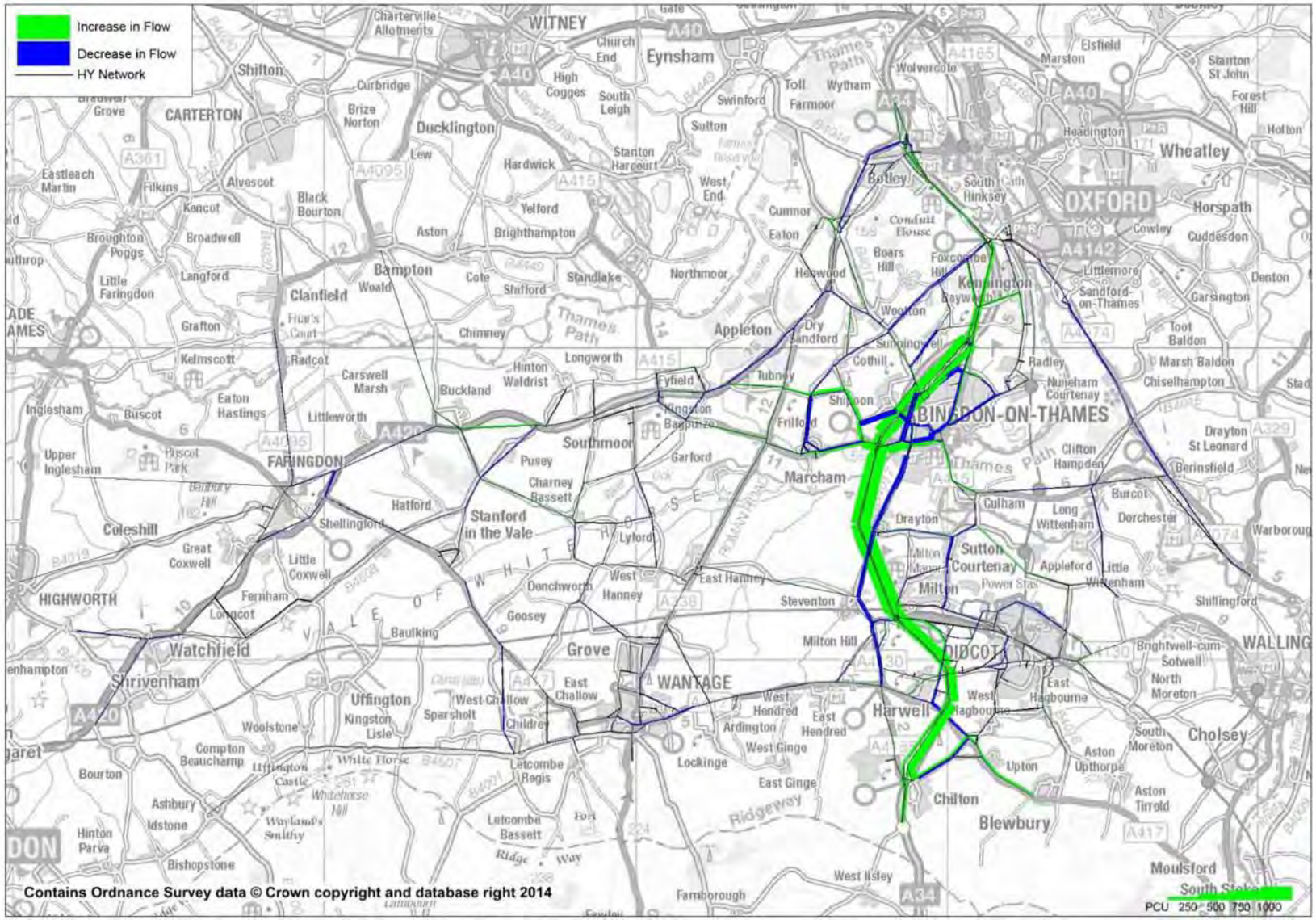
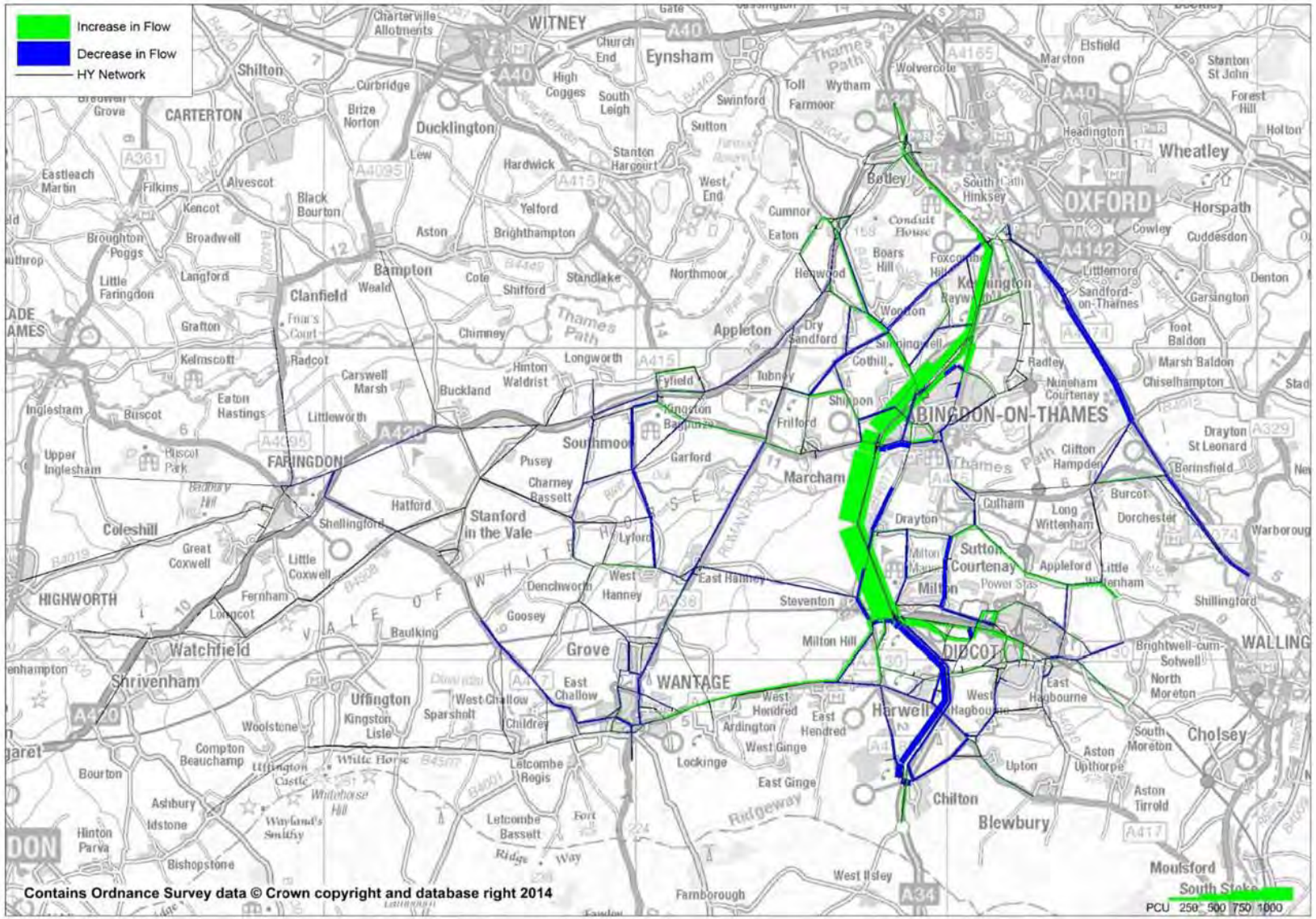
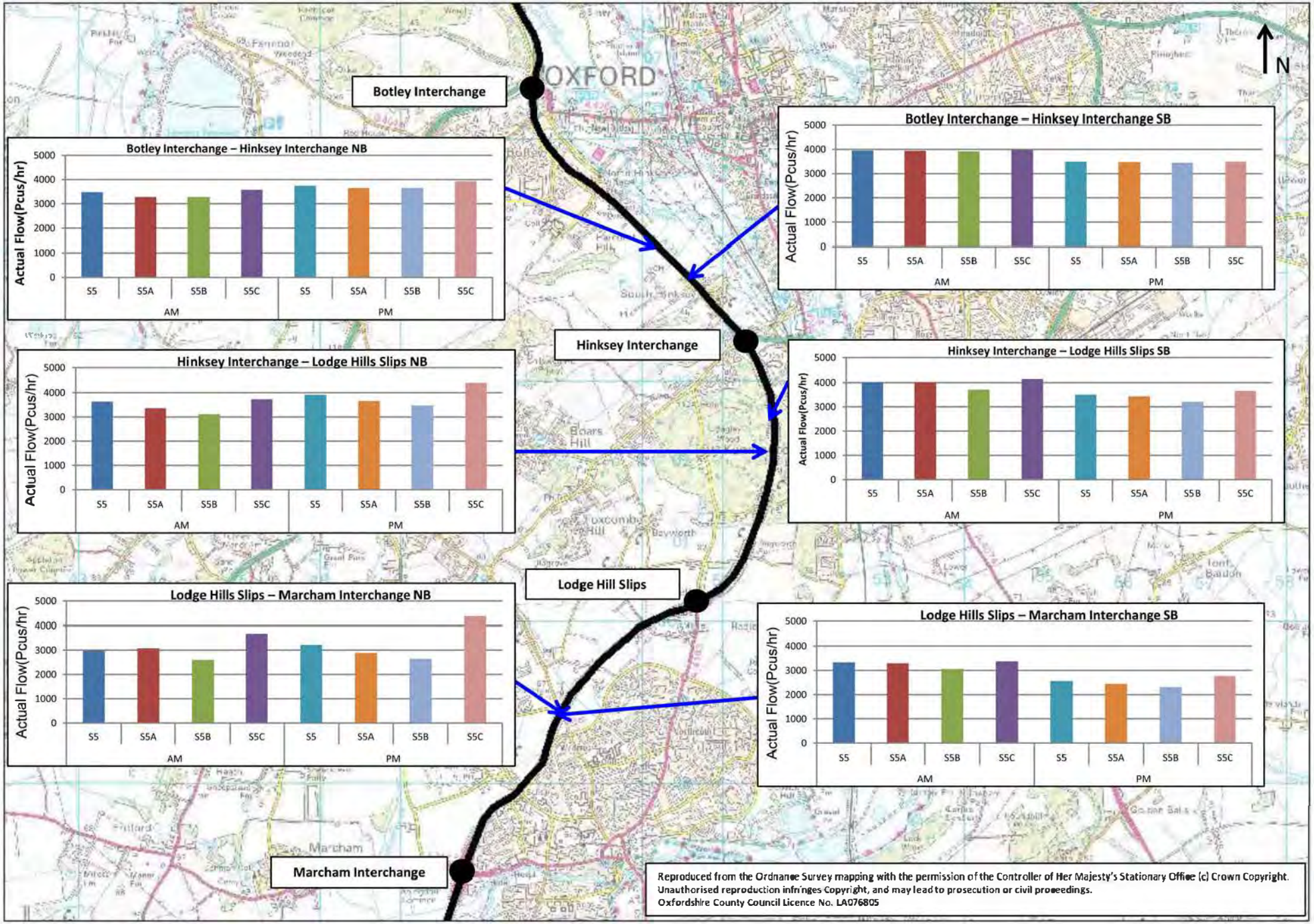


Figure D6 PM Flow Differences: S5c - S5 (pcu)



Appendix E. Flows Along Key Routes


Botley Interchange
Hinksey Interchange
Lodge Hill Slips
Marcham Interchange
OXFORD
N
Botley Interchange – Hinksey Interchange NB
Botley Interchange – Hinksey Interchange SB
Hinksey Interchange – Lodge Hills Slips NB
Hinksey Interchange – Lodge Hills Slips SB
Lodge Hills Slips – Marcham Interchange NB
Lodge Hills Slips – Marcham Interchange SB
Actual Flow(Pcus/hr)
0
1000
2000
3000
4000
5000
S5
S5A
S5B
S5C
AM
PM
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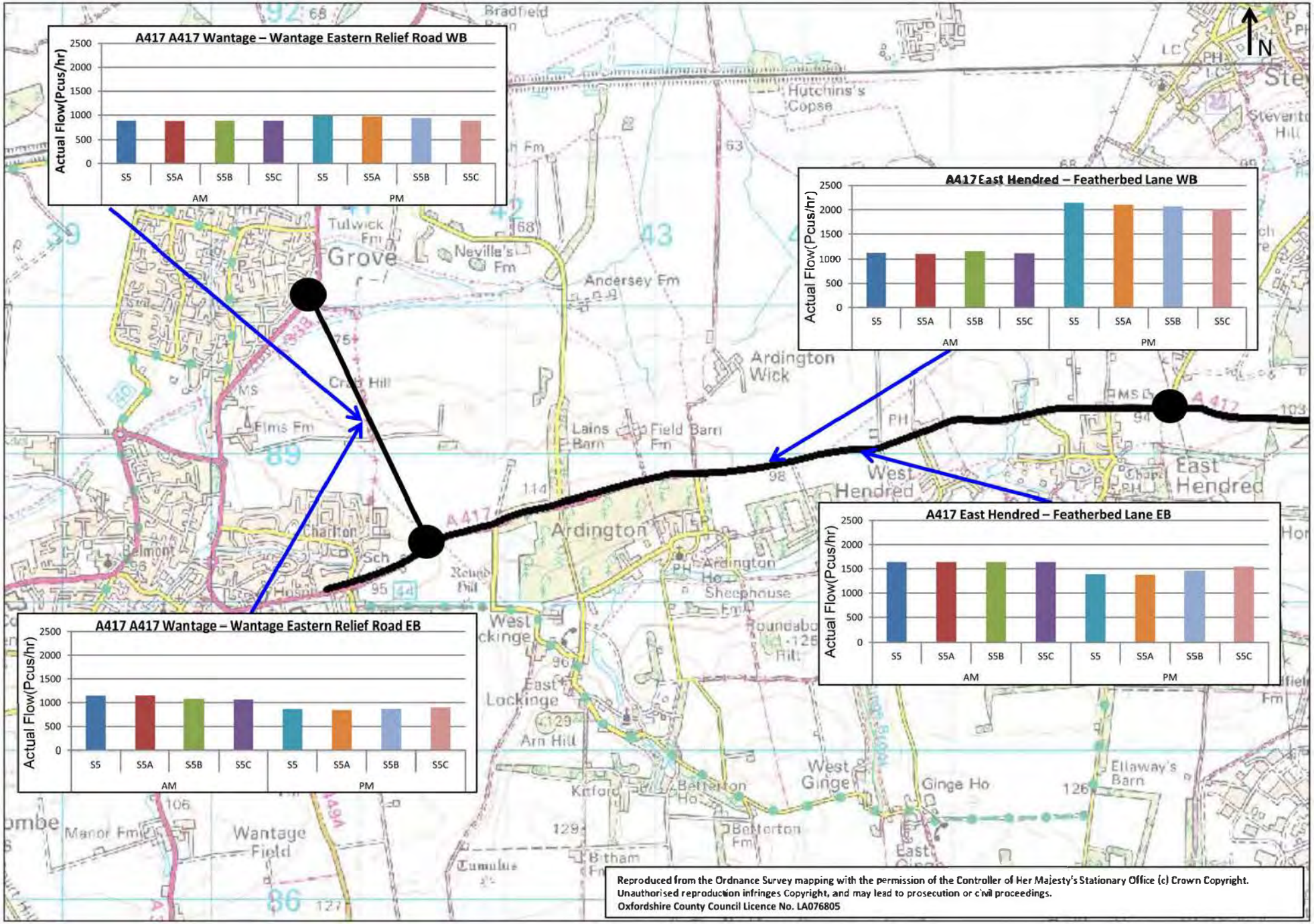
A417 A417 Wantage – Wantage Eastern Relief Road WB
Actual Flow(Pcus/hr)
2500
2000
1500
1000
500
0
S5
S5A
S5B
S5C
S5
S5A
S5B
S5C
AM
PM
A417 East Hendred – Featherbed Lane WB
Actual Flow(Pcus/hr)
AM
PM
A417 East Hendred – Featherbed Lane EB
Actual Flow(Pcus/hr)
AM
PM
A417 A417 Wantage – Wantage Eastern Relief Road EB
Actual Flow(Pcus/hr)
AM
PM
N
Bradfield
Hutchins's Copse
Tulwick Fm
Grove
Neville's Fm
Ancersey Fm
Ardington Wick
Elms Fm
Lains Barn
Field Barn Fm
West Hendred
East Hendred
Ardington
Charlton
Belmont
Sheephouse Fm
West Lockinge
East Lockinge
Arn Hill
Kingston Ho
Betterton Ho
West Ginge
Ginge Ho
Ellaway's Barn
Manor Fm
Wantage
Field
Tumulus
Betterton Fm
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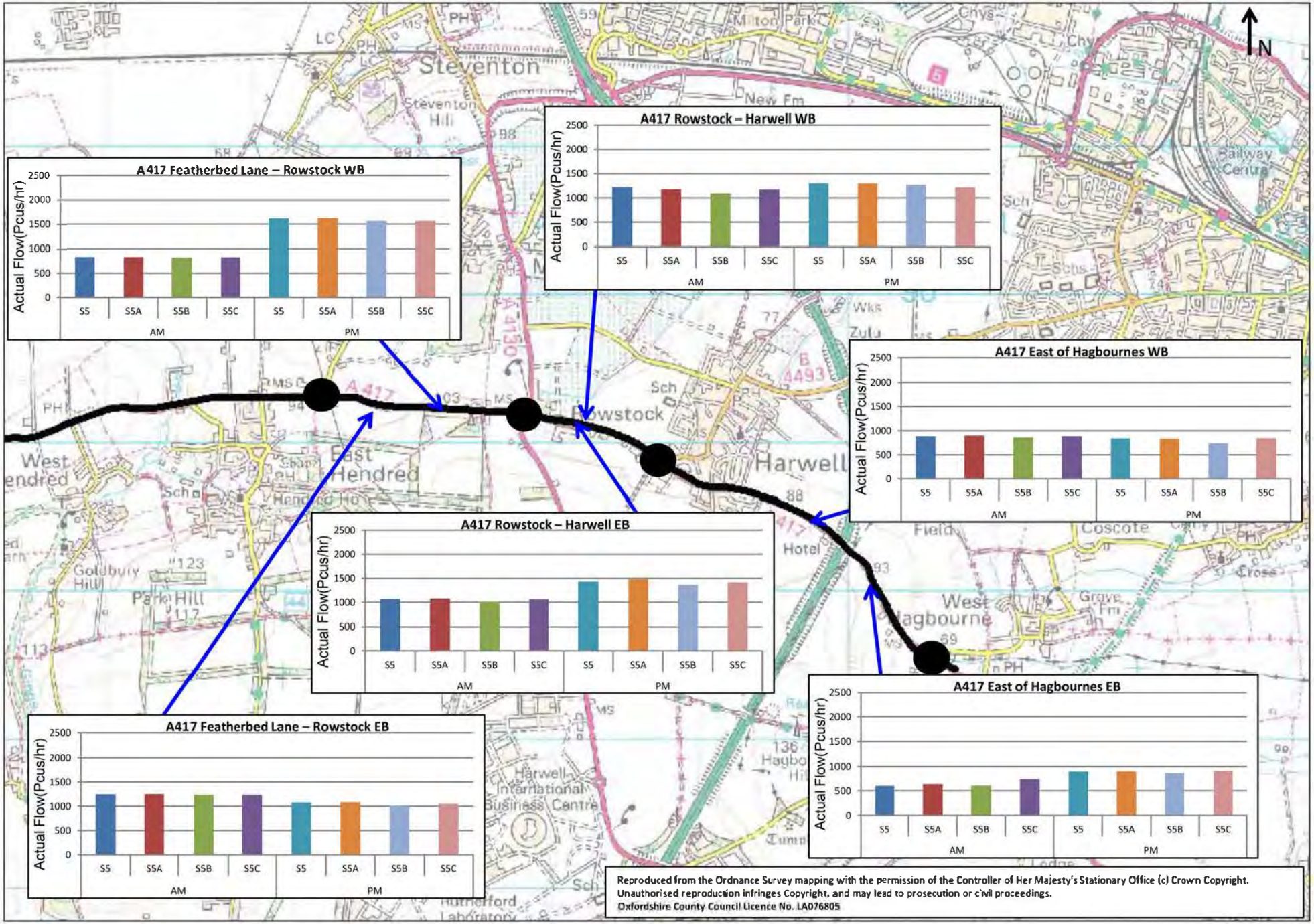
N
A417 Rowstock – Harwell WB
A417 Featherbed Lane – Rowstock WB
A417 East of Hagbournes WB
A417 Rowstock – Harwell EB
A417 Featherbed Lane – Rowstock EB
A417 East of Hagbournes EB
Actual Flow(Pcus/hr)
2500
2000
1500
1000
500
0
S5
S5A
S5B
S5C
AM
PM
Steventon
Harwell
Rowstock
East Hendred
West Hagbourne
Coscote
Harwell International Business Centre
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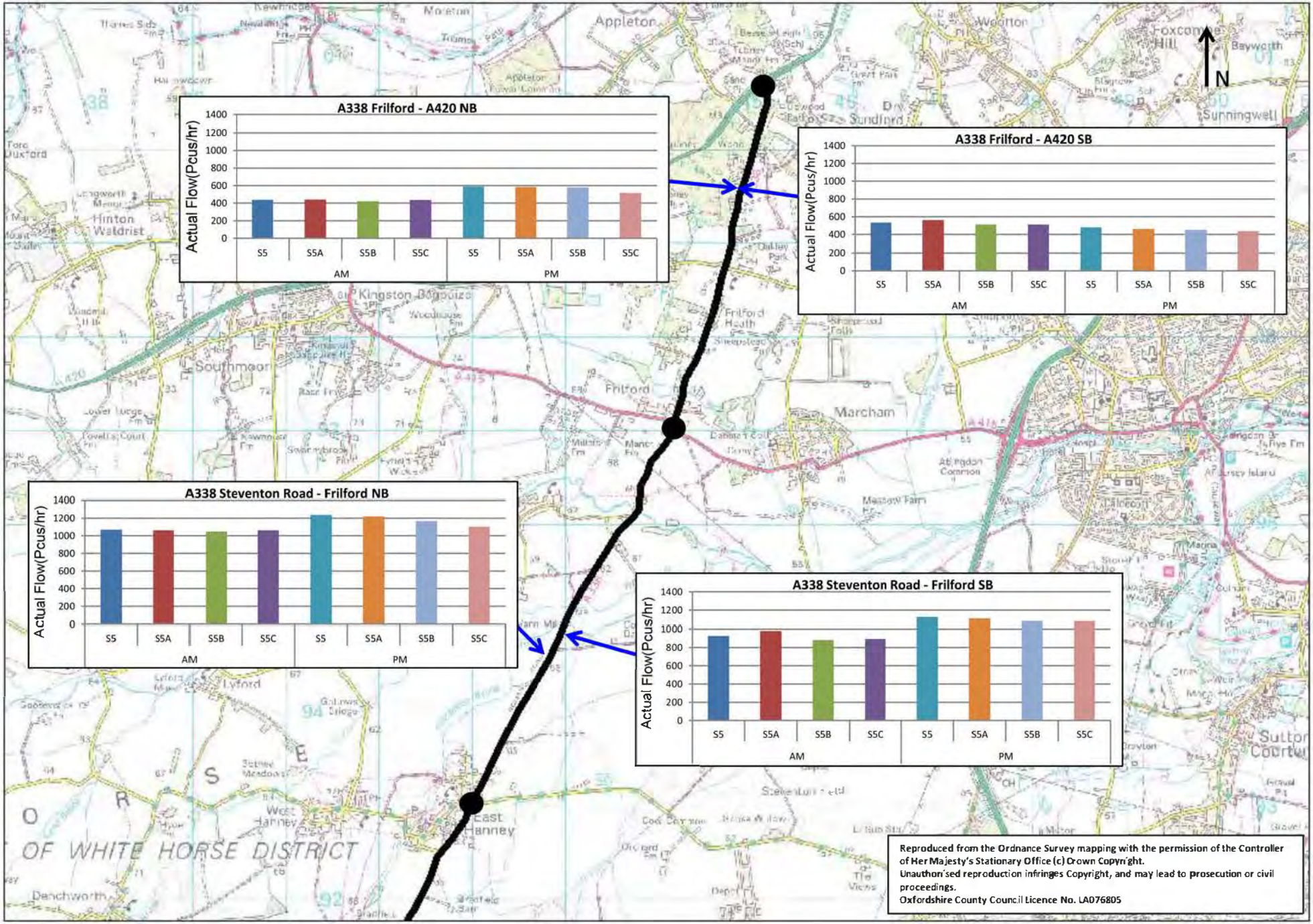
A338 Frilford - A420 NB
Actual Flow(Pcus/hr)
1400
1200
1000
800
600
400
200
0
S5
S5A
S5B
S5C
S5
S5A
S5B
S5C
AM
PM
A338 Frilford - A420 SB
Actual Flow(Pcus/hr)
1400
1200
1000
800
600
400
200
0
S5
S5A
S5B
S5C
S5
S5A
S5B
S5C
AM
PM
A338 Steventon Road - Frilford NB
Actual Flow(Pcus/hr)
1400
1200
1000
800
600
400
200
0
S5
S5A
S5B
S5C
S5
S5A
S5B
S5C
AM
PM
A338 Steventon Road - Frilford SB
Actual Flow(Pcus/hr)
1400
1200
1000
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600
400
200
0
S5
S5A
S5B
S5C
S5
S5A
S5B
S5C
AM
PM
N
Appleton
Sunningwell
Hinton Waldrist
Kingston Bagpuize
Southmoor
Frilford
Marcham
Lyford
East Hanney
OF WHITE HORSE DISTRICT
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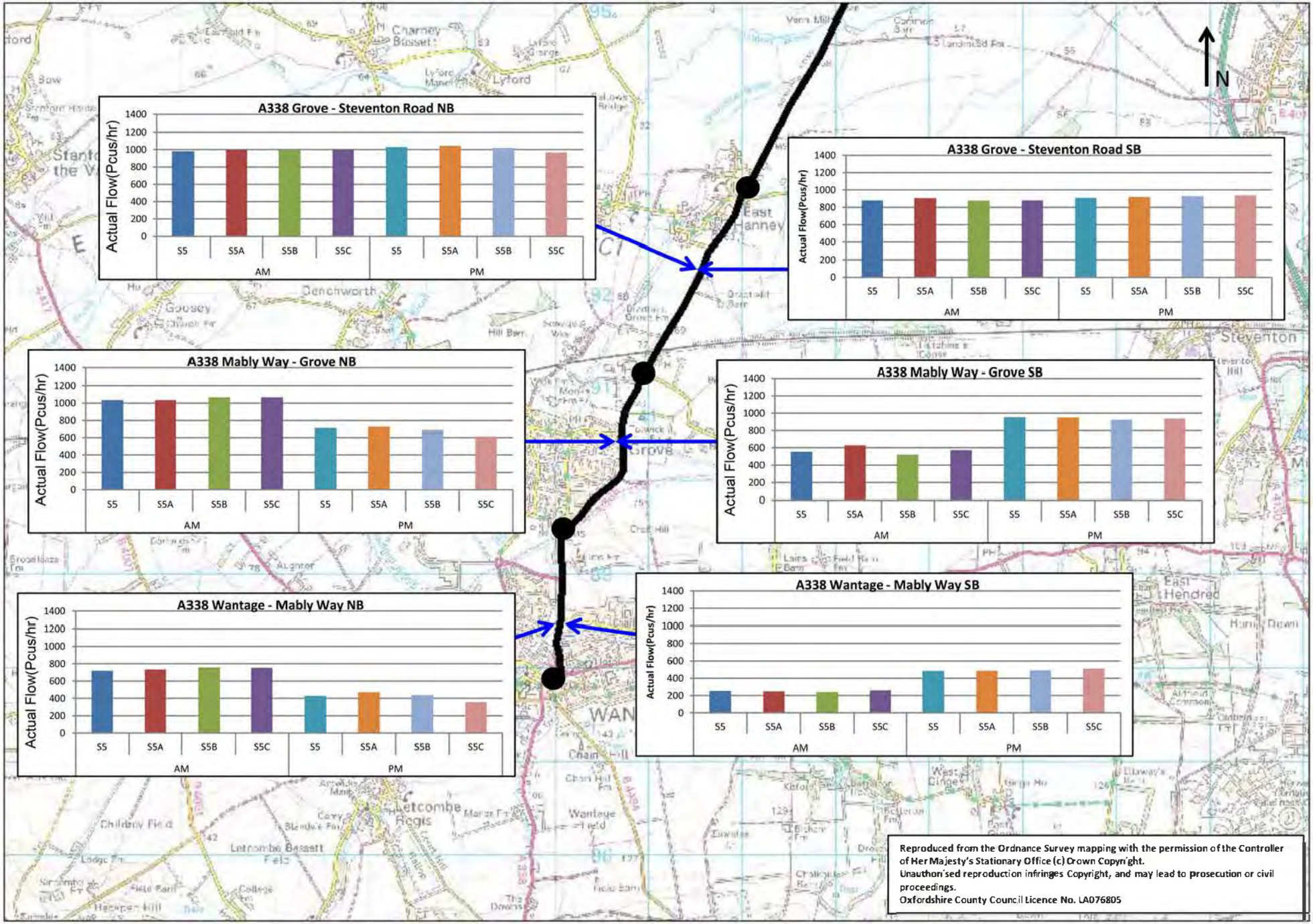
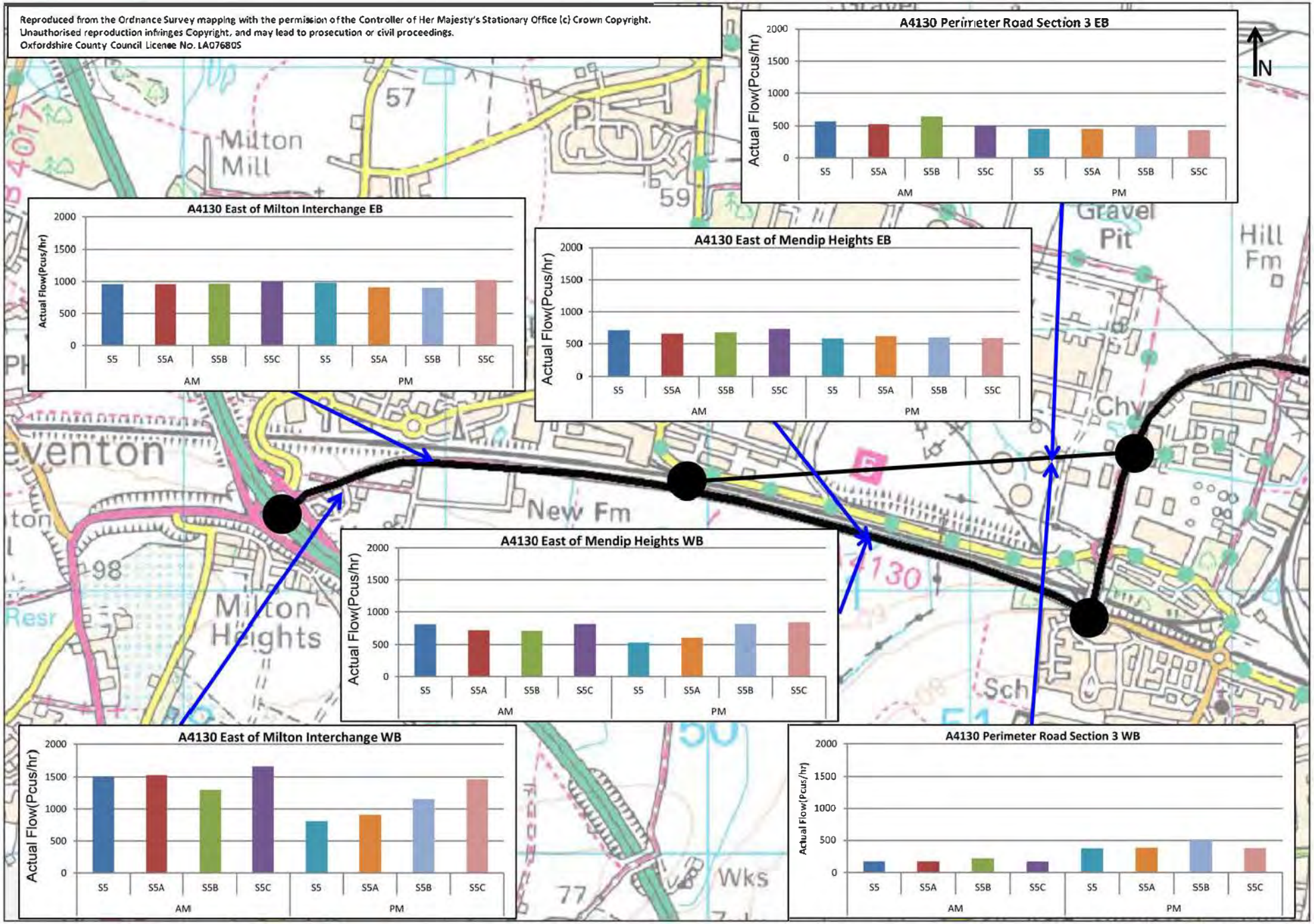
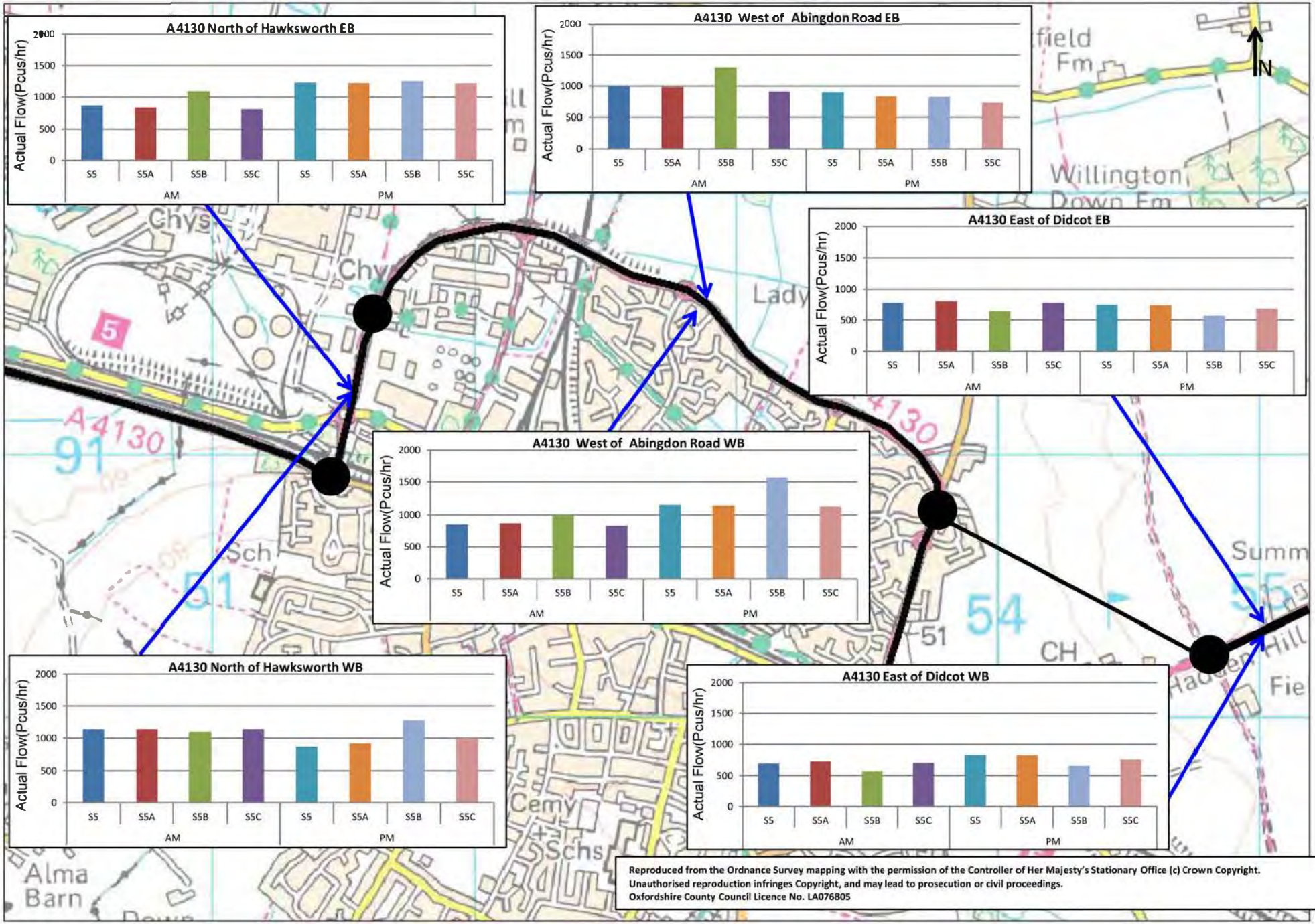






Appendix F. Oxfordshire Strategic Model Tests

Technical note

Project:	Vale of White Horse ETI	**To:**	Oxfordshire County Council
Subject:	OSM Tests	**From:**	Atkins
Date:	17 October 2014	**cc:**	

1. Introduction

The Local Plan 2031 sets out a policy framework for the delivery of sustainable development across the district up to 2031. It sets out the spatial strategy and strategic policies for the district to deliver sustainable development. It identifies the number of new homes and jobs to be provided in the area and makes provision for retail, leisure and commercial development and the infrastructure needed to support them.

An Evaluation of Transport Impacts (ETI) Study that has informed the preparation of the Vale of White Horse District Council Local Plan 2031 Part 1: Strategic Sites and Policies[1]. This has used the Central Oxfordshire Transport Model (COTM) and has focused upon the highway impacts of the developments.

This Technical Note reports on some of the ETI tests undertaken using the new Oxfordshire Strategic Model (OSM). This was developed in 2013/14 and contains a multi-modal demand model. The aim of this Technical Note is therefore the confirm that the ETI results undertaken using a highway only model remain valid using a more recently developed model that includes interaction with a public transport model and the impact of changing demand responses resulting from changes in highway and public transport travel 'costs'. This note needs to be read in conjunction with the the report: *Evaluation of Transport Impacts Study to inform the Vale of White Horse District Council Local Plan 2031: Part 1 Strategic Sites and Policies.*

1.1. Model System

The work is based on the new OSM. The base model has recently been completed and early forecasts for 2031 have been finalised. The OSM modelling system was developed to represent travel conditions in 2013 and consists of three key elements:

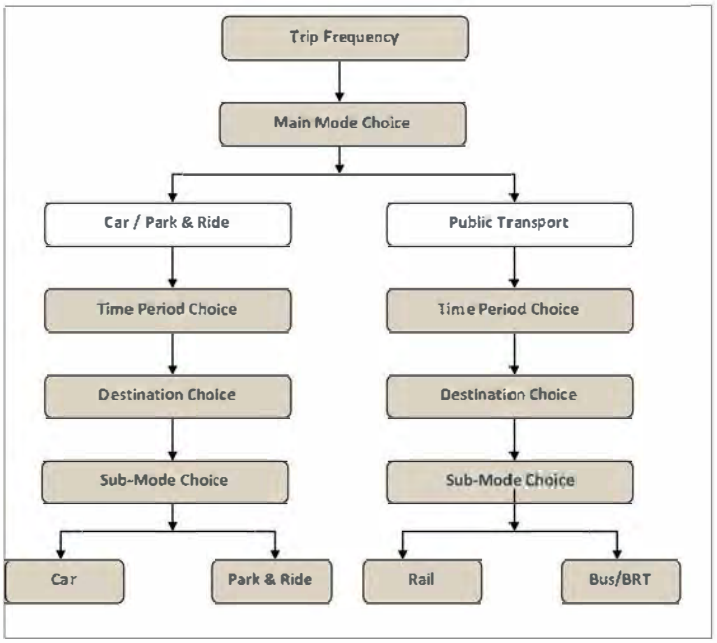
- a Highway Assignment Model (RTM) representing vehicle-based movements within and across the Oxfordshire County for a 2013 October weekday morning peak hour (08:00 – 09:00), an average inter-peak hour (10:00 – 16:00) and an evening peak hour (17:00 – 18:00);
- a Public Transport Assignment Model (PTM) representing bus and rail-based movements across the same area and for the same time periods, month and year; and
- a five-stage multi-modal incremental Demand Model (MDM) that estimates frequency choice, main mode choice, time period choice, destination choice, and sub mode choice in response to changes in generalised costs of travel across the 24-hour period (07:00 – 07:00).

The MDM has a hierarchical logit choice structure as shown in Figure 3-1. Compliant with WebTAG, it has an incremental demand modelling approach which responds to changes in travel 'cost' from the base generalised costs to a future test scenario. The model considers trip frequency, then main mode and following from that considers time period choice and destination choice, in increasing levels of sensitivity. In short, the model can change how often a trip is made, by what mode, when to which destination.

[1] The plan period for the Vale Local Plan was originally 2011 to 2029. This was altered in 2014 to become 2011 to 2031 and is referred to throughout this report as the Local Plan 2031.

Technical note

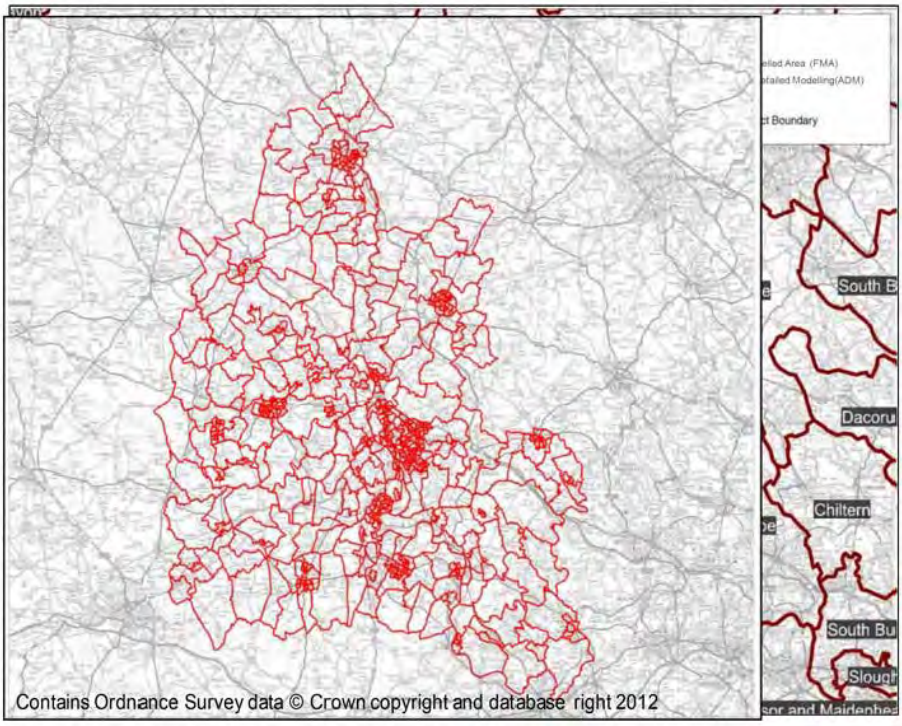
Figure 1. Demand model hierarchy



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 fully modelled area all strategic highway links will be included although not all junctions will be simulated. The detailed 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 better known.

The Vale of White Horse straddles the detailed modelled area, meaning that everything within the detailed modelled area and trips crossing the detailed modelled area have been subject to calibration and validation exercises.

Figure 1-1 Detailed Modelled Area



Technical note

The modelling work has replicated some of the stages of the VoWH ETI to enable comparisons between COTM and OSM to be identified and for the impact of public transport to be identified. These are called scenarios rather than stages to make it clear that there are differences between the models and scenarios tested:

- Scenario 1 – ETI Stage 1 (Draft Local Plan Consultation Feb 13);
- Scenario 2 – ETI Stage 5 (Local Plan - Publication Version (Nov 2014);
- Scenario 3 – ETI Stage 5 with Lodge Hill South Facing Slips and A4130 dualling between Milton Interchange and Science Bridge ;
- Scenario 4 – No comparable ETI stage but combines Scenario 3 with public transport measures; and
- Scenario 5 – No comparable ETI stage but combines public transport measures with the Clifton Hampden bypass and Culham crossing and Lodge Hill South Facing Slips and A4130 dualling between Milton Interchange and Science Bridge.

The ETI Stage 1 development assumptions were provided by VOWH and OCC and matched local plan levels of development for each district across the county. Additional demand for ETI Stages 3 and 5 was provided by the VoWH. Details of the number of houses and jobs for strategic sites within the VoWH are presented in detail in Table 2.2 and 2.3. Housing and employment activity elsewhere is based on the National Trip End Model assumptions

Table 2-2 Additonal housing in each scenario between 2011 and 2031

District	ETI Stage 1	ETI Stage 3	ETI Stage 5
Cherwell	7517	7517	7517
Oxford	4108	4108	4108
South Oxfordshire	10429	10429	10429
Vale of White Horse	***13294***	***20560***	***20560***
West Oxfordshire	5208	5208	5208
Grand Total	46869	54299	54299

Table 2-3 Employment in each scenario

District	ETI Stage 1	ETI Stage 3	ETI Stage 5
Cherwell	12480	12480	12480
Oxford	6191	6191	6191
South Oxfordshire	2856	2856	2856
Vale of White Horse	***14300***	***23000***	***23000***
West Oxfordshire	2323	2323	2323
Grand Total	37080	60080	60080

ETI Stage 1 concluded that that the following interventions were required to support the development:

- Wantage Eastern Link Road;
- Featherbed Lane;
- Steventon Lights;
- Milton Interchange;
- Chilton north facing slips;
- Hagbourne Hill Improvements;
- East of Harwell Link; and
- Science Bridge.

The Technical Note focuses on demand and public transport impacts for each stage followed by highway impacts for each stage.

Technical note

2. Demand and public transport impacts

2.1. Demand response

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 committed changes up to the forecast year of 2031. A **Reference Forecast** is a term specific to setting up a forecast with a variable demand model and is an intermediate step to producing the Forecast Scenario. It uses the growth in trip ends over the forecasting period, but does not take into account changes in travel cost between base and forecast years, this is a pre DM stage in the forecasting process. The DM is then used to arrive at the **Forecast Scenario** where changes to the Reference Forecast brought about by the changes in network costs are reflected through the DM. This is an iterative process within the DM which can change trip frequency, time, mode, destination and sub-mode. 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.

Results are reported below at a 12hr level for trip origins and destinations within VoWH by mode, for each test in Table 2.1 below. They focus on the **Forecast Scenario** as this reflects the impact **of** the MDM to the different transport interventions. .

Comparing Scenario 1 (ETI Stage 1) and Scenario 2 (ETI Stage 5), the key findings are that the addition of approximately 7000 houses and 9000 jobs is forecast to increase car demand by approximately 14,000 (7%) extra car trips over 12hrs, with 470 (3.5%) additional public transport trips in Scenario 2. The motorised mode share (person trips) remains 95% highway and 5% public transport for Scenarios 1 and 2.

In comparison with Scenario 2 (ETI Stage 5), the addition of Lodge Hill South Facing Slips and A4130 dualling between Milton Interchange and Science Bridge (Scenario 3) is forecast to result in a small increase in highway trips (165 origins and 562 destinations).

Scenario 4 shows the cumulative impact of adding the public transport services to Scenario 3 and it is forecast to result a decrease in car trips to and from VoWH of around 1800 vehicle trips and a large increase in bus trip origins (3300) and destinations (4400) which have in part switched mode from car and rail.

Scenario 5 shows the cumulative impact of adding the public transport services to the Clifton Hampden bypass and Culham crossing and is forecast to result in a decrease in car trips to and from VoWH although there is forecast to be an increase in demand to and from South Oxfordshire, reflecting the geographic location of the Clifton Hampden bypass and Culham crossing. There is also forecast to be a large increase in bus trip origins (3300) and destinations (4300) which have in part switched mode from car and rail.

To get an idea of the discrete impact of the public transport package a comparison of Scenario 3 with Scenario 4 highlights a forecast decrease in car trips to and from VoWH of approximately 1900 vehicle trips in 12hrs and an increase in trips destinations of (3300) and origins of (4200) from VoWH which represents a 35% and 43% increase respectively.

Technical note

Table 1. Forecast 12 hour demand in VoWH by mode for each scenario (0700-1900)

	Scenario 1		*Scenario 2*		*Scenario 3*		*Scenario 4*		*Scenario 5*	
	Origin	**Destination**	**Origin**	**Destination**	**Origin**	**Destination**	**Origin**	**Destination**	**Origin**	**Destination**
Car (vehicles)	212795	210477	226783	223805	226948	224367	225131	222446	225041	222765
Bus (people)	10399	10570	10708	10865	10732	10908	14049	15164	14085	15194
Rail (people)	3209	2824	3370	2974	3364	2968	2722	2405	2683	2372
TOTAL (people)	279601	276490	297557	293594	297781	294334	298185	295626	298069	296021
Comparison with Scenario 1										
Car (vehicles)			13988	13328						
Bus (people)			309	295						
Rail (people)			161	150						
TOTAL (people)			17956	17104						
Comparison with Scenario 2										
Car (vehicles)					165	562	-1652	-4337	-1742	-1040
Bus (people)					24	43	3341	4456	3377	4329
Rail (people)					-6	-6	-648	-965	-687	-602
TOTAL (people)					224	740	2693	3491	2690	3727
Comparison with Scenario 3										
Car (vehicles)							-1817	-1921		
Bus (people)							3317	4256		
Rail (people)							-642	-563		
TOTAL (people)							404	1292		

Scenario 1 – ETI Stage 1;
Scenario 2 – ETI Stage 5;
Scenario 3 – ETI Stage 5A with Lodge Hill South Facing Slips and A4130 dualling between Milton Interchange and Science Bridge;
Scenario 4 – No comparable ETI stage but combines Scenario 3 with public transport measures; and
Scenario 5 – No comparable ETI stage but combines public transport measures with the Clifton Hampden bypass and Culham crossing and Lodge Hill South Facing Slips and A4130 dualling between Milton Interchange and Science Bridge.

2.2. Public transport response

The public transport assignment model assigns the two sub-modes of public transport demand: bus and rail separately. From the model it is possible to obtain high level information about the performance of the public transport provision by considering: in-vehicle time, wait time and walk time. In scenarios that improve public transport provision it would be expected that total in-vehicle time increases to reflect more journeys being made by public transport and that average wait time and walk time would decrease reflecting increased frequencies and greater service penetration.

The Table below shows the high level public transport statistics. It contains a lot of information but the key indicators show that:

- Due to the introduction of the public transport measures, Scenario 4 is associated with an increase in average in-vehicle time[4] and a decrease in average walk and wait time in all three time periods compared with Scenario 3
- The addition of highway provision in Scenario 5 has the effect of slightly reducing bus demand compared with Scenario 4 but does not result in other changes in public transport performance.

Table 2. Performance of Public Transport Network across whole model

Time period	Scenario 2		Scenario 3		Scenario 4		Scenario 5	
	Rail	Bus	Rail	Bus	Rail	Bus	Rail	Bus
AM peak hour								
Demand (person trips)	5,213	13,070	5,202	13,081	4,961	13,722	4,936	13,650
Total IVT (mins.*pass.)	248,870	356,244	249,185	356,559	240,021	397,889	239,095	393,873
Average IVT (mins.)	47.7	27.3	47.9	27.3	48.4	29	48.4	28.9
Total Walk	313,136	267,684	312,631	267,616	294,734	279,642	293,304	278,616
Average Walk (mins.)	20.5		20.5		20.4		20.4	
Total Wait (mins.*pass.)	66,355	75,253	66,326	75,417	62,969	70,991	62,701	70,457
Average Wait (mins.)	12.7	5.8	12.7	5.8	12.7	5.2	12.7	5.2
IP average hour								
Demand	2,166	10,004	2,163	10,006	2,052	10,297	2,046	10,259
Total IVT (mins.*pass.)	104,547	225,278	104,467	225,177	103,038	247,474	102,841	246,957
Average IVT (mins.)	48.3	22.5	48.3	22.5	50.2	24	50.3	24.1
Total Walk	130,260	209,730	130,163	209,731	121,067	230,407	120,650	229,427
Average Walk (mins.)	21		21		22.4		22.4	
Total Wait (mins.*pass.)	28,536	47,217	28,497	47,270	27,154	43,863	27,077	43,726
Average Wait (mins.)	13.2	4.7	13.2	4.7	13.2	4.3	13.2	4.3
PM peak hour								
Demand	5,673	13,202	5,665	13,208	5,412	13,688	5,389	13,665
Total IVT (mins.*pass.)	258,873	351,765	258,948	352,385	250,822	386,659	250,073	385,150
Average IVT (mins.)	45.6	26.6	45.7	26.7	46.3	28.2	46.4	28.2
Total Walk	344,230	267,035	343,677	267,118	327,416	277,003	326,169	276,592
Average Walk (mins.)	20.2		20.2		20.2		20.2	
Total Wait (mins.*pass.)	77,889	66,278	77,851	66,309	73,975	62,626	73,654	62,442
Average Wait (mins.)	13.7	5.0	13.7	5.0	13.7	4.6	13.7	4.6

[4] Indicating greater use of public transport

Technical note

3. Highway impacts

3.1. Network performance

The highway network performance for ETI Stage 1, using the metrics described in Section 2.4, are shown in Tables 3 and 4 for the morning and evening peak hour respectively. The results are based upon an assignment of the demand for highway travel described in Chapter 2and although the model covers the whole of Oxfordshire, they reflect traffic conditions on the highway network in the VoWH only. These statistics form the baseline against which the combination of other land use scenarios and transport interventions are assessed.

3.2. Link performance

The key corridors for highway corridors within the VoWH as these are critical to providing access to planned development within the Vale Plan and where plans for mitigation are likely to be focussed to deal with revised levels of transport demand:

- A34 from Chilton to Hinksey Hill
- A420 from Shrivenham to Botley
- A417 from Wantage to Upton
- A415 from A420 to Abingdon
- A338 from Wantage to A420
- A4130 from Rowstock to Didcot
- A4185 from Chilton to Rowstock

The analysis focuses on network performance, where the network is said to be operating at operational capacity (i.e. conditions are such that traffic speed has dropped on links and minor incidents such as a turning vehicle have exaggerated impacts on traffic flow) with a volume to capacity ratio between 85% and 95%. These condition are described as being at capacity (i.e. it is not practically possible for additional traffic to use the link) when the volume to capacity ratio reaches or exceeds 95%.

The network performance statistics relative to those generated by COTM show that the OSM forecast model experiences less delay and queueing than the COTM equivalents. However, comparing the results from the two model there are a similar pattern of results given the same changes in infrastructure and consistent conclusions would be drawn from the two models.

Scenario 2 (ETI Stage 5) is forecast to result increased delays in the morning and evening peaks compared to Scenario 1 (ETI Stage 1). The addition of smaller highway measures in Scenario 3 (ETI Stage 5a) is forecast to reduce delays and the network performance of Scenario 3 in the morning peak is similar to Scenario 1, although the evening peak network does not perform as well as Scenario 1.

The addition of the Culham Bridge and Clifton Hampden Bypass as well as the public transport package (Scenario 5, but no ETI equivalent) reduces highway network delays in the morning and evening peak hours. Therefore the same conclusion is drawn using OSM as using COTM.

Table 3. Network performance on VoWH network in morning peak hour

	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5
Delay (pcuh)	3202	3310	3213	3167	3017
% change against Stage 1		3%	0%	-1%	-6%
Total Time (pcuh)	10632	10920	11001	10959	10751
% change against Stage 1		3%	3%	3%	1%
Total Distance (pcukm)	512843	524001	523049	523936	519706
% change against Stage 1		2%	2%	2%	1%
Average Speed (km/h)	48	48	48	48	48
% change against Stage 1		0%	-1%	-1%	0%

Table 4. Network performance on VoWH network in evening peak hour

	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5
Delay (pcuh)	3642	4001	3867	3803	3641
% change against Stage 1		10%	6%	4%	0%
Total Time (pcuh)	11060	11645	11602	11557	11378
% change against Stage 1		5%	5%	4%	3%
Total Distance (pcukm)	510105	523377	519574	521332	519764
% change against Stage 1		3%	2%	2%	2%
Average Speed (km/h)	46	45	45	45	46
% change against Stage 1		-3%	-3%	-2%	-1%

3.2.1. Scenario 1 (ETI Stage 1)

A34

The A34 connects some of the major settlements within Oxfordshire and of relevance to VoWH connects Oxford, Abingdon, Didcot and Milton and Harwell Campuses. It is also part of the national Strategic Road Network linking Oxfordshire to Hampshire and Southampton ports to the south and routes to the north via the M40 and M1.

This scenario shows that the A34 is forecast to be operating at or above operational capacity in the northbound and southbound directions between Botley and Milton in the morning peak. In the evening peak the northbound section between Milton and Botley is operating at or above operational capacity. In the southbound direction the A34 is operating at or above operational capacity between Botley and Lodge Hill.

A417

The A417 provides one of two east-west routes through the VoWH, in this case between Faringdon and Wallingford. The route consists of traffic travelling from Wantage, Grove and Faringdon to Oxford, Abingdon (via A34), Harwell Campus (via A4185), Didcot (via A4130) and Wallingford.

This scenario shows that the A417 is operating at or above operational capacity in the eastbound and westbound directions between Wantage and Featherbed Lane for the morning and evening peak respectively.

A338

The A338 caters for north-south movements between Wantage and Grove and Oxford, Abingdon and Bicester via A420 or A415 and A34 respectively.

This scenario shows that the A338 is forecast to be operating below operational capacity in both peaks except for the north and southbound approaches to Frilford Interchange.

A420

The A420 provides a route between Swindon and towns and villages (including Shrivenham and Faringdon) along its route to Oxford.

This scenario shows that the A420 westbound is generally forecast to be operating below operational capacity in the morning peak in both direction but at or above operational capacity on short stretches near Buckland, Fyfield and Cumnor in the eastbound direction. In the evening peak the A420 is forecast to be operating below operational capacity except at Buckland where it operates at or above operational capacity in both directions, the westbound sections near Fyfield and Cumnor are also forecast to operate at or above operational capacity in the evening peak.

A415

The A415 provides the second east-west route through the Vale between the A420, Marsham and Abingdon and carries traffic travelling from Witney, Wantage and Grove to Abingdon and Didcot via A34.

This scenario shows that the A415 is forecast to be operating below operational capacity in both time periods except for the Frilford lights which operate over operational capacity.

A4130

The A4130 links the A417 to Milton Campus and Didcot and carries traffic travelling from Didcot and Wallingford to Wantage & Grove, Witney, Abingdon and Oxford via the A34 or the A417 for Wantage and Grove.

This scenario shows that the A4130 is forecast to be operating at capacity in the morning and evening peaks on the road to the east of Milton Interchange, although assumptions have been made that the accesses and egresses associated with Valley Park and Great Western Park would be designed to perform no worse than at operational capacity in 2031.

A4185

The A4185 connects Chilton and Rowstock and carries traffic travelling between Wantage, Grove, and Faringdon and Harwell Campus and also traffic between Harwell Campus and Didcot, Oxford and Abingdon via the Milton Interchange.

This scenario shows that the sections of the A4185 between Chilton Interchange and Harwell Campus and between Featherbed Lane and Steventon is forecast to perform at capacity.

3.2.2. Scenario 2 (ETI Stage 5)

A34

Scenario 3 shows that the A34 is forecast to be operating at or above operational capacity in the northbound and southbound directions between Botley and Milton in the morning peak. In the evening peak the northbound section between Milton and Botley is operating at or above operational capacity. In the southbound direction the A34 is operating at or above operational capacity between Botley and Lodge Hill.

A417

This scenario shows that in the morning peak the A417 is forecast to be operating at or above operational capacity in the eastbound and westbound directions between Wantage and Featherbed Lane for the morning and evening peak respectively.

A338

Scenario 2 shows that the A338 is forecast to be operating below operational capacity in both peaks except for the north and southbound approaches to Frilford Interchange.

A420

This scenario shows that the A420 westbound is forecast to be operating below operational capacity in the morning peak except at Buckland where it operates at or above operational capacity and there are also short sections of the A420 near Fyfield and Cumnor which also operate at or above operational capacity in the eastbound direction. In the evening peak the A420 is forecast to be operating below operational capacity except at the eastern approach to Buckland where it operates at or above operational capacity and again the sections near Fyfield and Cumnor also forecast to operate at or above operational capacity in the westbound direction.

A415

Scenario 3 shows that the A415 is forecast to be operating below operational capacity in the morning peak in the westbound direction. In the eastbound direction the A415 is forecast to be operating below operational capacity in both time periods except for the Frilford lights which operate over operational capacity.

A4130

This scenario shows that the A4130 is forecast to be operating at capacity in the morning and evening peaks on the road to the east of Milton Interchange, although assumptions have been made that the accesses and egresses associated with Valley Park and Great Western Park would be designed to perform no worse than at operational capacity in 2031.

A4185

Scenario 3 shows that during the morning and evening peaks the A4185 is forecast to operate below operational capacity, although gets close to this between Chilton Interchange and Harwell Campus and the A4185 between Featherbed Lane and Steventon is forecast to perform at capacity.

3.2.3. Scenarios 3 and 5 (ETI Stage 5b - Stage 5c)

A34

Scenarios 3 and 5 show that the A34 is forecast to be operating at or above operational capacity in the northbound and southbound directions between Botley and Milton in the morning peak. In the evening peak the northbound section between Milton and Botley is operating at or above operational capacity. In the southbound direction the A34 is operating at or above operational capacity between Botley and Lodge Hill. The improvement at Lodge Hill reduces congestion within the vicinity of the scheme. The addition of PT reduces the level of forecast congestion, without creating new issues on other areas of the network.

A417

Scenarios 3 and 5 show that in the morning peak the A417 is forecast to be operating at or above operational capacity in the eastbound and westbound directions between Wantage and Featherbed Lane for the morning and evening peak respectively. The addition of PT reduces the level of forecast congestion, without creating new issues on other areas of the network.

A338

Scenarios 3 and 5 show that the A338 is forecast to be operating below operational capacity in both peaks except for the north and southbound approaches to Frilford Interchange. The addition of PT reduces the level of forecast congestion, without creating new issues on other areas of the network.

A420

Scenarios 3 and 5 show that the A420 westbound is forecast to be operating below operational capacity in the morning peak except at Buckland where it operates at or above operational capacity and there are also short sections of the A420 near Fyfield and Cumnor which also operate at or above operational capacity in

the eastbound direction. In the evening peak the A420 is forecast to be operating below operational capacity except at the eastern approach to Buckland where it operates at or above operational capacity and again the sections near Fyfield and Cumnor also forecast to operate at or above operational capacity in the westbound direction. The addition of PT reduces the level of forecast congestion, without creating new issues on other areas of the network.

A415

Scenarios 3 and 5 show that in the morning peak the A415 is forecast to be operating below operational capacity in both time periods except for the Frilford lights which operate over operational capacity. The addition of PT reduces the level of forecast congestion, without creating new issues on other areas of the network.

A4130

Scenarios 3 and 5 show that the A4130 is forecast to be operating at capacity near the NW Valley Park access. The addition of PT reduces the level of forecast congestion, without creating new issues on other areas of the network.

A4185

Scenarios 3 show that the A4185 is forecast to operate below operational capacity, although gets close to this between Chilton Interchange and Harwell Campus and the A4185 between Featherbed Lane and Steventon is forecast to perform at capacity. The addition of PT reduces the level of forecast congestion, without creating new issues on other areas of the network.

Scenario 5 shows that the A4185 is forecast to operate below operational capacity although gets close to this between Chilton Interchange and Harwell Campus in the morning peak. In the evening peak the A4185 is forecast to operate below operational capacity, although gets close to this between Chilton Interchange and Harwell Campus and the A4185 between Featherbed Lane and Steventon is forecast to perform at capacity.

3.3. Comparison with COTM and OSM

The analysis has shown that results from the fixed matrix approach applied to COTM and the variable demand model approach contained within OSM would lead to the consistent conclusions. There is limited variation between scenarios in terms of the location of the problems, there is however occasionally a slight difference in in the magnitude of the problems.

A further finding is that although public transport measures are forecast to reduce some of the congestion in Scenario 3 (ETI Stage 5A), the reported hotspots do not fully disappear through the introduction of these measures. This is a combination of the relatively small shift in the proportion of car trips and the fact that this decongestion or reduction in highway trip demand enables queued trips to complete their journeys.

Graham Bown
Atkins Limited
Epsom Gateway,
Ashley Road,
Epsom,
Surrey
KT18 5AL