

Vale of White Horse District Council Local Plan Part 2

Evaluation of Transport Impacts - Stage 1
Oxfordshire County Council

8 March 2017

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1. Introduction

Atkins have been commissioned by Oxfordshire County Council (OCC) and Vale of White Horse (VoWH) District Council to undertake a preliminary Evaluation of Transport Impacts (ETI) in relation to VoWH District Council Local Plan Part 2 (LPP2). The LPP2 sets out a policy framework for the delivery of sustainable development across the District up to 2031. It sets out the spatial strategy for additional development to that allocated within Local Plan Part 1 and additional policies for the district to help deliver sustainable development.

Atkins's role in this process is to provide evidence to the commissioning authorities to enable them to make conclusions about sustainable development in Vale of White Horse of which transport is only one consideration. The ETI modelling associated with LPP2 has the following elements:

- It helps to support development of the VoWH LPP2, which looks to allocate further sustainable development sites to VoWH Local Plan Part 1 (LPP1) in particular to meet Oxfordshire's unmet need and provides further, more detailed, Local Plan policies to those set out in LPP1.
- As a baseline, it uses the growth included in the adopted VoWH LLP1 and the preferred supporting infrastructure scenario tested and agreed in support of the VoWH examination (Scenario 5b in the ETI Final Report, November 2014).
- It uses the most up to date Oxfordshire Strategic Model (OSM), which has a baseline of 2013 and forecast year of 2031.
- It tests the impact of various development site geographical clusters in Stage 1 to review impacts of growth in different areas, and the impact of particular scenarios in Stage 2, including the option of a new by-pass for South Abingdon.
- Stage 1 and Stage 2 of the ETI modelling work have helped to inform proposed site selection, recognising that transport evidence is only part of the consideration in proposing new sites.

This report should be considered in the context of VoWH ETI modelling work undertaken in previous stages and summarised in Table 1.

Table 1 Summary of ETI Stages

ETI and Local Plan Stage	Growth and Infrastructure Tested	Summary of Conclusions
Submission LPP1: Stage 5b ETI [November 2014]	Distribution of 20,560 homes and 23,000 jobs in the Vale along with South East Plan levels of development in the other districts in Oxfordshire. Adopted scenario considers diverting traffic away from the A34 by a new Thames crossing near Culham and a Clifton Hampden bypass, utilising the A415 and A4074 as alternative routes between Didcot, Oxford and Abingdon.	The proposed mitigation for ETI Stage 5b, along with various corridor schemes that are being developed along the A420, A417, A338 and A4130 and enhanced public transport and smarter choices would contribute towards mitigating most, if not all congestion hotspots as well as enabling more people to travel and improve transport choice for all.
Current updated Do-minimum [November 2016]	The land use assumptions for the Do Minimum scenario include a total of 21,748 additional dwellings and 26,379 additional jobs. Development has been included elsewhere in the county at levels agreed with OCC Officers. Table 11 summarises the highway schemes that have been included in the Do Minimum scenario as an addition to the Base Year network.	Overall the issues identified along key corridors in ETI Stage 5B are consistent with the Do-Minimum in terms of location and severity. Although, the Do-Minimum scenario, containing more development than that assumed in the Local Plan Part 1 ETI, has other parts of the network that exceed capacity.
LPP2 preferred options: Stage 1: Clusters [November 2016]	In addition to the Do-minimum, Development Clusters ranging in size between 2,200 and 6,680 dwellings were tested. These were as follows <ul style="list-style-type: none"> Cluster 1: 6,680 dwellings mainly focused on the A420; Cluster 2: 3,840 dwellings North and West of Abingdon; Cluster 3: 4,590 dwellings South and West of Abingdon; Cluster 4: 2,200 dwellings between Abingdon and Didcot; Cluster 5: 4,600 dwellings in the Harwell and Milton Heights area; Cluster 6: 4,295 dwellings in the Wantage and Grove area. There were no differences between the Do Minimum and the alternative scenarios in terms of transport supply assumptions (highway, Park & Ride, and public transport).	Congestion is forecast to increase as follows: <ul style="list-style-type: none"> Cluster 1 is forecast to affect the A420 at Botley interchange; Cluster 2 is forecast to affect the already congested A34; Cluster 3 is forecast to affect the already congested A34 and the A415; Cluster 4 is forecast to affect the already congested A34 but have some limited impact on the A4130; Cluster 5 is forecast to affect the already congested A34 and is also forecast to affect the A417 and A4130, but have some limited impact on the A415 and A4185; and Cluster 6 is forecast to have limited impacts on the A338, A417.

ETI and Local Plan Stage	Growth and Infrastructure Tested	Summary of Conclusions
<p>LPP2 preferred options: Stage 1: Development Scenarios [January 2016]</p>	<p>In addition to the Do-minimum assumptions, Development Scenarios were as follows:</p> <ul style="list-style-type: none"> Scenario 1: 3,600 dwellings focused on Harwell and Dalton Barracks and four smaller sites Scenario 2: 3,600 dwellings spread over eleven sites Scenario 3: 3,600 dwellings spread over thirteen sites Scenario 4: 5,400 dwellings, adding 1,800 dwellings at South Abingdon to Scenario 1 without mitigation Scenario 5: 5,400 dwellings, adding 1,800 dwellings at South Abingdon to Scenario 1 with mitigation <p>There are no differences between the Do Minimum and the modelled scenario tests in terms of transport supply assumptions (highway, park and ride and public transport) except that scenario 5 includes the South-Abingdon By-pass.</p>	<p>Congestion is forecast to increase as follows:</p> <ul style="list-style-type: none"> Scenario 1 is forecast to affect network performance along the A34, particularly at the Botley Hinksey Hill and Lodge Hill junctions. Additionally, Scenario 1 is forecast to affect network performance on the A420 Near Cumnor, Fyfield and Southmoor; Scenario 2 is modelled to impact upon network performance along the A34, particularly at the Botley Hinksey Hill and Lodge Hill junctions. Furthermore, the A415 at Frilford Road westbound at the A338 approach, near Appleton Road, Marcham Road / Spring Road junction, B4017 / Ock Street junction and Ock Street/ West St Helen Street junction and A420 at Fyfield and Southmoor are forecast to exceed capacity; The modelling forecasts an impact on network performance along the A34 under Scenario 3, particularly at the Botley Hinksey Hill and Lodge Hill junctions. The A420 is modelled to exceed capacity at Cumnor, Fyfield and Southmoor. Under Scenario 4, in addition to network capacity issues identified under Scenario 1, the modelling forecasts capacity impacts along the A417 between Wantage and Featherbed Lane and Westbound approach at Rowstock Roundabout and along A415 at Frilford Road westbound at the A338 approach, near Appleton Road, Marcham Road / Spring Road junction, the B4017 / Ock Street junction and Ock Street / West St Helen Street junction. The modelling of the South Abingdon by-pass in Scenario 5 is forecast to have a comparable network performance to Scenario 1.

2. Modelling Approach

2.1. Background

The ETI Local Plan 2031: Part 1 study was carried out by Atkins in November 2014 using the highway aspects of Central Oxfordshire Transport Model (COTM). The Part 1 study identified the highway issues associated with the final draft Local Plan and demonstrated the impacts of medium scale and two larger scale mitigation measures.

In the ETI work for Local Plan Part 1, the demand for highway transport was forecast for highway-only modelling following Department for Transport (DfT) guidelines, whereas this study utilises a full demand model contained within the Oxfordshire Strategic Model (OSM), which is described in section 2.2 and section 2.3. The housing and employment assumptions between ETI Stage 1 and current study are presented in Table 2 and Table 3.

Table 2 Housing assumptions in the Local Plan Part 1 ETI work and the Local Plan Part 2 Stage 1

	Local Plan Part 1: ETI Stages			Local Plan Part 2
District	ETI Stage 1	ETI Stage 3	ETI Stage 5	Stage 1
Cherwell	7517	7517	7517	23669
Oxford	4108	4108	4108	6895
South Oxfordshire	10429	10429	10429	19076
Vale of White Horse	13294	20560	20560	21748
West Oxfordshire	5208	5208	5208	5088
Grand Total	46869	54299	54299	76476

Table 3 Employment assumptions in ETI Stage 1 and ETI Stage 2- Local Plan Part 2

	Local Plan Part 1: ETI Stages			Local Plan Part 2
District	ETI Stage 1	ETI Stage 3	ETI Stage 5	Stage 1
Cherwell	12480	12480	12480	33288
Oxford	6191	6191	6191	30267
South Oxfordshire	2856	2856	2856	4135
Vale of White Horse	14300	14300	23000	26379
West Oxfordshire	2323	2323	2323	12182
Grand Total	37080	60080	60080	106252

There are therefore a number of differences between this study and the previous ETI work:

- Different modelling tools (although analysis undertaken during Local Plan Part 1 showed that the different modelling tools will still have resulted in similar conclusions); and
- Different growth assumptions in the other districts of Oxfordshire - it is recognised that the growth assumptions have changed since ETI Stage 1 and these revised growth assumptions reflect increased growth aspirations by each District.

2.2. Description of the model

The work is based on the Oxfordshire Strategic Model (OSM) developed by Atkins for Oxfordshire County Council (OCC). The OSM modelling system was developed to represent travel conditions in 2013 and consists of three key elements:

- a Highway Assignment Model (HAM) 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 (PTAM) representing bus and rail-based movements across the same area and for the same time periods; and
- a five-stage multi-modal Demand Model (MMDM) 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). It does this incrementally from the Base Year.

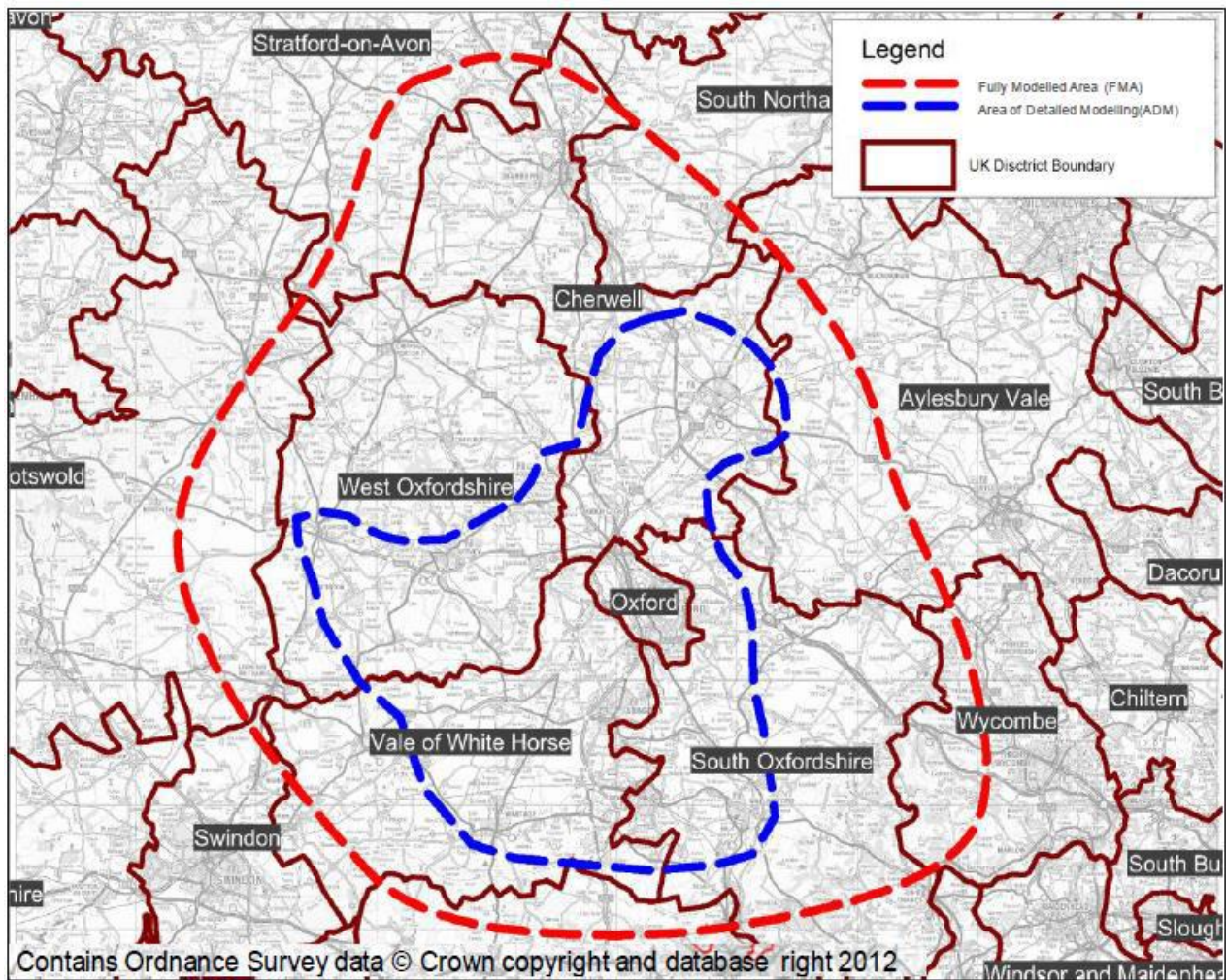
The entire OSM model covers the whole of Great Britain with different degrees of detail.

The OSM covers the strategic links in Oxfordshire and has a detailed modelled area and a fully modelled area as shown in Figure 1. The level of detail varies as follows:

- **Fully Modelled Area:** the area over which proposed interventions have influence, and in which junctions are in SATURN simulation, is further subdivided as:
 - **Area of Detailed Modelling** – the area over which significant impacts of interventions are more certain and the modelling detail in this area would be characterised by: representation of all trip movements; small zones; very detailed networks; and junction modelling (including flow metering and blocking back).
 - **Rest of the Fully Modelled Area** – the area over which the impacts of interventions are considered to be quite likely but relatively weak in magnitude and would be characterised by: representation of all trip movements; somewhat larger zones and less network detail than for the Area of Detailed Modelling; and speed/flow modelling (primarily link-based but possibly also including a representation of strategically important junctions).
- **External Area:** the area where impacts of interventions would be so small as to be reasonably assumed to be negligible and would be characterised by: a SATURN buffer network representing a large proportion of the rest of Great Britain, a partial representation of demand (trips to, from and across the Fully Modelled Area); large zones; skeletal networks and simple speed/flow relationships or fixed speed modelling.

The VoWH District is largely situated inside the area of detailed modelled (ADM), meaning that everything within that area has been subject to calibration and validation exercises. The ADM includes Abingdon, Wantage, Grove, Faringdon and the extent of A34 from Oxford to Chilton.

Figure 1 **Detailed Modelled Area**

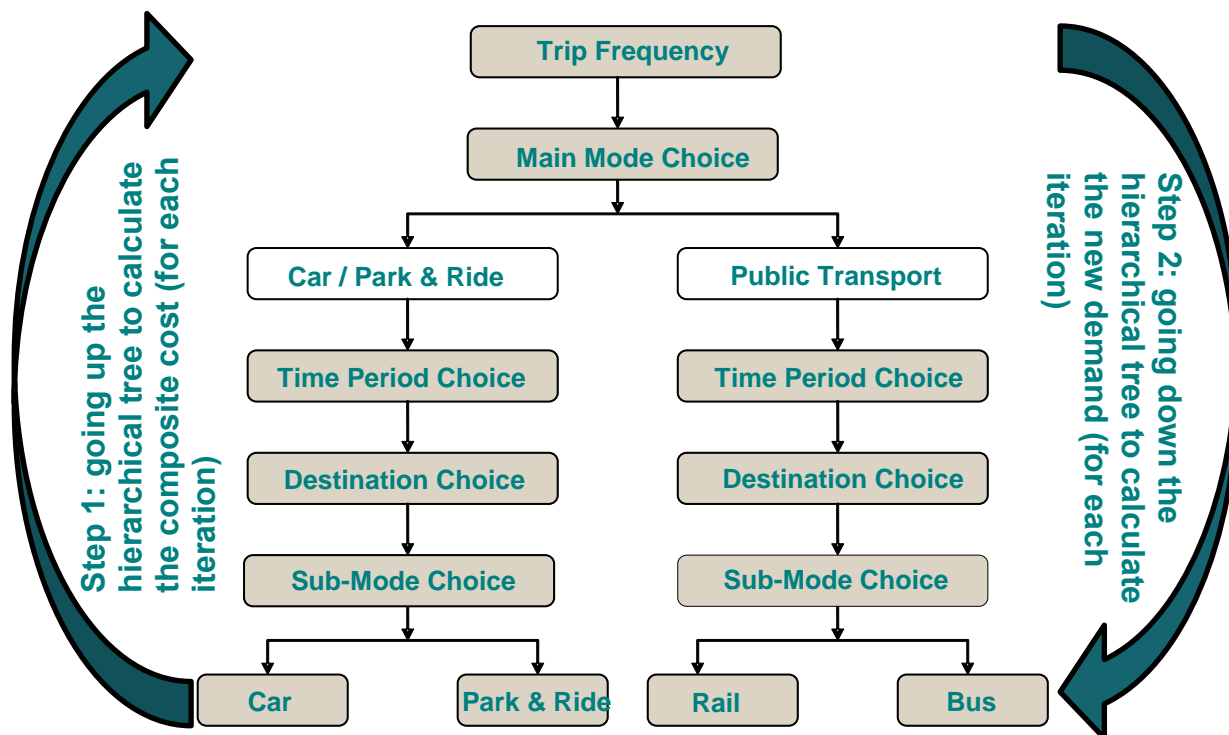


2.3. Description of the Demand Model

The MMDM has a hierarchical logit choice structure as shown in Figure 2. Following WebTAG¹, it has an incremental demand modelling approach which responds to changes in travel 'cost' between the 2013 Base Year and the 2031 future year scenario. The process passes through different iterations until it converges.

¹ Department for Transport (DfT) Transport analysis guidance: WebTAG, provides information on the role of transport modelling and appraisal. <https://www.gov.uk/guidance/transport-analysis-guidance-webtag>

Figure 2 Demand Model Hierarchy



2.4. Approach

Figure 3 summarises the approach taken for every scenario that is tested in OSM. The model allows changes both in terms of supply and/or demand for each scenario. These inputs enter the Demand model, which will estimate how these changes will impact on the distribution of the demand over different time periods, different modes and different routes.

Once a demand model run has finished, a set of checks is performed to confirm the suitability of the results:

- Check that the additional demand is assigned to the expected zones and the level of post demand is consistent with the inputs;
- Check convergence of the demand model;
- Check convergence of the highway model.
- Check performance of the network near the added schemes; and
- Check delays on the highway network.

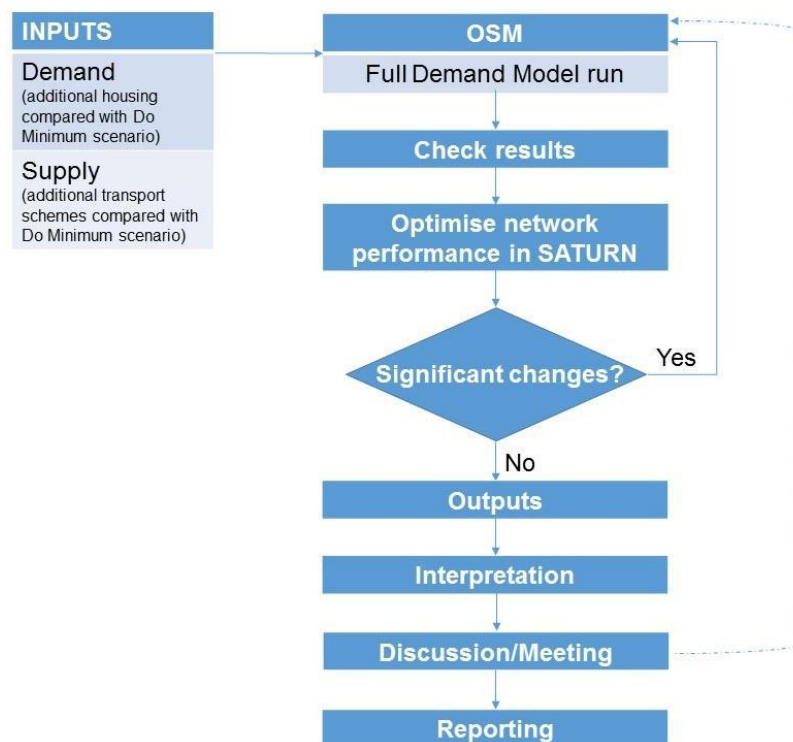
As a result of this process, some improvements might be necessary to be implemented into the network:

- Review of centroid connectors; and
- Optimisation of signal timings.

If the changes are significant (e.g. changed centroid connectors or change of a number of signal timings on main routes), the demand model is rerun with the new inputs.

Once the performance of the model is satisfactory, the results are analysed and the necessary outputs are prepared.

Figure 3 Transport Model Approach



2.5. Modelled Scenarios - Stage 1: Clusters

For the purposes of the ETI Local Plan: Part 2, a Do Minimum Scenario and six geographical clusters are considered. The proposed geographical clusters, provided by VOWH District Council, contain additional dwellings to meet the VOWH assessed housing need. Each scenario is built from the Do Minimum and it is not cumulative with others.

Table 4 Development Scenarios Modelled

Number	Name	Description
Run99M4	Do-Minimum	2031 with Local Plan development proposals, to provide the Do minimum scenario
Run99V1	Cluster 1	2031 comprising of the additional housing developments for Cluster 1.
Run99V2	Cluster 2	2031 comprising of the additional housing developments for Cluster 2.
Run99V3	Cluster 3	2031 comprising of the additional housing developments for Cluster 3.
Run99V4	Cluster 4	2031 comprising of the additional housing developments for Cluster 4.
Run99V5	Cluster 5	2031 comprising of the additional housing developments for Cluster 5.
Run99V6	Cluster 6	2031 comprising of the additional housing developments for Cluster 6.

Following on from the Cluster assessment, a number of scenario tests were also undertaken. These are summarised in Table 64 on page 87.

3. Assumptions of the Do Minimum scenario

3.1. Land-use assumptions

The latest housing and employment numbers were provided by OCC and the districts in the summer of 2016, and they were compiled for processing and application to an updated and revised Do-minimum model. The number of houses is provided by OCC or the districts for each site. For the employment, the Gross Floor Area is provided for each site and the number of jobs is estimated based on the use types A and B only, using the area per job summarised in Table 5.

Table 5 Area per job (sqm) used in OSM

Type	Area per job (sqm)
A	18
B	41
B1	12
B2	36
B8	75

Table 6 is a summary of the land use assumptions. In VOWH, the land use assumptions for the Do Minimum scenario include a total of 21,748 additional dwellings and 26,379 additional jobs.

Table 6 Summary of Do Minimum scenario land use assumptions

Developments 2031	Oxford	Cherwell	Vale	South	West	TOTAL
Houses	6,895	23,669	21,748	19,076	5,088	76,476
Jobs	30,267	33,288	26,379	4,135	12,182	106,252

The information provided by OCC and the districts regarding the land use assumptions for the Do Minimum scenario is quite extensive. As a consequence, this data is been presented in a standalone spreadsheet that accompanies this document.

3.2. Trip rates

Table 7 to Table 10 summarise the trip rates for the different use types. All the rates were derived from TRICS 7.1. To be noted that two development site are using specific trip rates at the request of the developers, with the approval of OCC. The trip rates for the developments situated inside Oxford City have been revised to obtain approximately the same mode share observed in Base Year.

Table 7 Residential trip rates (trips per dwelling)

Time period	Mode	Direction	Oxford City	Rest of OXON	Northern Gateway	Valley Park
Morning peak period (07:00 - 10:00)	Car (veh.)	Arrival	0.295	0.368	0.335	0.349
		Depart	0.694	0.816	0.796	0.791
	PT (pers.)	Arrival	0.080	0.013	0.008	0.006
		Depart	0.322	0.100	0.111	0.050
Inter Peak period (10:00 - 16:00)	Car (veh.)	Arrival	0.862	1.086	1.031	1.088
		Depart	0.791	1.000	1.013	1.031
	PT (pers.)	Arrival	0.258	0.049	0.058	0.052
		Depart	0.236	0.038	0.045	0.038
Afternoon peak period (16:00 - 19:00)	Car (veh.)	Arrival	0.699	0.883	0.874	0.863
		Depart	0.457	0.598	0.569	0.587
	PT (pers.)	Arrival	0.250	0.080	0.098	0.025
		Depart	0.030	0.012	0.013	0.012

Table 8 Trip rates for industrial sites (trips per 100 sqm)

Time period	Mode	Direction	Type B Oxford City	Type B Rest of OXON	Type B1	Type B2	Type B8
Morning peak period (07:00 - 10:00)	Car (veh.)	Arrival	1.229	1.784	2.799	2.113	0.130
		Depart	0.380	0.551	0.703	0.789	0.033
	PT (pers.)	Arrival	0.700	0.127	0.698	0.090	0.000
		Depart	0.198	0.024	0.031	0.015	0.000
Inter Peak period (10:00 - 16:00)	Car (veh.)	Arrival	1.080	1.670	2.252	2.245	0.166
		Depart	1.440	1.790	2.436	2.454	0.170
	PT (pers.)	Arrival	0.951	0.116	0.230	0.026	0.000
		Depart	1.100	0.164	0.325	0.062	0.000
Afternoon peak period (16:00 - 19:00)	Car (veh.)	Arrival	0.268	0.379	0.516	0.509	0.022
		Depart	1.067	1.511	2.441	1.713	0.098
	PT (pers.)	Arrival	0.075	0.025	0.050	0.009	0.000
		Depart	0.597	0.119	0.614	0.065	0.000

Table 9 Trip rates for commercial sites at Northern Gateway

Time period	Mode	Direction	Type B1 (trips/100 sqm)	Hotel (trips/bed)
Morning peak period (07:00 - 10:00)	Car (veh.)	Arrival	2.640	0.328
		Depart	0.571	0.402
	PT (pers.)	Arrival	0.970	0.047
		Depart	0.026	0.177
Inter Peak period (10:00 - 16:00)	Car (veh.)	Arrival	1.686	0.590
		Depart	1.706	0.639
	PT (pers.)	Arrival	0.274	0.102
		Depart	0.485	0.171
Afternoon peak period (16:00 - 19:00)	Car (veh.)	Arrival	0.455	0.401
		Depart	2.451	0.326
	PT (pers.)	Arrival	0.056	0.145
		Depart	0.783	0.041

Table 10 Trip rates for other use types

Time period	Mode	Direction	Type A (trips/100 sqm)	Type C (trips/ha)	Type D (trips/100 sqm)	Health (trips/100 sqm)
Morning peak period (07:00 - 10:00)	Car (veh.)	Arrival	9.493	18.443	1.400	2.113
		Depart	6.782	16.483	0.856	0.789
	PT (pers.)	Arrival	0.266	3.391	0.719	0.090
		Depart	0.136	19.485	0.088	0.015
Inter Peak period (10:00 - 16:00)	Car (veh.)	Arrival	35.084	55.867	3.325	2.245
		Depart	33.995	58.106	3.494	2.454
	PT (pers.)	Arrival	1.177	42.673	2.193	0.026
		Depart	1.046	51.111	2.674	0.062
Afternoon peak period (16:00 - 19:00)	Car (veh.)	Arrival	14.860	20.128	2.566	0.509
		Depart	16.741	20.533	2.347	1.713
	PT (pers.)	Arrival	0.433	34.743	0.622	0.009
		Depart	0.405	21.948	0.570	0.065

All this information is also included in the standalone spreadsheet that accompanies this document.

3.3. Highway assumptions

Table 11 summarises all the highway schemes that have been included in the Do Minimum scenario as an addition to the Base Year network. The drawings have been provided by OCC.

Table 11 Highway schemes included in the Do Minimum scenario (additional to Base Year network)

District	Highway scheme description
Cherwell	A41 / Neunkirchen Way roundabout (Rodney House)
Cherwell	A41 Oxford Road / Boundary Way roundabout improvement scheme
Cherwell	Bicester Town Centre changes
Cherwell	M40 J10 Improvements
Cherwell	M40 J9 Phase 2
Cherwell	Oxford Road / Pingle Drive junction
Cherwell	Bucknell Road/A4095 Howes Lane new priority junction
Cherwell	Pioneer Roundabout
Cherwell	South West Bicester Link Road
Cherwell	Upper Heyford improvement
Cherwell	Updated Bicester SE Perimeter Road as indicated by OCC, Langford Lane is not included in the model for being only a local access
Cherwell	Spine Road Through SE Bicester – modelled at a speed of 40 mph (64 kph) as indicated by OCC
Cherwell	Upgrade of the SE Segment of the A4421
Cherwell	Improvements to Skimmingdish Lane
Cherwell	Tunnel under the rail line – Howes Lane Realignment and the off-site mitigation at Lords Lane
Cherwell	London Road is now banned in the model
Cherwell	Charbridge Lane – dualled
Cherwell	Banbury schemes (Banbury East of M40 J11 Link Road, Banbury Hennef Way Corridor improvements, Banbury Salt Way, Banbury Bridge Street Junction (and other town centre)) were not modelled as Banbury is just outside the simulation area.
City	Becket Street extension and new junction with Oxpens Road – New site access and link road through Oxpens site
City	Botley interchange – Capacity improvements on circulatory and approaches
City	Cutteslowe and Wolvercote Roundabouts
City	Eastern Arc
City	Frideswide Square including changes to Beckett Street
City	Hinksey Hill – A423 to A34sb
City	Hinksey Hill – Science Transit
City	Kennington Roundabout Improvements
City	The Plain and Longwall Street junction – Signal retiming at Longwall Street and cycle improvements
City	West Way / Botley Road Junction
City	Worcester Street/George Street junction
City	Updated all infrastructure around Northern Gateway according to the latest layout (TN037 from PBA), which includes the internal link road open to through traffic, the A40-A44 link and improvements to Peartree Interchange
City	Updated Barton site access and bus link
City	Headington roundabout - phase 1 (completed)
City	Horspath Driftway (being completed as part of Access to Headington Package)
City	Includes Access to Headington package.
West	A4095/B4022 Staple Hall - Two mini-roundabouts connected by a short connecting link (2014 situation)

District	Highway scheme description
West	A415 Ducklington Lane/Station Lane junction improvement - Capacity increase on the Station Lane approach.
West	Brize Norton Village Traffic Calming - Capacity constraint on Minster Road between Elm Grove and Manor Road to reflect link layout change.
West	Down's Road/A40 new junction - At grade roundabout access for Downs Road connecting onto the A40.
West	B4477 Capacity Enhancement through widening (still single carriageway)
West	Straightening of the existing road between the A40 at Minster Lovell south to the roundabout junction north of Brize Norton
West	Includes bus lane eastbound between Eynsham and Duke's Cut Bridge and the related improvements to Eynsham and Cassington junction to accommodate the bus lane
West	Shilton Link Road from B4020 to Elmhurst Way
Vale/South	Harwell Link Road Section 1 (B4493 to A417)
Vale/South	Didcot Northern Perimeter Road Stage 3
Vale/South	Wantage Eastern Link Road (WELR)
Vale/South	A34 Milton Interchange Hamburger
Vale/South	A34 Chilton Northern Slip Roads
Vale/South	Foxhall Bridge Widening
Vale/South	Access to Harwell Section 2 (Hagbourne Hill)
Vale/South	Grove Northern Link Rd
Vale/South	Rowstock Roundabout improvements
Vale/South	Featherbed/Steventon Lights junction improvements
Vale/South	Great Western Park access
Vale/South	Valley Park spine road (A4130 – B4493)
Vale/South	Coding to reflect traffic management measures in villages (Harwell)
Vale/South	Harwell Oxford all access points junction improvements
Vale/South	Improvements to traffic signals at Frilford Junction (A415/A336)
Vale/South	Junctions on A4130
Vale/South	A420 Western Vale infrastructure (Faringdon – access to The Steeds development)
Vale/South	Lodge Hill Interchange (South facing slip roads onto the A34)
Vale/South	Clifton Hampden By-pass
Vale/South	Culham to Didcot Thames River Crossing
Vale/South	Science Bridge modelled with two roundabouts as in the OCC layout & A4130 Capacity Improvements
Vale/South	South Access to Valley Park Spine Road modelled according to the layout provided by Brookbanks in October (5 arm roundabout).
Vale/South	A420-Highworth Road, Shrivenham

3.4. Park and Ride assumptions

As informed by OCC on May 9, 2016, the six proposed peripheral Park and Ride sites should not be included in the updated Do Minimum scenario with the exception of Eynsham. The location and accesses of Eynsham P&R site have been provided by WODC when defining the scope of this work. All the existing P&R sites will be kept open and the catchment areas will be the ones defined for the A40 Corridor Study (October 2015).

3.5. Public Transport assumptions

Table 12 and Table 13 summarise all the public transport schemes that have been included in the Do Minimum scenario as an addition to the Base Year network. These details were provided by OCC.

Table 12 Public Transport Schemes included in the scenarios - Bus

District	Bus scheme description
Cherwell	2 new buses per hour to Banbury via Bankside plus enhancement of service s4 between Deddington and Banbury via main road
Cherwell	Create additional services between Upper Heyford and Bicester, also Upper Heyford with Oxford with an additional frequency of 1 bph for all time periods. (new frequency 2 buses per hour)
Cherwell	Create new bus service from NW Bicester to Bicester Town Centre with a frequency of 6 buses per hour in each direction
Cherwell	Create new bus service between Bicester Town Centre and Oxford going through Graven Hill (using Spine Road Through SE Bicester and Bicester SE Perimeter Road) with a frequency of 2 buses per hour in each direction
Cherwell	Update of the bus service S5 to stop at Graven Hill;
Cherwell	As a consequence on the ban on London Road, all the buses using this segment previously were re-routed via Charbridge Lane.
City	Frequency update for services 700, 800 and 900
City	Bus services serving Barton development (re-routing of bus service 8 and new shuttle service between Barton and John Radcliffe Hosp. with a frequency of 2bph);
City/West	S7 service for Northern Gateway now operating all day with a frequency of 4 bph;
City/West	S2 service now operating with a frequency of 4 bph to serve Eynsham P&R
City/West	S1 service now operating with a frequency of 2 bph to serve compensate the improvements to S2.
West	2 buses per hour (Chipping Norton – Banbury) (currently one bus per hour)
Vale/South	Faringdon - Increase 66 service (Swindon-Oxford) to 3 buses/hour
Vale/South	Wallingford - Increase X39 service (Wallingford-Oxford) to 3 buses/hour
Vale/South	Thame - Increase 280 (Thame - Oxford) to 4 buses/hour
Vale/South	2 buses per hour Harwell-Crab Hill-Grove Airfield-Milton Park-Didcot (service 36) plus diversion of 2 buses per hour Wantage-Oxford through site (either x30 or 31)
Vale/South	"North East Didcot, 4 buses per hour to Didcot Town Centre and Station and then 2 of these extended to Milton Park and on to Harwell"
Vale/South	"Valley Park, 2 buses per hour Didcot-Wantage Road-Valley Park-Milton Park plus 2 buses per hour Didcot - main road - Valley Park – Harwell"
Vale/South	"Great Western Park, same pattern as at Valley Park, 4 per hour to Didcot Town Centre, 2 to Milton Park, 2 to Harwell"

Table 13 Public Transport Schemes included in the scenarios - Rail

Line	Rail scheme description
East West Rail	East West Rail comprises four new services:
	• Reading – Bedford with a headway of 60 minutes all day;
	• Reading – Milton Keynes with a headway of 60 minutes all day;
	• Bletchley – Milton Keynes with a headway of 60 minutes all day;
	• Milton Keynes – Marylebone with a headway of 60 minutes all day.
Evergreen 3	Evergreen3 from Chiltern Railway consists in the creation of a new service between Oxford and London Marylebone, with a headway of 30 minutes all day.
North Cotswolds Line	The services inherited from the Base Year have been substituted by the following (for all time periods):
	• Worcester to/from London Paddington – 1 tph
	• Hanborough to/from London Paddington – 1 tph
	• Hanborough to/from Oxford – 1 tph
Culham Station	The following services now stop at Culham and Radley (in all time periods):
	• Reading to/from Bedford – 1 tph
	• Reading to/from Milton Keynes – 1 tph
Oxford to Didcot	Additionally, two more trains per hour stop at Radley and 1 train per hour stops at Appleton (in all time periods).
Didcot Parkway	For the service between Swindon and London Paddington, 1 more train per hour was added to the ones inherited from the Base Year, making a total of 3 tph (only AM and PM).
Henley-on-Thames	Shuttle service between Henley and Twyford with a frequency of 2 tph, allowing the transfer to the services to London and Oxford.
Banbury to Oxford	The direct service between Banbury and London Paddington was substituted by a shuttle between Banbury and Didcot (in AM and PM) and Banbury and Oxford (in IP) with a frequency of 1 tph.
Oxford to Heathrow	A service with 2 tph already exists between Oxford – Didcot Parkway – Reading – Heathrow – London Paddington. Updated journey time.
Oxford - Swindon/Bristol	New regional service between (Nottingham – Loughborough - Leicester – Kettering - Wellingborough -) Bedford – Bletchley – Bicester Village – Oxford Parkway – Oxford – Didcot – Swindon – Chippenham - Bath – Bristol with 1 tph.
Cowley Branch	New service between Bicester and Oxford Retail Park with a frequency of 1 tph. The line and service are coded but not currently used in the PT model as it creates instability.

4. Do Minimum Highway Network Performance - 2031

4.1. Introduction

Highway network performance is measured in a number of ways: at a high level using network wide statistics and specific statistics and journey times along identified corridors. The metrics used to measure the performance of the highway network are delay (pcu-hours), total time (pcu-hours), total distance (pcu-km) and average speed (km/hr), as defined:

1. Link Cruise Time (pcu-hours) : Time which would be spent travelling on links, subdivided into free-flow speeds and the flow-specific extra travel time on those links with link speed-flow curves
2. Total Travel Time (pcu-hours): The sum of both link and junction times
3. Delay (pcu-hours) – Difference of TOTAL TRAVEL TIME and LINK CRUISE TIME
4. Travel Distance (pcu-km): Vehicle or pcu-kms on simulation links
5. Overall Average Speed (kph): Defined by (total distance) / (total time)

In addition, the model can be used to present graphics showing flow and link and junction volume to capacity ratios as well as changes in flow between different scenarios. More detailed analysis of model results has been undertaken along identified corridors within the District:

- A34 from Chilton to Botley
- 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

Understanding the impacts of the planned developments on the highway sections covered by these corridors enables an assessment of modelled responses of committed and planned transport infrastructure in relation to increased levels of demand and begins to identify where highway mitigation and infrastructure interventions may need to be considered.

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%; and
- at capacity (i.e. it is not practically possible for additional traffic to proceed along the link) with a volume to capacity ratio of 95% and above.

Analysis of network performance and performance along relevant corridors has been undertaken to compare the Do-Minimum and the proposed clusters for the modelled morning and evening peak hours.

4.2. Do-Minimum Scenario

4.2.1. Network Performance

The modelled highway network performance within the VOWH district for the Do-Minimum scenario for 2031 are shown in the Table 14. Comparisons against these statistics will provide a high-level summary of how the model has responded to the changes land use assumptions associated with the clusters.

Table 14 Vale of White Horse District modelled network performance – 2031 Do-Minimum

Do-Minimum Scenario	Vale of White Horse	
	Morning Peak	Evening Peak
Delay (pcu h)	2147	3130
Total Time (pcu h)	11019	12510
Total Distance (pcu km)	536607	563210
Average Speed (km/h)	49	45

4.2.2. Corridor Performance

The key corridors for highway network analysis are described in Section 5.1. This section describes the corridor performance in the Do-Minimum scenario for the morning and evening peak hours. The demand flow and volume-capacity plots are presented in Appendix B.

4.2.2.1. A34

The A34 connects some of the major settlements within Oxfordshire. Of relevance to the VoWH, it connects Botley, Oxford, Abingdon on Thames, Didcot, Milton Park and Harwell Campus. 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.

In the morning peak hour the largest forecast flows are between the junction with the Botley interchange and Lodge Hill, with a northbound flow of 4300pcu and a southbound flow of 4000pcu. The largest evening peak hour forecast flows are 4100pcu in the northbound direction between Milton Interchange and the Marcham Road junction and 4600pcu on the southbound section of the A34 between Botley Interchange and Lodge Hill.

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

4.2.2.2. A417

The A417 provides one of two east-west routes through the VoWH, in this case between Wantage and Blewbury. 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.

In the morning peak hour the largest forecast traffic flow in the eastbound direction is 1500pcu and on the westbound direction is 1100pcu, between Ardington and West Hendred. This eastbound traffic is generated from transport model zones in Wantage and Ardington travelling along the A417. Of these trips, 800 are dissipated to Abingdon along A417, and 600 towards the Frilford Road junction to join the A34 northbound and 100 trips southbound towards Harwell. In the evening peak hour the largest traffic flow along the eastbound section of the route is 1300pcu, on the approach to Featherbed Lane and largest traffic flow on the westbound section is 1700pcu between East Hendred and Ardington.

The Do-Minimum results show that the A417 is operating at or above operational capacity in the eastbound direction between Wantage and Featherbed Lane in the morning peak. In the evening peak the eastbound and westbound directions between Wantage and Featherbed Lane and the westbound direction at Rowstock are operating at or above operational capacity.

4.2.2.3. A338

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

In the morning peak hour the largest traffic flow in the northbound direction is 1300pcu and 1100pcu in the southbound direction between Wantage and East Hanney. In the evening peak hour the largest traffic flow in the northbound direction is 1100pcu and 1600pcu in the southbound direction between Wantage and East Hanney.

The Do-Minimum results show that the A338 is forecast above operational capacity in the northbound direction between East Hanney and Frilford in the morning peak. In the evening peak the A338 is forecast to be operating above operational capacity in the northbound and southbound directions at Frilford junction and in the southbound direction between East Hanney and Wantage.

4.2.2.4. A420

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

In the morning peak hour the largest forecast traffic flow is 1900pcu, on the approach to Botley Interchange in the eastbound direction whilst the largest traffic flow in the westbound section is 1300pcu on the exit from Botley Interchange. In the evening peak hour the largest traffic flow in the eastbound direction is 1600pcu on the approach to Botley Interchange and largest traffic flow on the southbound section is 1900pcu, on the exit from Botley Interchange.

The Do-Minimum shows that the A420 eastbound is forecast to be above operational capacity at Faringdon, eastbound section between Buckland and Longworth, eastbound and westbound directions at Fyfield and eastbound direction at Cumnor. In the evening peak the A420 is forecast to be operating above operational capacity at Buckland in both directions, Fyfield in both directions and Cumnor in the westbound direction.

4.2.2.5. A415

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

In the morning peak hour the largest traffic flow in the eastbound direction is 1300pcu at Frilford. The largest traffic flow in the westbound direction is 1600pcu on the approach to the Marcham A34 junction. In the evening peak hour the largest forecast traffic flows are on the exit to the Marcham Interchange with an eastbound flow of 1400pcu and a westbound flow of 1500pcu.

The Do-Minimum shows that the A415 is forecast to be operating below operational capacity in the morning peak hour in the westbound direction except at the Frilford junction. In the eastbound direction the A415 is forecast to be operating at or above operational capacity at the approach to the Marcham junction. In the evening peak the eastbound and westbound directions at Frilford, eastbound approach at Marcham junction and eastbound and westbound directions in Abingdon are forecast to perform above operational capacity.

4.2.2.6. A4130

The A4130 links the A417 to Milton Park and Didcot.

In the morning peak hour the largest forecast traffic flows are on the approaches to the Milton Interchange with an eastbound flow of 1600pcu and a westbound flow of 1900pcu. In the evening peak hour the largest forecast traffic flows are of 1400pcu in both the eastbound and westbound directions. The eastbound and westbound sections are the approaches to the Milton Interchange.

The Do-Minimum results show that the A4130 is forecast to be at or above operating capacity at the eastbound approach to the Milton Interchange and the westbound approach at Broadway Roundabout (A4130/B4493/Mendip Heights) and Jubilee Roundabout in the morning peak and evening peak hours.

4.2.2.7. A4185

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

In the morning peak hour the largest forecast traffic flow along the northbound section of the route is 1100pcu, on the exit from the Chilton Interchange. The largest traffic flow on the southbound section is 700pcu, on the section joining to Chilton Interchange. In the evening peak hour the largest traffic flow along the northbound section of the route is 700pcu, between Harwell and the A417. The largest traffic flow on the southbound section is 900pcu, on the approach to the Chilton Interchange.

The Do-Minimum shows that the section between Chilton Interchange and Harwell Campus is forecast to have minor capacity issues. There is the potential that highway Mitigation may be required if further allocation is made at Harwell Campus.

4.3. Summary

Along the key corridors a comparison between Local Plan Part 1 ETI Stage 5B and the current Do-Minimum scenario along the sections of the highway network in one or both peak hours is:

- In ETI Stage 5B, the A34 was forecast to perform better with the addition of the new Culham to Didcot Thames River Crossing and a Clifton Hampden Bypass, although the sections between Hinksey Hill and Milton Interchanges are still performing at operational capacity. The Thames Crossing is likely to benefit network performance of the A34, without it, the A34 is likely to experience a reduced level of performance. In this Do-Minimum scenario, the A34 is forecast to be operating at or above operational capacity in most of the sections from Chilton to Botley Interchange.
- In ETI Stage 5B, the A420 was forecast to operate at or above operational capacity in both directions at Buckland and short sections near Cumnor and near Fyfield with small delays between one to two minutes at these congested locations. In the Do-Minimum scenario A420 eastbound is forecast to be above operational capacity at Faringdon, Buckland and Longworth, sections near Fyfield and Cumnor.
- In ETI Stage 5B, the A415 was forecast to be operating at operational capacity between Kingston Bagpuize and Frilford and at capacity on the approach to the A34 and between Marcham and Frilford in the westbound direction during the evening peak with small delays between one to three minutes at these congested locations. The key issue here is the traffic signals at Frilford. The Do-Minimum shows that the A415 is forecast to operate at or above operational capacity in the morning at Frilford junction, eastbound approach at Marcham junction and Abingdon.
- In ETI Stage 5B, in the morning peak hour the A417 was forecast to be operating at or above operational capacity in the eastbound direction between Wantage and Featherbed Lane. In the evening peak the A417 is operating at or above operation capacity in the westbound direction between Featherbed Lane and Wantage. The Do-Minimum results show that the A417 is operating at or above operational capacity in the eastbound direction between Wantage and Featherbed Lane in the morning peak. In the evening peak the eastbound and westbound directions between Wantage and Featherbed Lane and the westbound direction at Rowstock are operating at or above operational capacity.
- In ETI Stage 5B, sections of the A338 in the northbound direction near Grove and Frilford were forecast to reach operational capacity. The Do-Minimum results show that the A338 is forecast to be above operational capacity at sections between East Hanney and Frilford.

Overall the issues identified along key corridors in ETI Stage 5B are consistent with the Do-Minimum in terms of location and severity. Although as may be expected, the Do-Minimum scenario which contains more development than that assumed in the Local Plan Part 1 ETI, has other parts of the network that exceed capacity.

5. LPP2 Stage 1: Clusters: Summary of Alternatives Tested

5.1. Land-use assumptions

As discussed, for the purposes of the LPP2 ETI, six geographical clusters are considered as alternative scenarios. The proposed geographical clusters, provided by VOWH District Council, contain additional dwellings, when compared with the Do-Minimum scenario, to meet the VOWH assessed housing need. The location of each Cluster is shown in Figure 4 and the quantum is summarised in Table 15.

Figure 4 Local Plan Part 2 – development locations tested in model

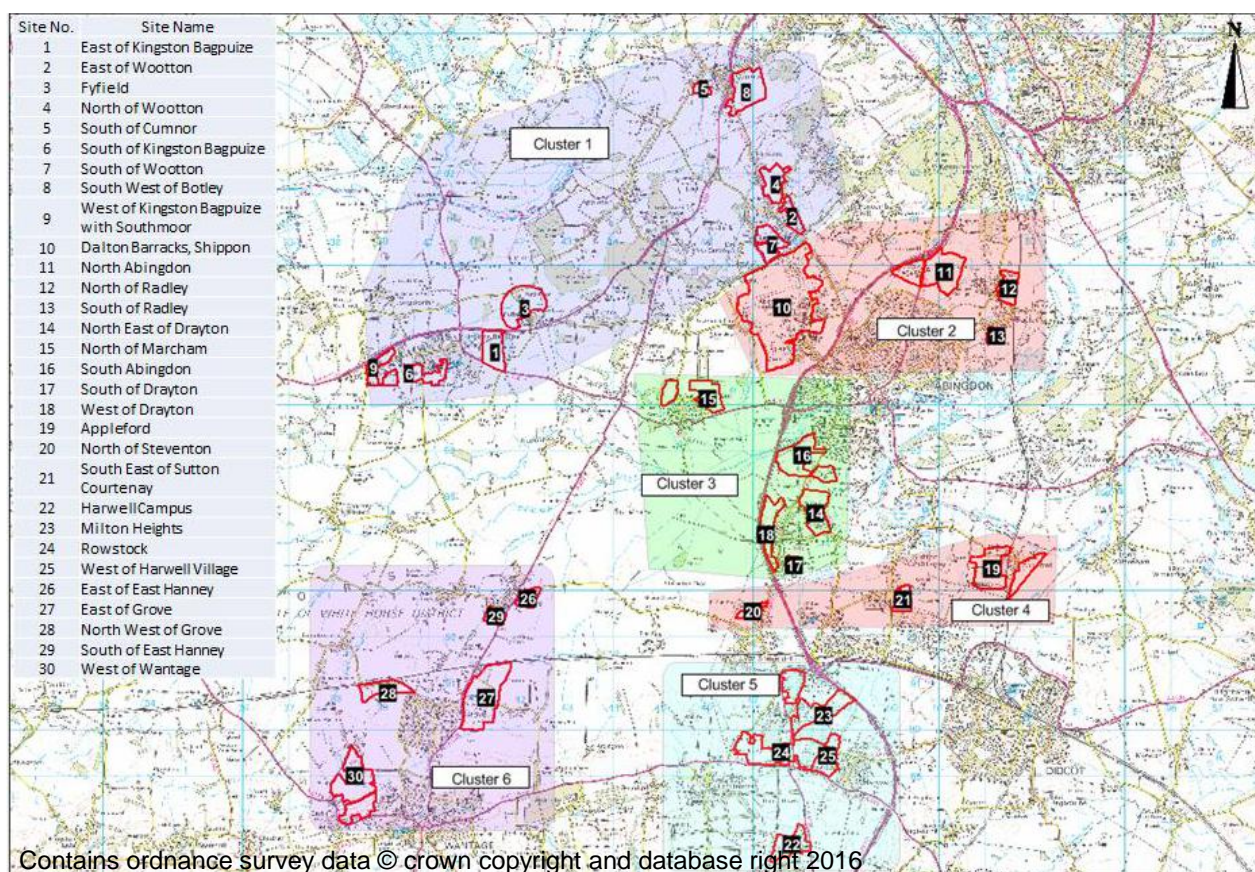


Table 15 Local Plan Part 2 – ETI Stage 1: Clusters land use assumptions

Cluster	Site	Capacity (No. of dwellings)	Comments
Cluster 1	South West of Botley	1,300	
	South of Cumnor	200	
	South of Wootton	800	
	East of Wootton	410	
	North of Wootton	790	

Cluster	Site	Capacity (No. of dwellings)	Comments
	Fyfield	1,000	
	East of Kingston Bagpuize	860	
	South of Kingston Bagpuize	620	
	West of Kingston Bagpuize with Southmoor	700	
	Total	6,680	
Cluster 2	North Abingdon	1500	2,000 Cap at 1,500
	North of Radley	600	
	South of Radley	240	
	Dalton Barracks, Shippon	1500	7,000 Cap at 1,500
	Total	3,840	
Cluster 3	South Abingdon	1,500	
	North East of Drayton	1,000	
	West of Drayton	850	
	South of Drayton	240	
	North of Marcham	1,000	
	Total	4,590	
Cluster 4	Appleford	1,500	
	South East of Sutton Courtenay	440	
	North of Steventon	260	
	Total	2,200	
Cluster 5	Milton Heights	1500	1,900 Cap at 1,500
	Rowstock	1500	2,100 Cap at 1,500
	West of Harwell Village	750	
	Harwell Campus	850	
	Total	4,600	
Cluster 6	West of Wantage	1500	2,200 Cap at 1,500
	North West of Grove	700	
	East of Grove	1500	2,300 Cap at 1,500
	East of East Hanney	375	
	South of East Hanney	220	
	Total	4,295	

Table 16 is a summary of the land use assumptions for each of the alternative scenarios (the only difference is the number of dwellings as the employment is not changing).

Table 16 **Summary of Clusters land use assumptions**

Developments 2031	Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5	Cluster 6
Houses	28,428	25,588	26,338	23,948	26,348	26,043
Jobs	26,379	26,379	26,379	26,379	26,379	26,379

5.2. **Transport Supply Assumptions**

There are no differences between the Do Minimum and the alternative scenarios in terms of transport supply assumptions (highway, Park & Ride, and public transport).

6. LPP2 Stage 1: Clusters: Demand Model results

In this chapter, the results for the 2031 forecast year (post demand model) are compared with the 2013 Base year and geographical cluster runs.

6.1. Convergence

As mentioned in Section 2.4, the convergence of the Demand Model is checked for all scenarios before preparing the results/outputs. WebTAG advised a level convergence of 0.2 within 25 iterations, which was achieved for the Do Minimum scenario and all the alternative scenarios.

6.2. Growth in demand

Table 17 summarises the growth in travel demand between 2013 base year, 2031 Do Minimum scenario and the six clusters for the entire model. Between 2013 base year and the 2031 Do Minimum scenario, overall travel demand for all districts together is forecast to grow by 42% over a 12 hour-period. Between 2031 Do Minimum scenario and Clusters, overall travel demand is estimated to additionally increase by 1% for all clusters except for Cluster 4 where the increase is 0.4%. The table does not include LGV and HGV demand.

Table 17 Summary of Demand Model results for the entire model – 12 hour period

Entire model	Base Year (BY)	Do Minimum (DM)	Cluster 1 (C1)	Cluster 2 (C2)	Cluster 3 (C3)	Cluster 4 (C4)	Cluster 5 (C5)	Cluster 6 (C6)
Reg car (veh.)	974,474	1,375,107	1,392,920	1,385,397	1,387,064	1,380,887	1,387,092	1,386,643
P&R (veh.)	6,477	8,150	8,307	8,195	8,258	8,159	8,250	8,158
Bus only (pax)	102,649	137,086	138,361	137,750	137,851	137,521	137,749	137,753
Rail (pax)	30,238	56,839	57,903	57,400	57,603	57,176	57,876	57,505
TOTAL (persons)	1,358,105	1,921,775	1,946,553	1,935,911	1,938,368	1,929,781	1,938,566	1,937,536

The Car and PT mode share for all the clusters are consistent when compared to Do-Minimum scenario as presented in Table 17 and Table 18. The percentages presented in Table 18 are for the entire modelled 12 hours. Differences in percentage mode share are modelled for individual time periods, these differences are balanced out over the 12 hour period.

Table 18 Mode share – 12 hour period

Entire model	Cluster 1 (C1)	Cluster 2 (C2)	Cluster 3 (C3)	Cluster 4 (C4)	Cluster 5 (C5)	Cluster 6 (C6)
No. of additional dwellings	6,680	3,840	4,590	2,200	4,600	4,295
Trips per dwelling over 12-hour	3.71	3.68	3.62	3.64	3.65	3.67
Car mode share	88%	88%	88%	88%	88%	88%
PT mode share	12%	12%	12%	12%	12%	12%

Table 19 and Table 20 summarise the travel demand but only for the district of VOWH. The growth in travel demand with respect to total persons, calculated based on trips for all modes, between 2013 base year and the 2031 Do Minimum scenario shows an increase of 76% for VOWH as origin and an increase of 74% for

VOWH as destination when considering the trips to/from all the districts over a 12-hour period. The growth in travel demand between the 2031 Do Minimum scenario and 2031 Clusters shows an additional increase of:

- 6% for VOWH as origin and 5% for VOWH as destination for Cluster 1
- 3% for VOWH as origin and 3% for VOWH as destination for Cluster 2
- 4% for VOWH as origin and 4% for VOWH as destination for Cluster 3
- 2% for VOWH as origin and 2% for VOWH as destination for Cluster 4
- 4% for VOWH as origin and 4% for VOWH as destination for Cluster 5
- 4% for VOWH as origin and 3% for VOWH as destination for Cluster 6.

Since the demand model is constrained to departures/dwellings, the increase in dwellings in each scenario satisfies more jobs which otherwise would be suppressed.

Table 19 Summary of Demand Model results for VoWH - Origins 12 hour

VOWH as origin	Base Year (BY)	Do Minimum (DM)	Cluster 1 (C1)	Cluster 2 (C2)	Cluster 3 (C3)	Cluster 4 (C4)	Cluster 5 (C5)	Cluster 6 (C6)
Reg car (veh.)	165,567	291,400	308,026	300,985	302,320	296,721	302,354	301,956
P&R (veh.)	795	1,184	1,296	1,221	1,279	1,197	1,227	1,198
Bus only (pax)	8,351	12,351	13,024	12,695	12,834	12,662	12,783	12,784
Rail (pax)	2,128	5,717	6,264	6,050	6,179	5,902	6,312	6,111
TOTAL (persons)	218,312	383,620	405,746	396,319	398,319	390,781	398,386	397,658

Table 20 Summary of Demand Model results for VoWH - Destinations 12 hour

VOWH as destination	Base Year (BY)	Do Minimum (DM)	Cluster 1 (C1)	Cluster 2 (C2)	Cluster 3 (C3)	Cluster 4 (C4)	Cluster 5 (C5)	Cluster 6 (C6)
Reg car (veh.)	165,626	288,354	303,698	297,371	298,499	293,483	298,634	298,236
P&R (veh.)	748	1,165	1,318	1,186	1,226	1,174	1,256	1,170
Bus only (pax)	8,181	12,467	13,091	12,786	12,927	12,767	12,889	12,876
Rail (pax)	1,732	5,413	5,921	5,736	5,842	5,615	6,000	5,769
TOTAL (persons)	217,769	379,604	400,084	391,541	393,242	386,526	393,564	392,727

7. LPP2 Stage 1: Clusters: Highway Network Performance

7.1. Introduction

The highway network performance of the different clusters is measured using the metrics discussed in section 4.1. In addition, the changes in flow between different scenarios and volume-capacity ratio plots are presented. This analysis has been undertaken to compare the Do-Minimum and the proposed Clusters for the modelled morning and evening peak hours, this section does not compare the Clusters against each other. The impact of the Clusters will only be felt in certain corridors and they are presented in Table 21.

Table 21 Corridors influenced in each cluster

Cluster Number	Corridor
1	A420
2	A34
3	A34, A415
4	A34, A4130
5	A34, A417, A4130 and A4185
6	A338, A417

7.2. Cluster 1

7.2.1. Network Performance

The modelled highway network performance within the VOWH district for the Do-Minimum and the Cluster 1 are shown in the Table 22 and Table 23. These statistics give a high-level summary of how the model has responded to the changes in in network and land use assumptions.

The trips generated by the 6,680 additional dwellings are forecast to increase delays, travel times and travel distances within the District during the morning and evening peak hours and has the effect of reducing average speed.

Table 22 Vale of White Horse District modelled network performance - morning peak hour 2031

	Vale of White Horse		
	Do-Minimum (DM)	Cluster 1 (C1)	% Difference (C1-DM)
Delay (pcu hr)	2147	2417	13%
Total Time (pcu hr)	11019	11555	5%
Total Distance (pcu km)	536607	546612	2%
Average Speed (km/h)	49	47	-4%

Table 23 Vale of White Horse District modelled network performance - evening peak hour 2031

	Vale of White Horse		
	Do-Minimum (DM)	Cluster 1 (C1)	% Difference (C1-DM)
Delay (pcu hr)	3130	3568	14%
Total Time (pcu hr)	12510	13274	6%
Total Distance (pcu km)	563210	577764	3%
Average Speed (km/h)	45	43	-4%

7.2.2. Flow Impacts

Figure 5 and Figure 6 present the demand flow difference between Cluster 1 and Do-Minimum modelled along the Shrivenham-Botley corridor.

In the AM peak hour, in Cluster 1 the demand flow along A420 is reduced due to increased delays at A420 approach to Botley interchange and northbound slip joining A34. As a result traffic is re-routing along the Besselsleigh Road to the south of Cumnor.

In the evening peak hour in Cluster 1 the demand flow along A420 is increasing except at Fyfield where a slight reduction in flows due to increase in delays.

Figure 5 A420 corridor demand flow difference (PCU/hr) – 2031 AM peak hour

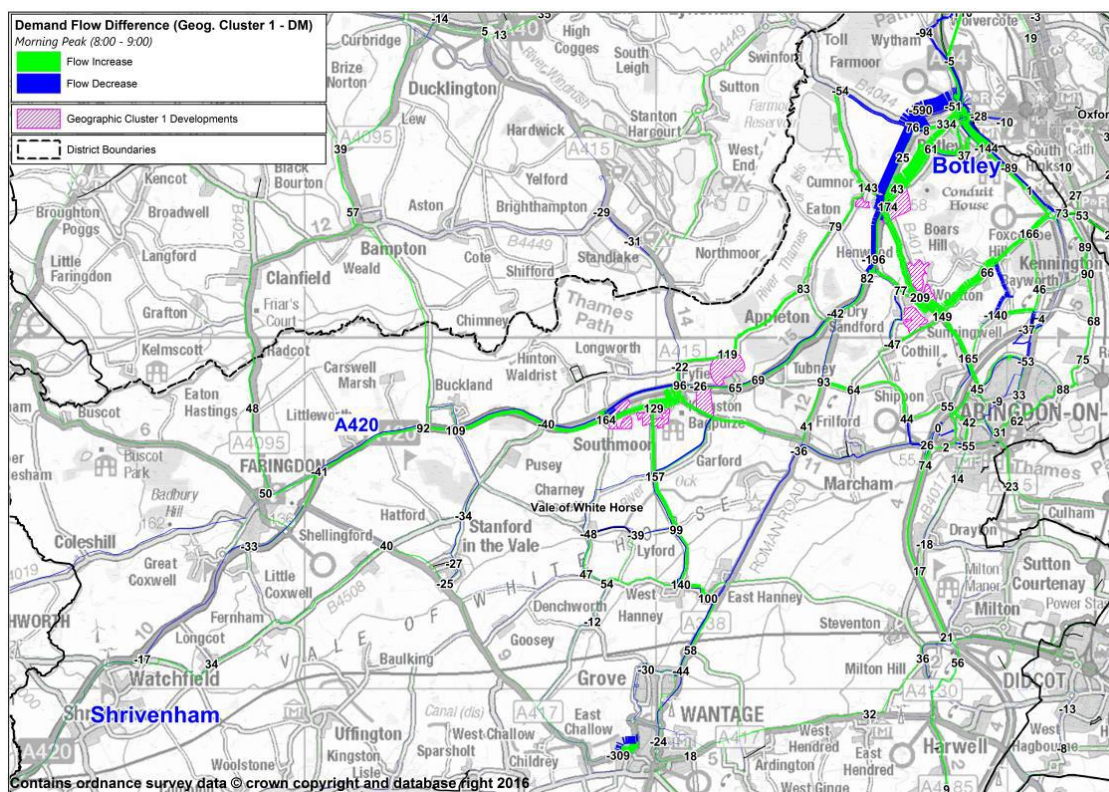
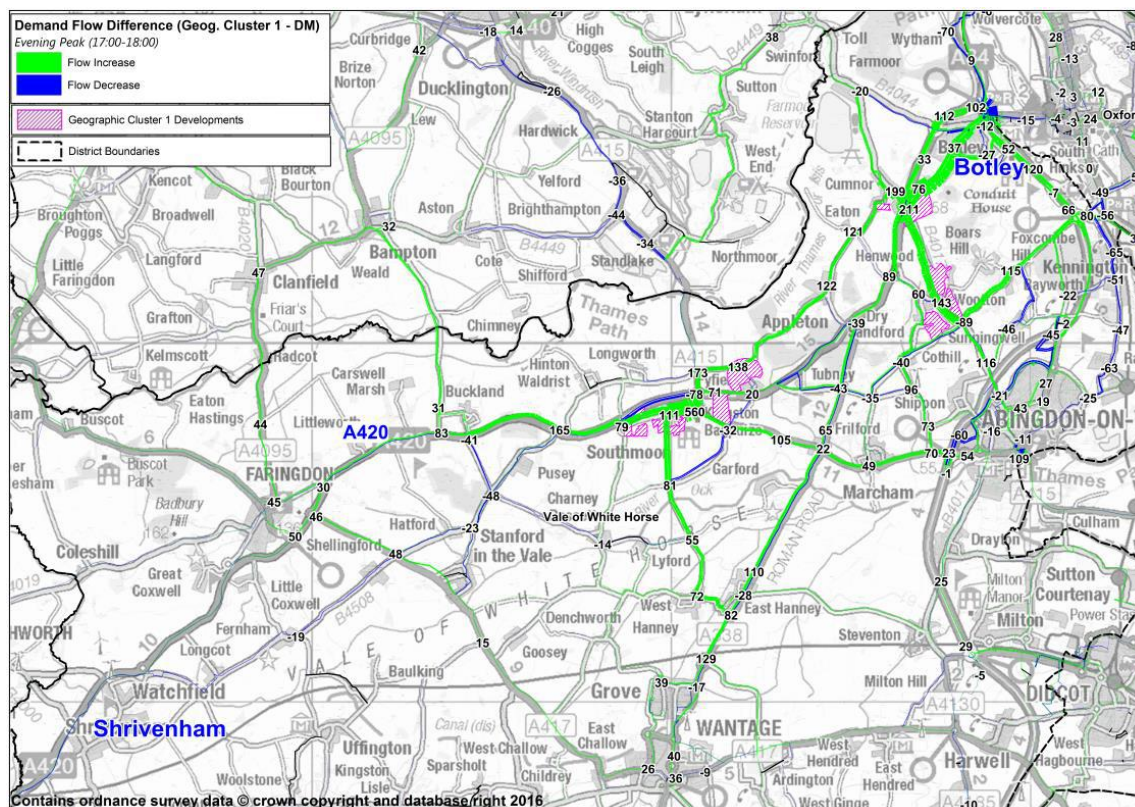


Figure 6 A420 corridor demand flow difference (PCU/hr) – 2031 PM peak hour



7.2.3. Corridor Performance – A420

Cluster 1 is focussed along the A420 corridor from Shrivenham to the Botley Interchange and as such we have analysed changes along this corridor following introduction of this growth as shown in Table 24 and Table 25.

In the morning peak hour, the increased level of demand generated by the Cluster 1 sites results in increased delays and total travel times while total distance and average speed decrease.

The reduction in total distance is due to the re-routing of traffic onto Basselsleigh Road to the south of Cumnor. This re-routing is forecast due to an increase of delays and capacity at the eastbound approach to Botley Interchange.

In the evening peak, the delay, total time, total distance increase while the average speed is decreasing.

The scale of the new developments along the corridor is forecast to have a significant impact on the patterns along the A420 section especially at Botley.

Table 24. Shrivensham – Botley corridor performance in the morning peak hour in 2031

	Shrivensham – Botley		
	Do-Minimum (DM)	Cluster 1 (C1)	Difference (C1 - DM)
Delay (pcu hr)	210	259	23%
Total Time (pcu hr)	1461	1503	3%
Total Distance (pcu km)	83509	82587	-1%
Average Speed (km/h)	57	55	-4%

Table 25. Shrivensham – Botley corridor performance in the evening peak hour in 2031

	Shrivensham – Botley		
	Do-Minimum (DM)	Cluster 1 (C1)	Difference (C1 - DM)
Delay (pcu hr)	287	402	40%
Total Time (pcu hr)	1600	1764	10%
Total Distance (pcu km)	87704	90543	3%
Average Speed (km/h)	55	51	-7%

7.2.4. Network Capacity - A420

Figure 7 to Figure 10 present the volume-capacity ratio for links and junctions for Do-Minimum and Cluster 1.

In Do-Minimum scenario, A420 is exceeding the capacity at the following approaches:

- In the morning peak hour, Botley Interchange, A420 northbound direction near Cumnor, northbound and southbound directions at Fyfield, northbound direction at Kingston Bagpuize.
- Botley Interchange, A420 southbound direction near Cumnor, northbound and southbound directions at Fyfield, southbound direction at Kingston Bagpuize are exceeding capacity in the evening peak hour.

In Cluster 1, A420 is exceeding the capacity at the following approaches:

- In the morning peak hour, Botley Interchange and A420 northbound direction at Botley, A420 northbound direction near Cumnor, northbound and southbound directions at Fyfield, northbound direction at Kingston Bagpuize.
- Botley Interchange, A420 southbound direction near Cumnor, northbound and southbound directions at Fyfield, northbound and southbound directions at Kingston Bagpuize are exceeding capacity in the evening peak hour.

Figure 7 A420 corridor V/C for links and junctions – 2031 DM AM peak hour

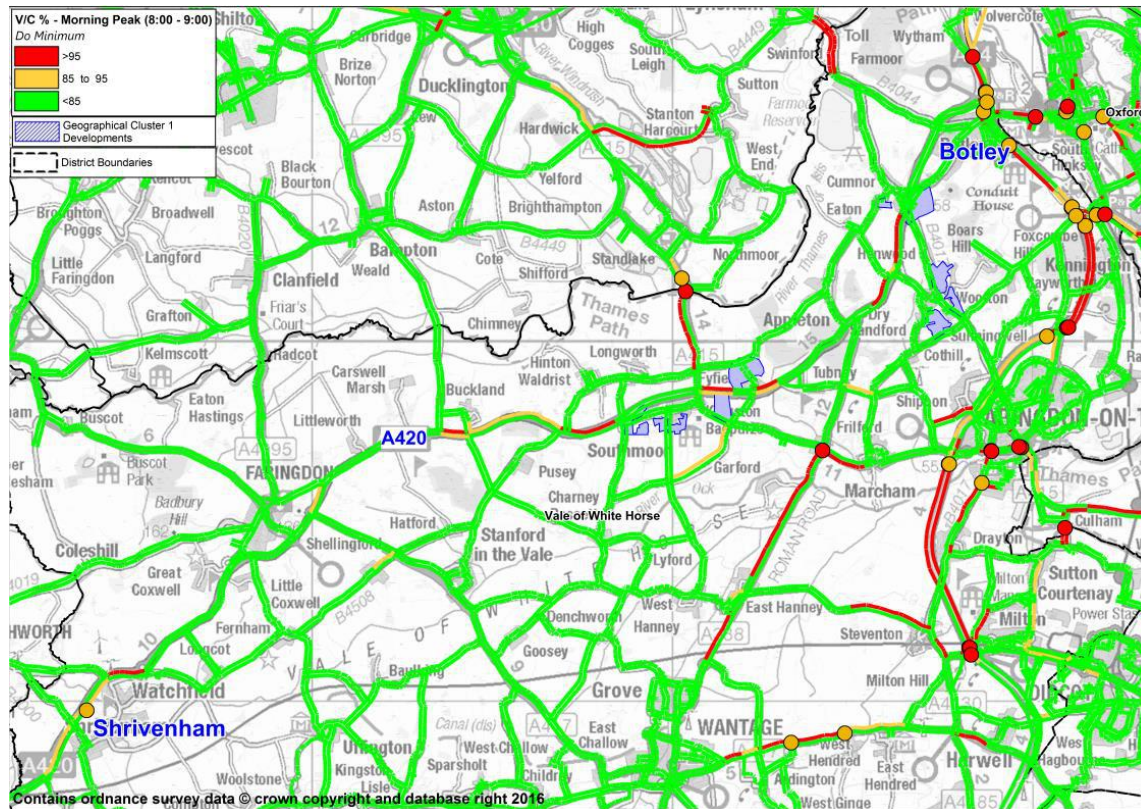


Figure 8 A420 corridor V/C for links and junctions– 2031 DM PM peak hour

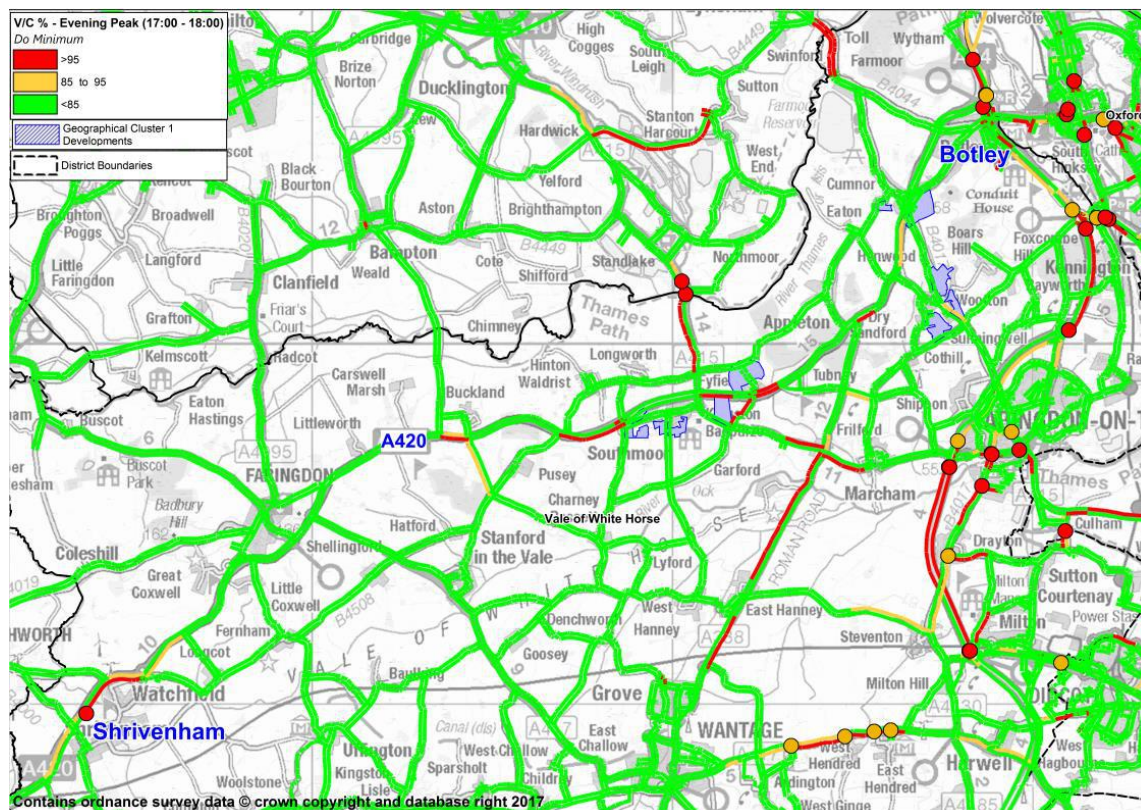


Figure 9 A420 corridor V/C for links and junctions– 2031 Cluster 1 AM peak hour

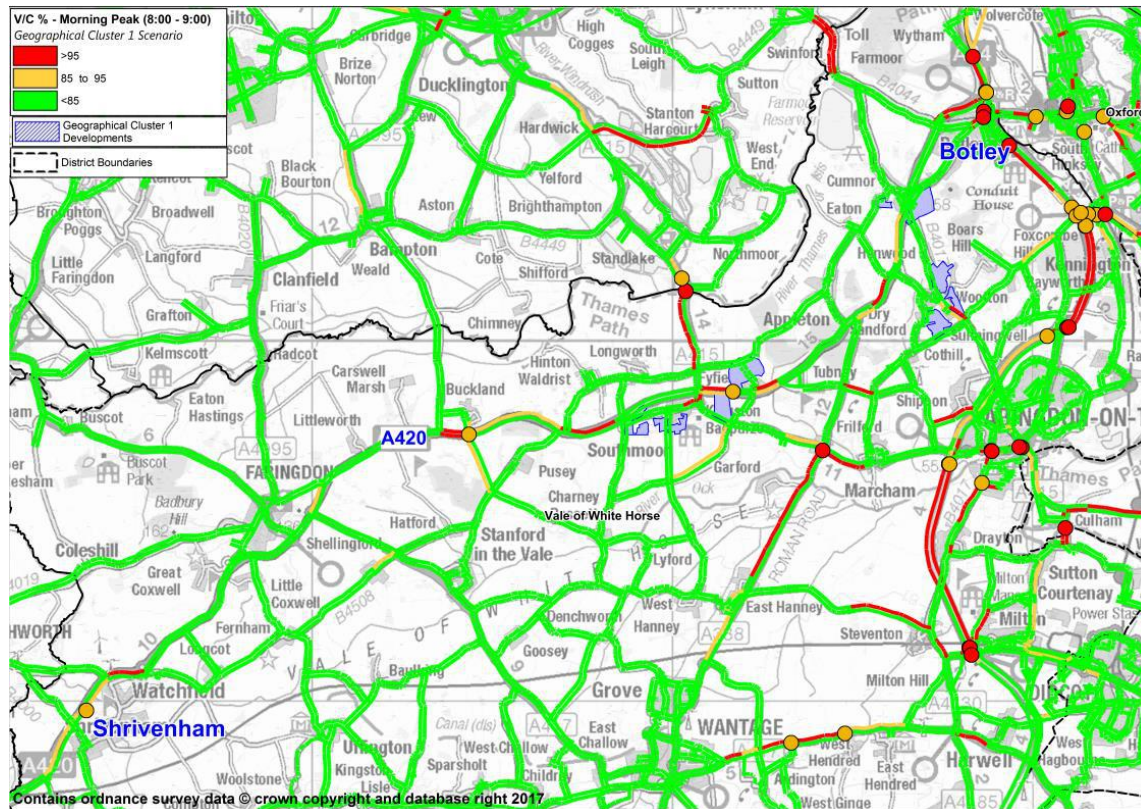
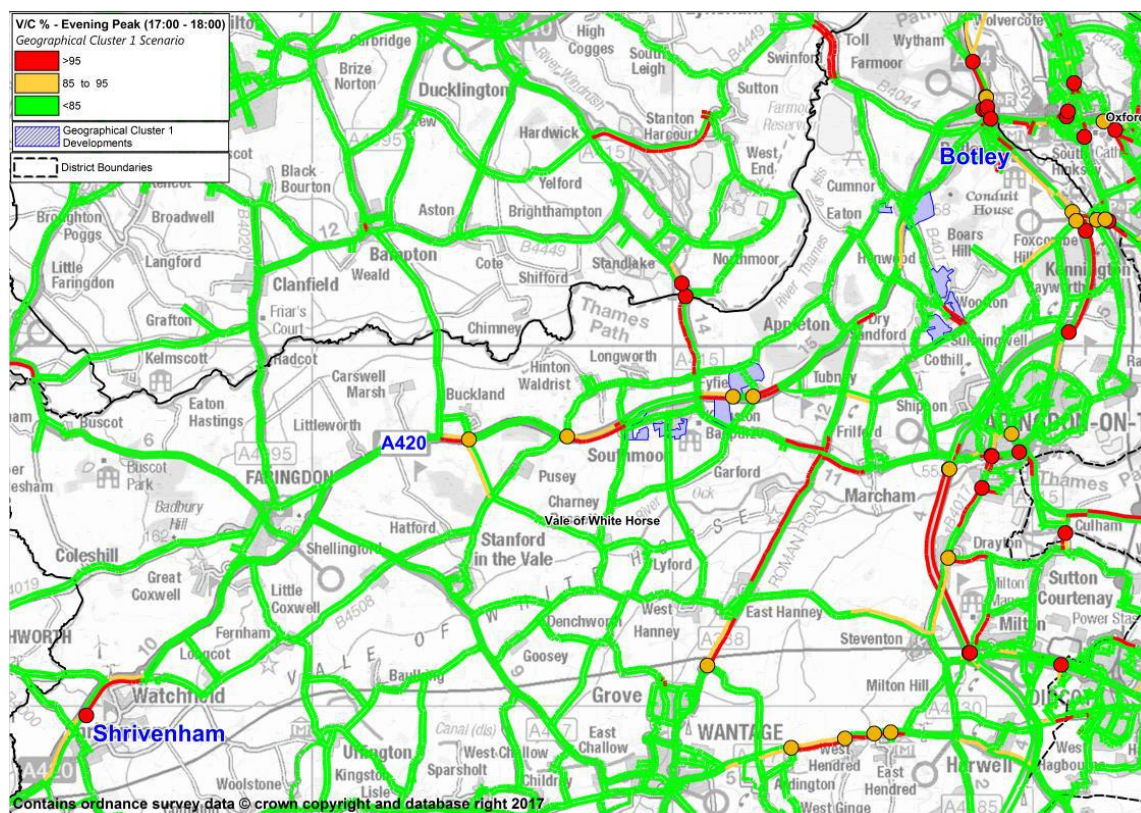


Figure 10 A420 corridor V/C for links and junctions– 2031 Cluster 1 PM peak hour



7.3. Cluster 2

7.3.1. Network Performance

The modelled highway network performance within the Vale of White Horse district for both the Do-Minimum and the Cluster 2 are shown in the Table 26 and Table 27. These statistics give a high-level summary of how the model has responded to the changes in network and land use assumptions.

The trips generated by the 3,840 additional dwellings are forecast to increase delays, travel times and travel distances within the Vale of White Horse district during the morning and evening peak hours. The average speed is decreasing in the morning and evening peak hours.

Table 26. Vale of White Horse District modelled network performance - morning peak 2031

	Vale of White Horse		
	Do-Minimum (DM)	Cluster 2 (C2)	% Difference (C2-DM)
Delay (pcu hr)	2147	2252	5%
Total Time (pcu hr)	11019	11259	2%
Total Distance (pcu km)	536607	542361	1%
Average Speed (km/h)	49	48	-2%

Table 27. Vale of White Horse District modelled network performance - evening peak 2031

	Vale of White Horse		
	Do-Minimum (DM)	Cluster 2 (C2)	% Difference (C2-DM)
Delay (pcu hr)	3130	3334	7%
Total Time (pcu hr)	12510	12864	3%
Total Distance (pcu km)	563210	568770	1%
Average Speed (km/h)	45	44	-2%

7.3.2. Flow Impacts

Figure 11 and Figure 12 present the demand flow difference between Cluster 2 and Do-Minimum modelled along the A34 corridor.

In the AM peak hour, in Cluster 2 the demand flow is forecast to increase along A34 although there is a small reduction in the northbound and southbound sections between Lodge Hill and Botley Interchange and in the northbound direction between Chilton and Milton Interchange in the range of +/- 40pcu.

In the evening peak hour, in Cluster 2 the demand flow along A34 is slightly changing in the range of +/- 40pcu.

Figure 11 A34 corridor demand flow difference (PCU/hr) – 2031 AM peak hour

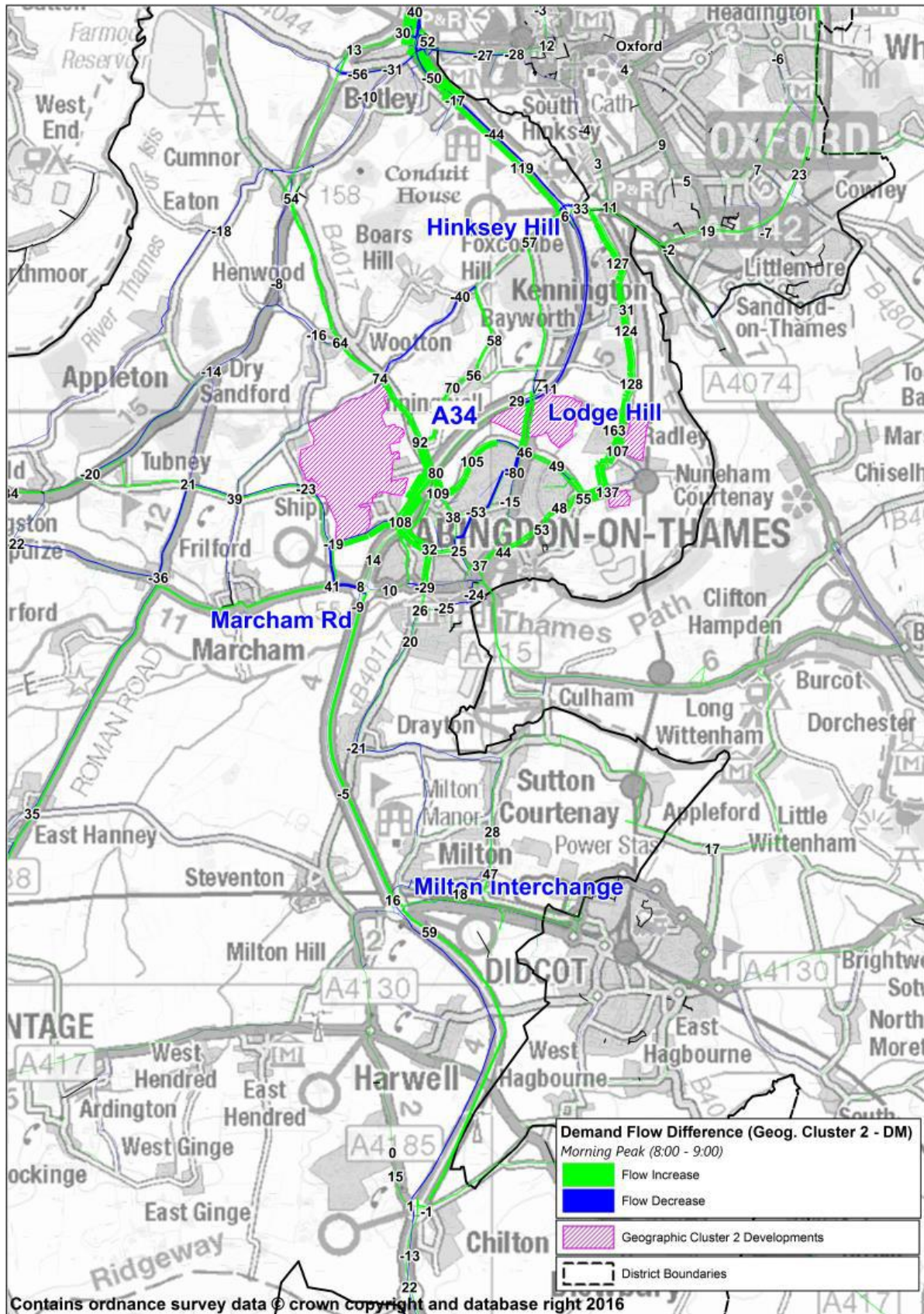
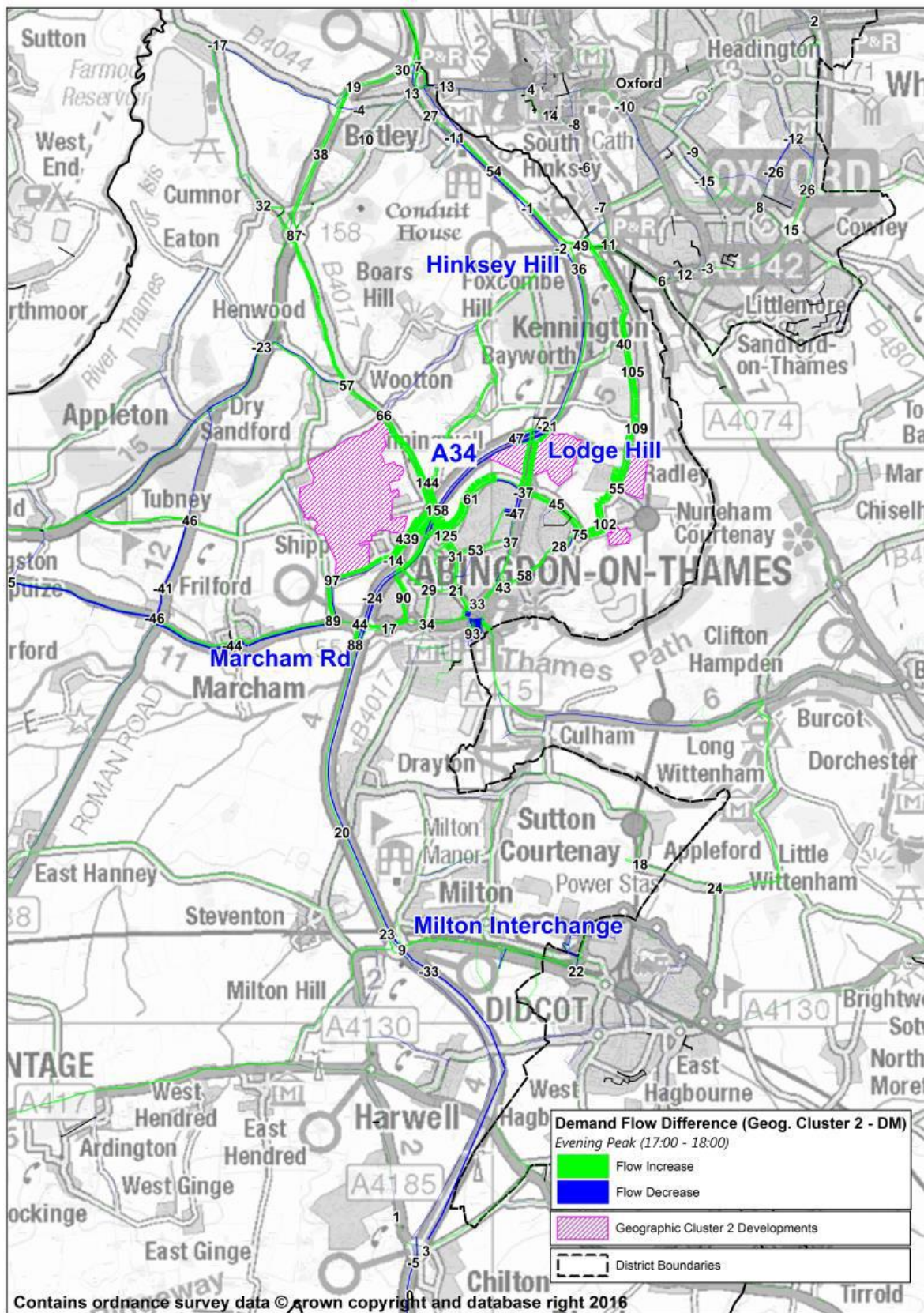


Figure 12 A34 corridor demand flow difference (PCU/hr) – 2031 PM peak hour



7.3.3. Corridor Performance – A34

Cluster 2 includes the additional dwellings along the A34 corridor located at north of Abingdon and Radley, we have analysed changes along this corridor following introduction of this growth as shown in Table 28 and Table 29. In the morning peak hour, the increased level of demand generated by these sites results in increased delays and total travel times while total distance and average speed decrease. In the evening peak, the delay, total time, total distance increase while the average speed is decreasing.

Table 28. Chilton – Hinksey Hill corridor performance in the morning peak hour in 2031

	Chilton - Hinksey		
	Do-Minimum (DM)	Cluster 2 (C2)	Difference (C2 - DM)
Delay (pcu hr)	640	686	7%
Total Time (pcu hr)	3011	3073	2%
Total Distance (pcu km)	191514	192454	0%
Average Speed (km/h)	64	63	-2%

Table 29. Chilton – Hinksey corridor performance in the evening peak hour in 2031

	Chilton - Hinksey		
	Do-Minimum (DM)	Cluster 1 (C1)	Difference (C1 - DM)
Delay (pcu hr)	809	900	11%
Total Time (pcu hr)	3165	3249	3%
Total Distance (pcu km)	192834	192411	0%
Average Speed (km/h)	61	59	-3%

7.3.4. Network Capacity - A34

Figure 13 to Figure 16 present the volume-capacity ratio for links and junctions for Do-Minimum and Cluster 2.

In Do-Minimum scenario, the performance of A34 is as follows:

- In the morning and evening peak hours, sections of A34 in Northbound and Southbound directions from Hinksey Hill to Milton interchange are exceeding capacity.

In Cluster 2, A34 is exceeding the capacity at the following approaches:

- Sections of the A34 in both the Northbound and Southbound directions from Hinksey Hill to Milton interchange are exceeding capacity in the morning peak hour. Due to this there is a reduction of 50pcu in the southbound direction between Botley and Lodge Hill. This reduced traffic is getting re-routed along the local roads namely Kennington Road.
- In the evening peak hour, sections of A34 in Northbound and Southbound directions from Hinksey Hill to Milton interchange are exceeding capacity, the Hinksey Hill junction itself is also exceeding capacity with a V/C of greater than 85%.

Figure 13 A34 corridor V/C for links and junctions– 2031 DM AM peak hour

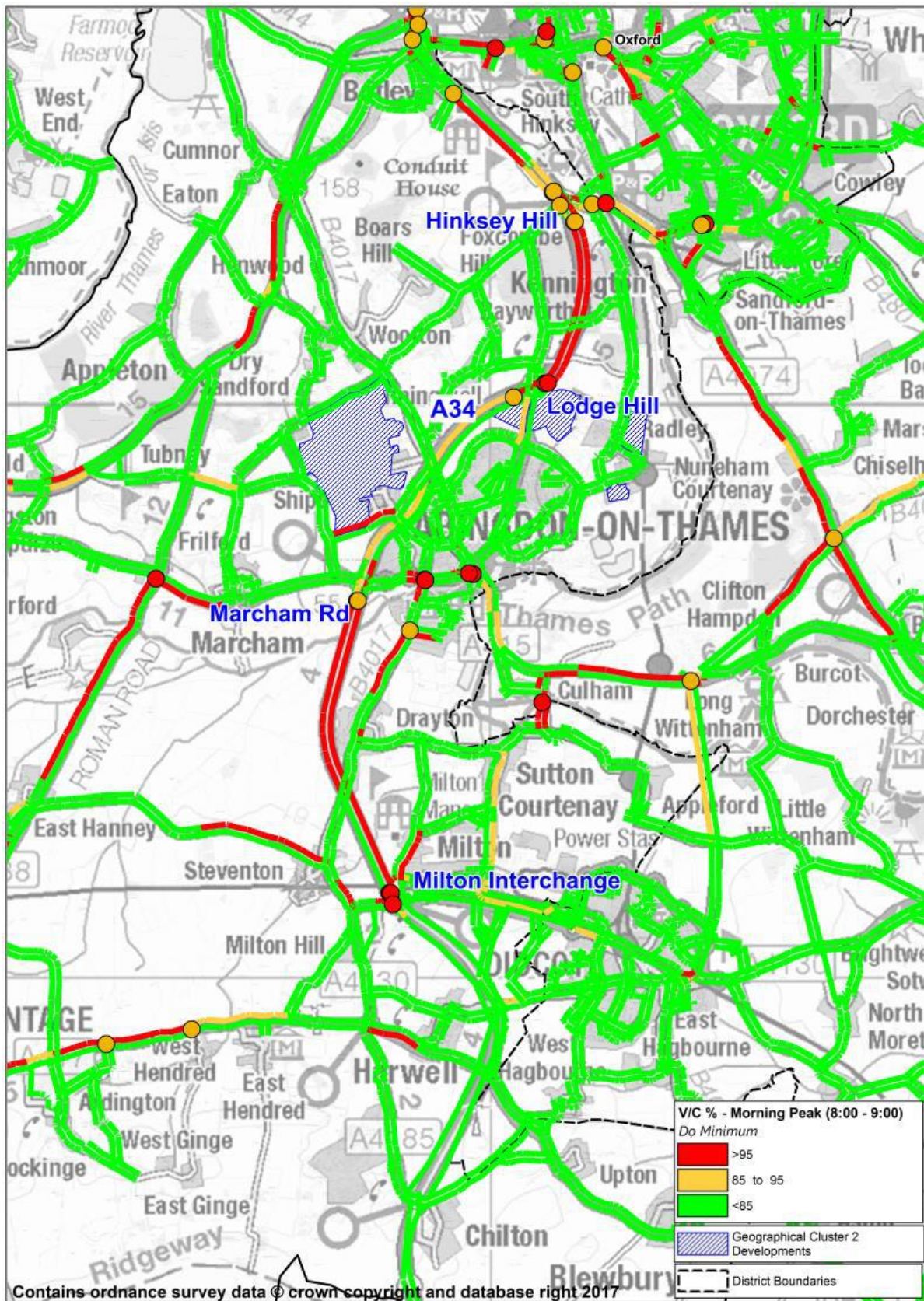


Figure 14 A34 corridor V/C for links and junctions– 2031 DM PM peak hour

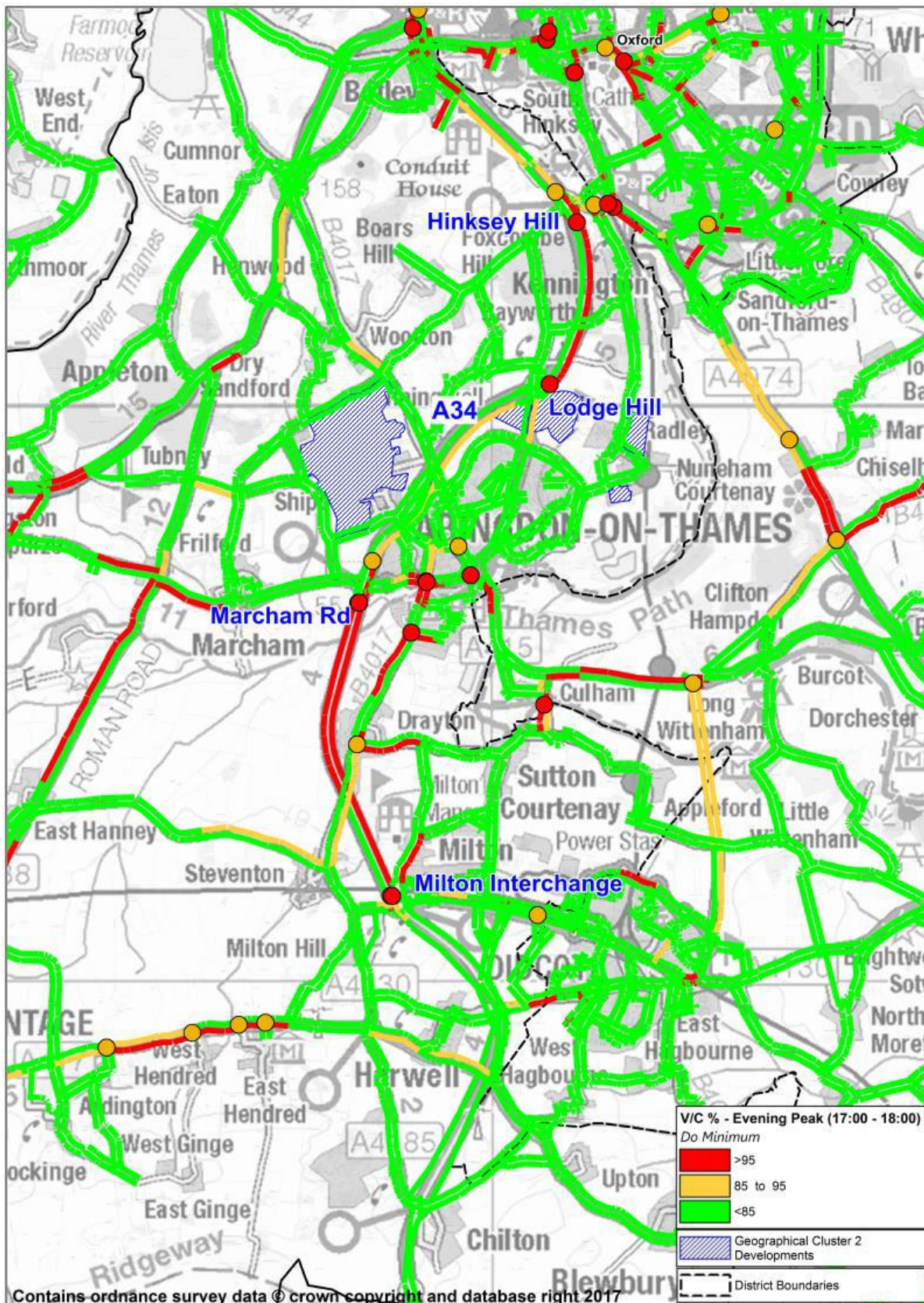


Figure 15 A34 corridor V/C for links and junctions– 2031 Cluster 2 AM peak hour

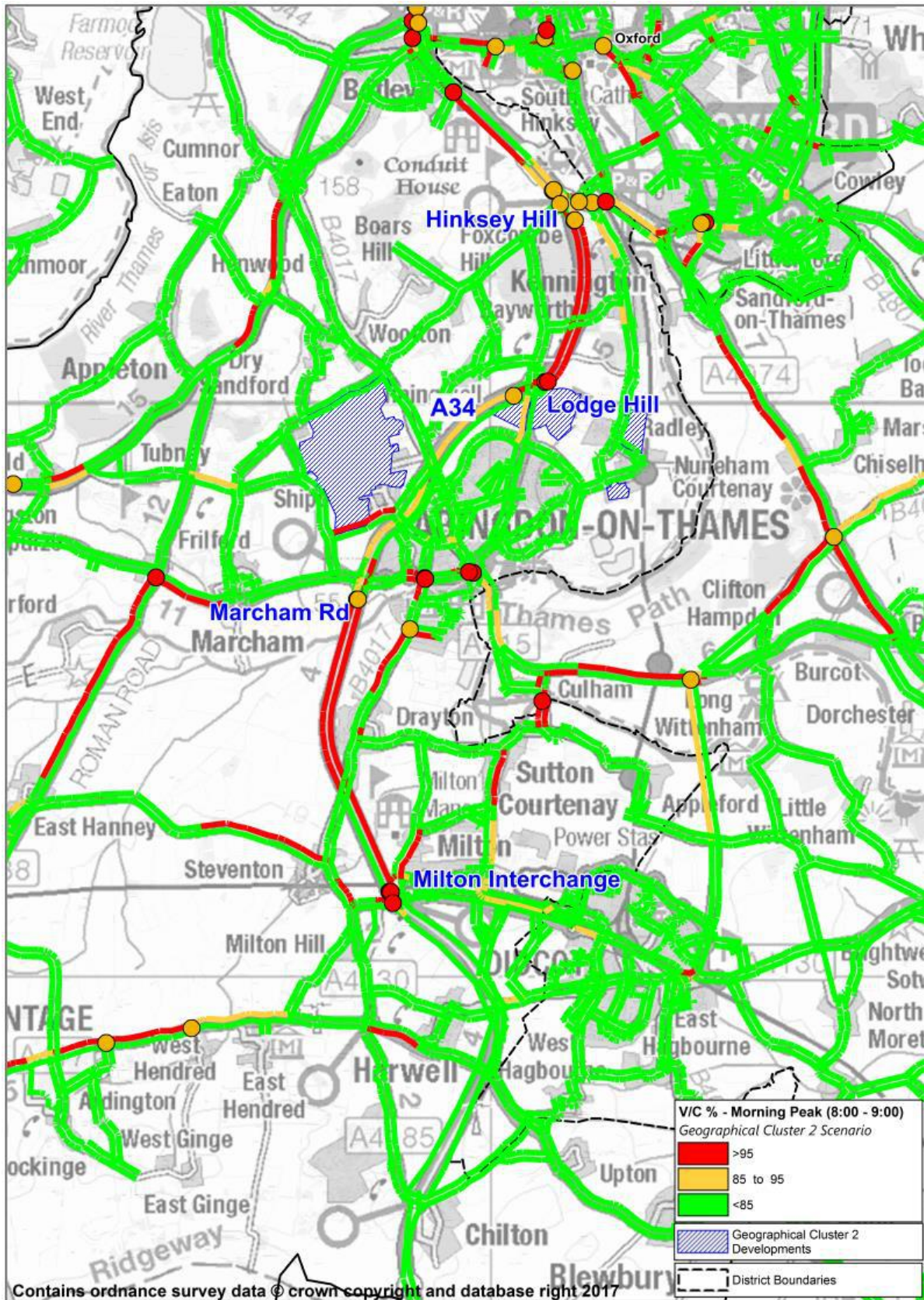
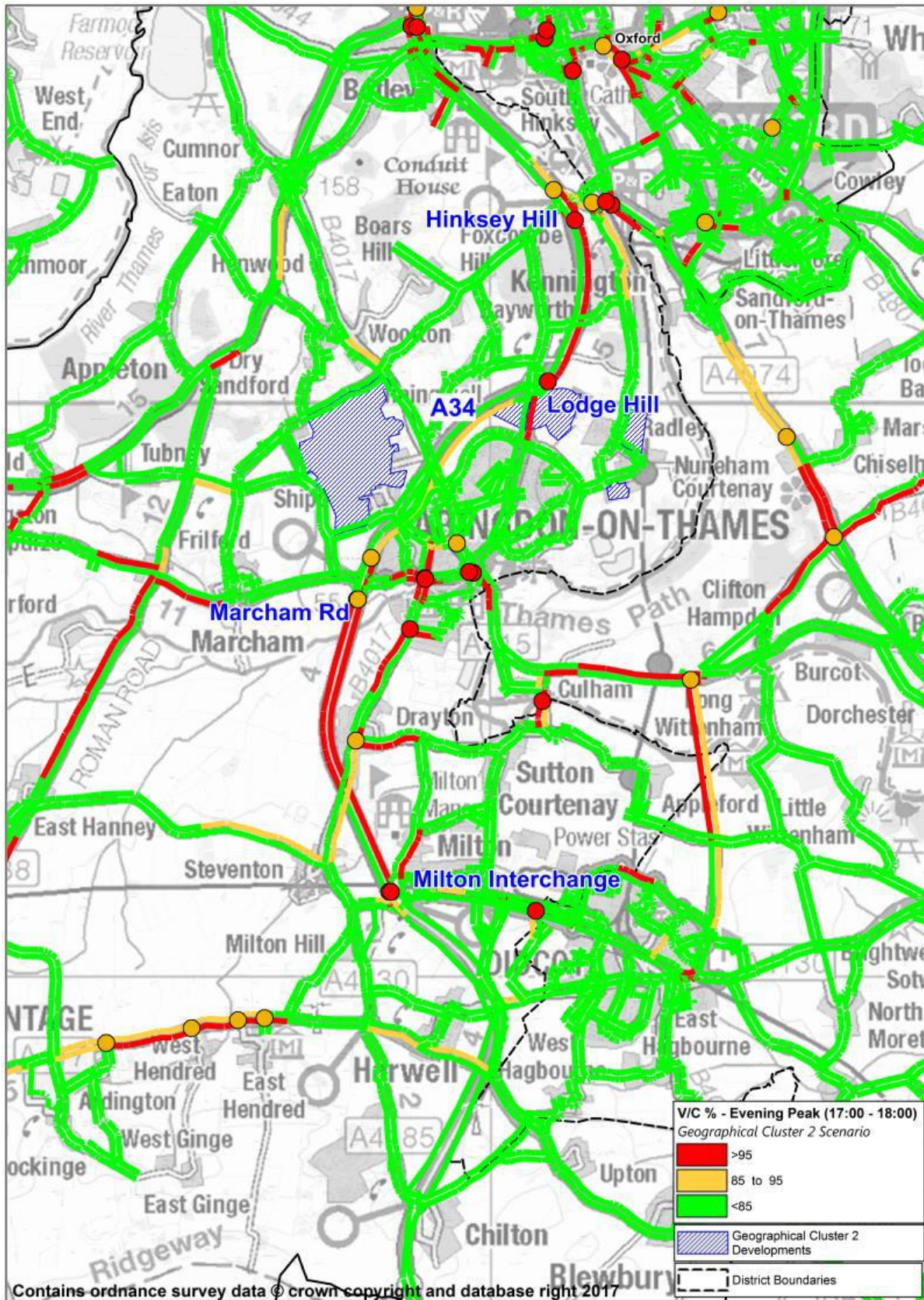


Figure 16 A34 corridor V/C for links and junctions– 2031 Cluster 2 PM peak hour



7.4. Cluster 3

7.4.1. Network Performance

The modelled highway network performance within the Vale of White Horse district for both the Do-Minimum and the Cluster 3 are shown in the Table 30 and Table 31. These statistics give a high-level summary of how the model has responded to the changes in in network and land use assumptions.

The trips generated by the 4,590 additional dwellings are forecast to increase delays, travel times and travel distances within the Vale of White Horse district during the morning and evening peak hours. The average speed is decreasing in the morning and evening peak hours.

Table 30. Vale of White Horse District modelled network performance - morning peak 2031

	Vale of White Horse		
	Do-Minimum (DM)	Cluster 3 (C3)	% Difference (C3-DM)
Delay (pcu hr)	2147	2381	11%
Total Time (pcu hr)	11019	11422	4%
Total Distance (pcu km)	536607	544221	1%
Average Speed (km/h)	49	48	-2%

Table 31. Vale of White Horse District modelled network performance - evening peak 2031

	Vale of White Horse		
	Do-Minimum (DM)	Cluster 3 (C3)	% Difference (C3-DM)
Delay (pcu hr)	3130	3457	10%
Total Time (pcu hr)	12510	13036	4%
Total Distance (pcu km)	563210	571576	1%
Average Speed (km/h)	45	44	-2%

7.4.2. Flow Impacts

The demand flow along B4017 is forecast to increase in the northbound and southbound directions in the range of 50pcu to 100pcu in both morning and evening peak hours. Performance of the B4017 is considered in more detail in Section 11.

Figure 17 and Figure 18 present the demand flow differences between Cluster 3 and Do-Minimum modelled along the A34, B4017 and A415 corridors.

In the AM peak hour, in Cluster 3 the demand flow along A415 is forecast to decrease in the eastbound approach at Frilford junction, eastbound and westbound A415 approaches at the Marcham junction.

The change in flow along A34 between Botley and Milton Interchange is in the range of +/-50pcu while there is an increase of 90pcu in the southbound direction between Milton and Chilton Interchanges.

In the evening peak hour, in Cluster 3 the demand flow along A415 is forecast to decrease in the westbound approach at Frilford junction and eastbound A415 approach at the Marcham junction.

The change in demand flow along A34 is in the range of +/-50pcu.

The demand flow along B4017 is forecast to increase in the northbound and southbound directions in the range of 50pcu to 100pcu in both morning and evening peak hours. Performance of the B4017 is considered in more detail in Section 11.

Figure 17 A34, B4017 and A415 corridor demand flow difference (PCU/hr) – 2031 AM peak hour

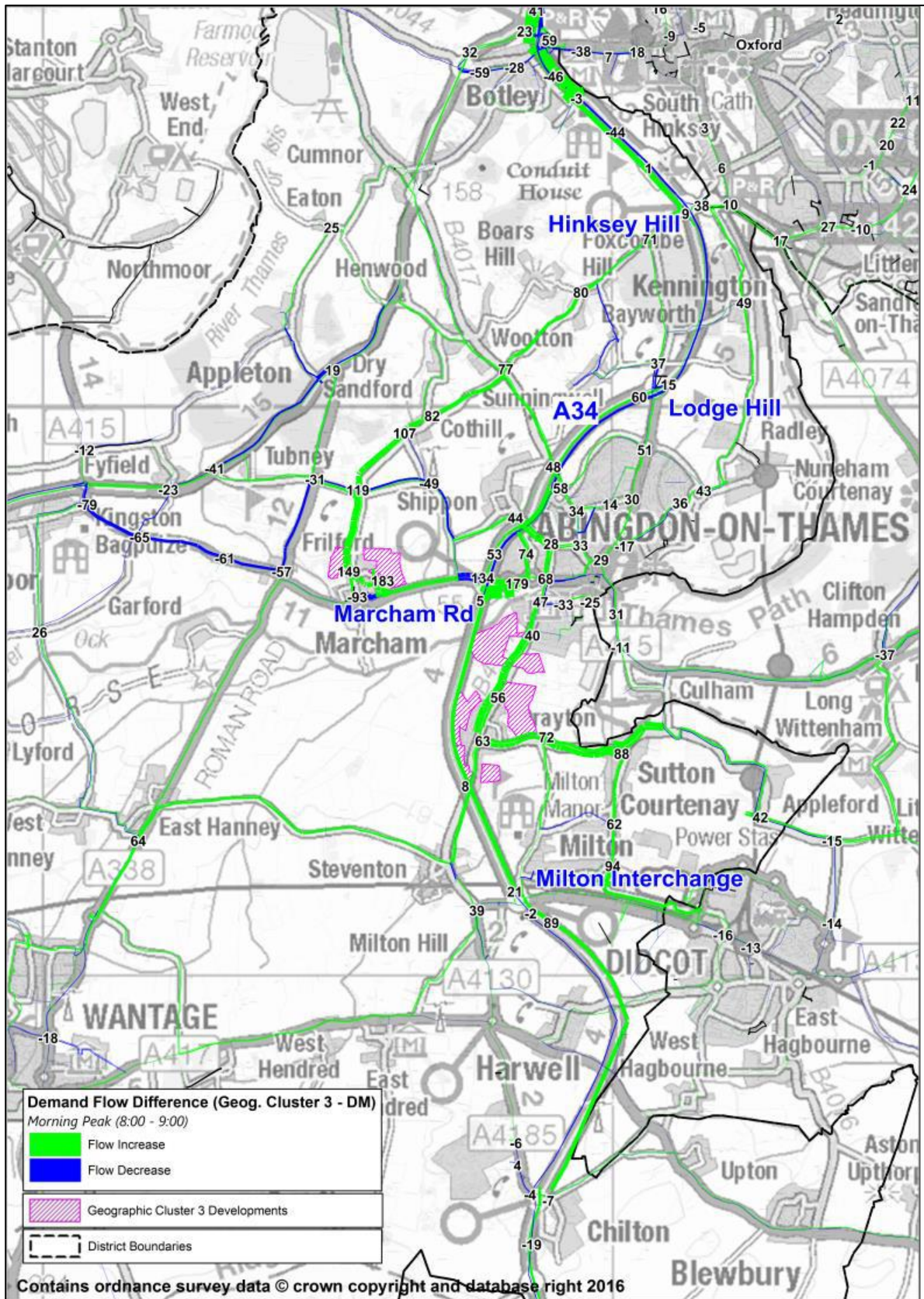
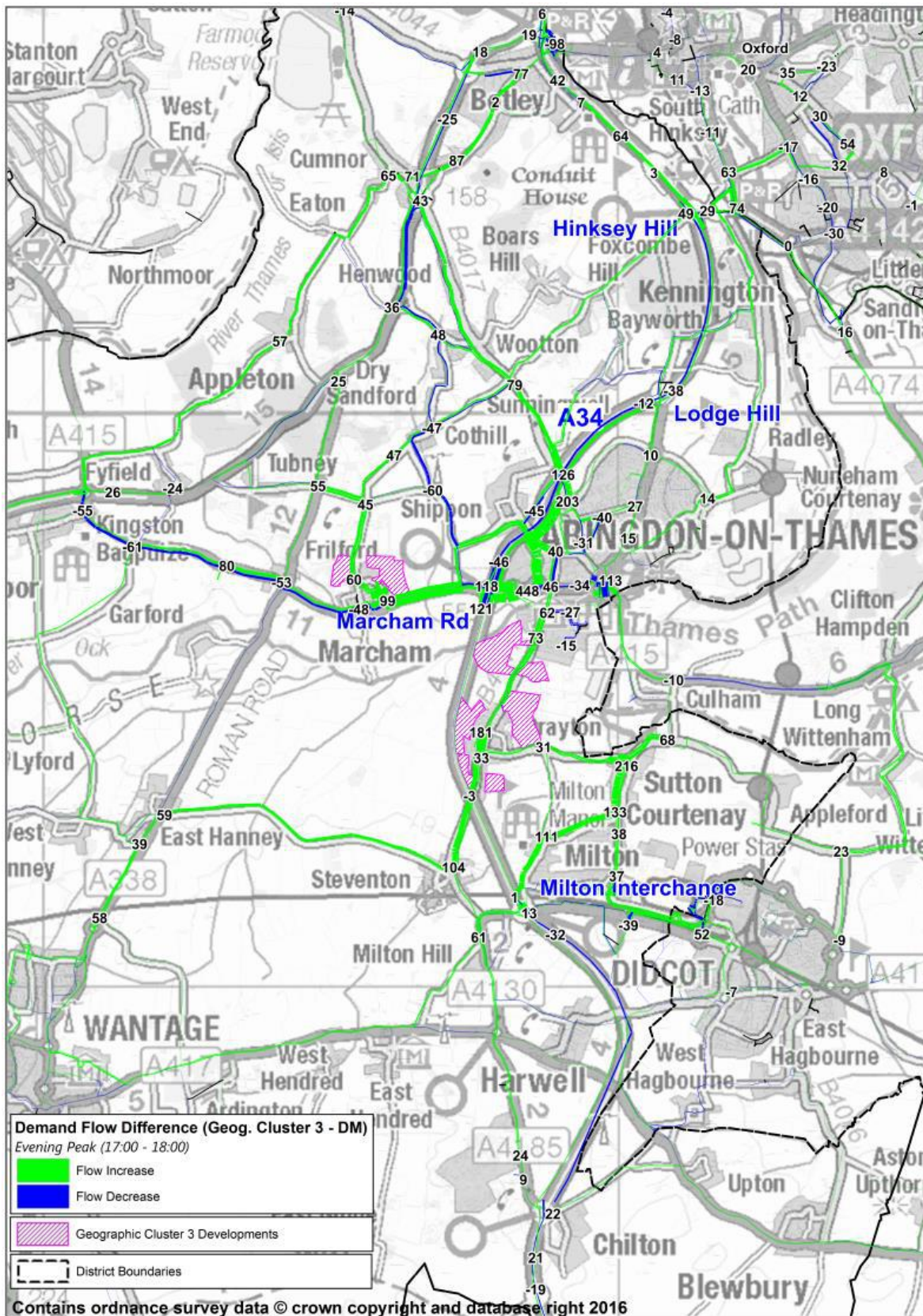


Figure 18 A34, B4017 and A415 corridor demand flow difference (PCU/hr) – 2031 PM peak hour



7.4.3. Corridor Performance – A34, B4017 and A415

Cluster 3 includes the additional dwellings along the A34, B4017 and A415 corridors located at Drayton and Marcham.

7.4.3.1. A34

Along the A34, in the morning peak hour, the increased level of demand generated by these sites results in increased delays and total travel times while the average speed decrease. There is a slight change in total distance which increases by 1%. In the evening peak, the delay, total time increase while the average speed is decreasing. These are presented in Table 32 and Table 33.

Table 32. A34 Chilton – Hinksey Hill corridor performance in the morning peak hour in 2031

	Chilton - Hinksey		
	Do-Minimum (DM)	Cluster 3 (C3)	Difference (C3 - DM)
Delay (pcu hr)	640	694	8%
Total Time (pcu hr)	3011	3085	2%
Total Distance (pcu km)	191514	192951	1%
Average Speed (km/h)	64	63	-2%

Table 33. A34 Chilton – Hinksey corridor performance in the evening peak hour in 2031

	Chilton - Hinksey		
	Do-Minimum (DM)	Cluster 3 (C3)	Difference (C3 - DM)
Delay (pcu hr)	809	923	14%
Total Time (pcu hr)	3165	3285	4%
Total Distance (pcu km)	192834	193309	0%
Average Speed (km/h)	61	59	-3%

7.4.3.2. A415

Along A415, in the morning peak hour, the increased level of demand generated by these sites results in increased delays and total travel times while the average speed decrease as shown in Table 34. In the evening peak, the delay, total time and total distance increase while the average speed is decreasing as shown in Table 35 .

Table 34. A415 from A420 to Abingdon corridor performance in the morning peak hour in 2031

	A420 - Abingdon		
	Do-Minimum (DM)	Cluster 3 (C3)	Difference (C3 - DM)
Delay (pcu hr)	257	306	19%
Total Time (pcu hr)	580	625	8%
Total Distance (pcu km)	15849	15911	0%
Average Speed (km/h)	27	25	-7%

Table 35. A415 from A420 to Abingdon corridor performance in the evening peak hour in 2031

	A420 - Abingdon		
	Do-Minimum (DM)	Cluster 3 (C3)	Difference (C3 - DM)
Delay (pcu hr)	383	458	20%
Total Time (pcu hr)	681	767	13%
Total Distance (pcu km)	15609	16182	4%
Average Speed (km/h)	23	21	-9%

7.4.3.3. B4017

Along B4017, in the morning peak hour, the increased level of demand generated by these sites results in increased delays, total distance and total travel times while the average speed decrease as shown in Table 36. In the evening peak, the delay, total time and total distance increase while the average speed is decreasing as shown in Table 35 .

Table 36. B4017 from Steventon to Abingdon corridor performance in the morning peak hour in 2031

	Steventon - Abingdon		
	Do-Minimum (DM)	Cluster 3 (C3)	Difference (C3 - DM)
Delay (pcu hr)	107	147	37%
Total Time (pcu hr)	287	345	20%
Total Distance (pcu km)	7459	8058	8%
Average Speed (km/h)	26	23.3	-10%

Table 37. B4017 from Steventon to Abingdon corridor performance in the evening peak hour in 2031

	Steventon - Abingdon		
	Do-Minimum (DM)	Cluster 3 (C3)	Difference (C3 - DM)
Delay (pcu hr)	141	234	66%
Total Time (pcu hr)	340	451	33%
Total Distance (pcu km)	8050	8668	8%
Average Speed (km/h)	23.7	19.2	-19%

7.4.4. Network Capacity – B4017, A415 and A34

Figure 19 to Figure 22 present the volume-capacity ratio for links and junctions for Do-Minimum and Cluster 3.

7.4.4.1. Do minimum

In Do-Minimum scenario, the performance of A34 and A415 is as follows:

7.4.4.1.1. A415

- In the morning peak hour, Frilford Road westbound, the eastbound slip at the Marcham junction, the eastbound and westbound approaches at A415/Spring Road junction are modelled to exceed capacity.
- In the evening peak hour, Frilford road westbound and eastbound directions, eastbound slip at Marcham junction, eastbound and westbound approaches at A415/Spring Road junction are exceeding capacity.

7.4.4.1.2. A34

- In the morning peak hour, sections of A34 in northbound and southbound directions between Milton and Marcham, northbound direction between Marcham and Lodge Hill, northbound and southbound directions between Lodge Hill and Botley Interchange are modelled to exceed capacity.
- In the evening peak hour, sections of A34 in northbound and southbound directions between Milton and Marcham, southbound direction between Marcham and Lodge Hill, northbound and southbound directions between Lodge Hill and Botley Interchange are again forecast to exceed capacity.

7.4.4.1.3. B4017

- In the morning peak hour, northbound and southbound directions at B4017/Drayton Road junction and northbound at B4017/Marcham Road junction are modelled to exceed capacity.
- In the evening peak hour, southbound direction at B4017/Drayton Road junction, northbound and southbound directions at B4017/Marcham Road junction are modelled to exceed capacity.

7.4.4.2. Cluster 3

In Cluster 3, the performance of A34, B4017 and A415 is as follows:

7.4.4.2.1. A415

- In the morning peak hour, there is a reduction of 70 PCUs along A415 from A420 to Frilford Road, nearly 100 PCUs on eastbound slip at Marcham junction. This is due to the reduction of volume-capacity ratio along these links in Cluster 3 compared to Do-Minimum scenario.
- In the evening peak hour, there is a reduction of 60 PCUs along A415 from Frilford Road to A420, nearly 44 PCUs on eastbound slip at Marcham junction and 60 PCUs on westbound A415 at Abingdon.

7.4.4.2.2. A34

- In the morning peak hour, there is a reduction of nearly 50 PCUs in the southbound direction from Botley Interchange to Marcham junction.
- In the evening peak hour, there is a reduction of nearly 40 PCUs in the northbound direction from Marcham junction to Hinksey Hill.

Figure 19 A34 and A415 corridor V/C for links and junctions– 2031 DM AM peak hour

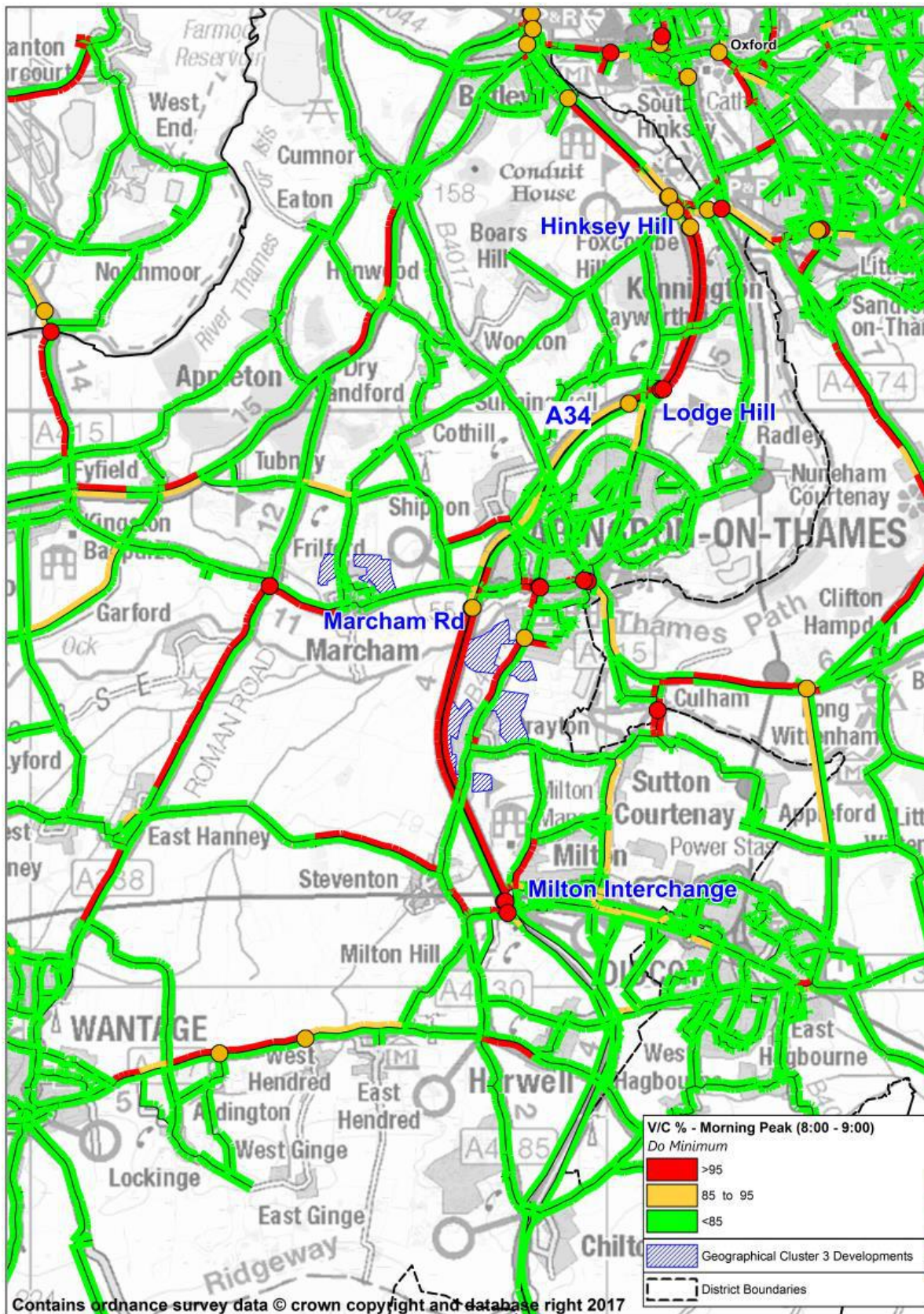


Figure 20 A34 and A415 corridor V/C for links and junctions– 2031 DM PM peak hour

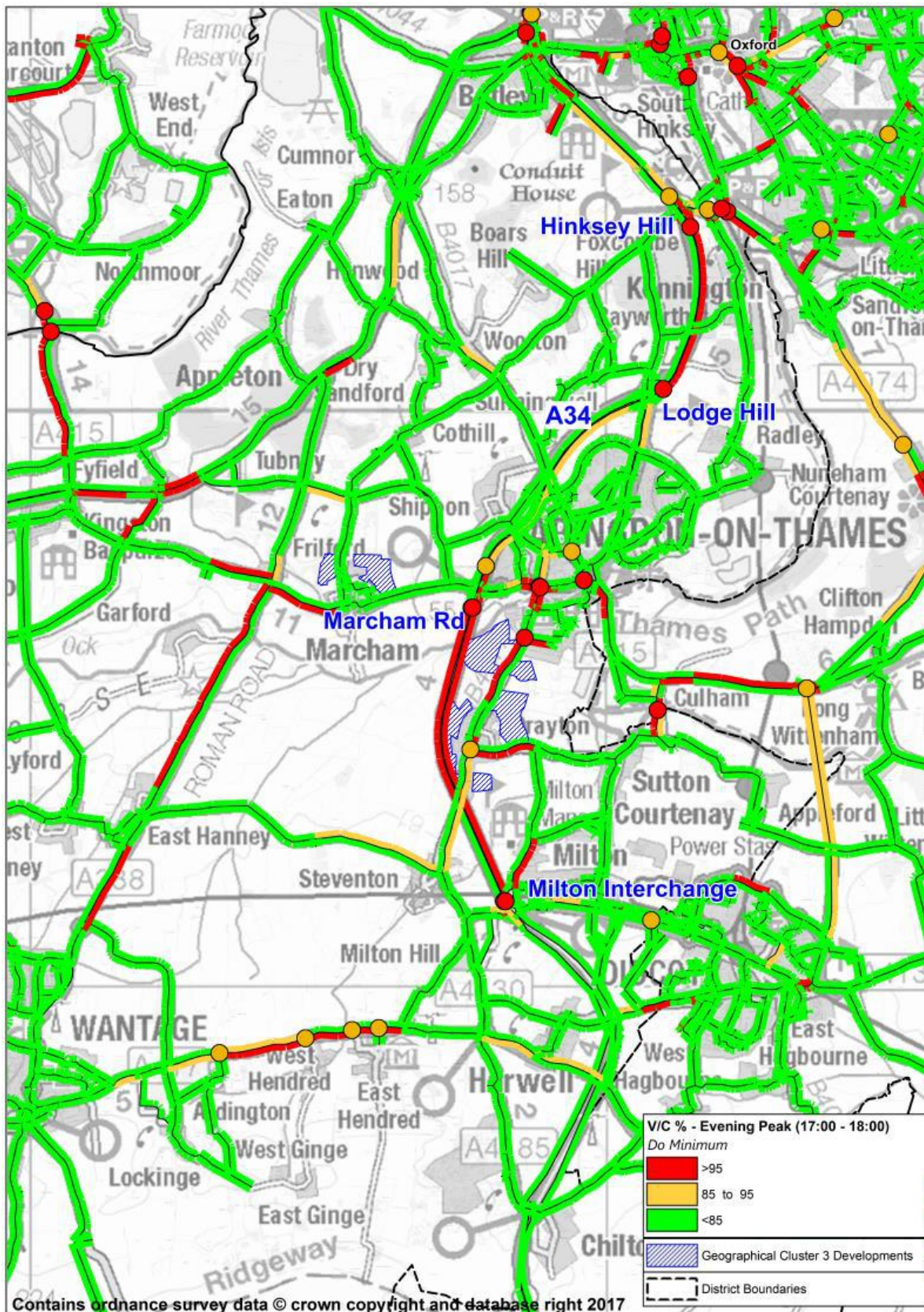


Figure 21 A34 and A415 corridor V/C for links and junctions– 2031 Cluster 3 AM peak hour

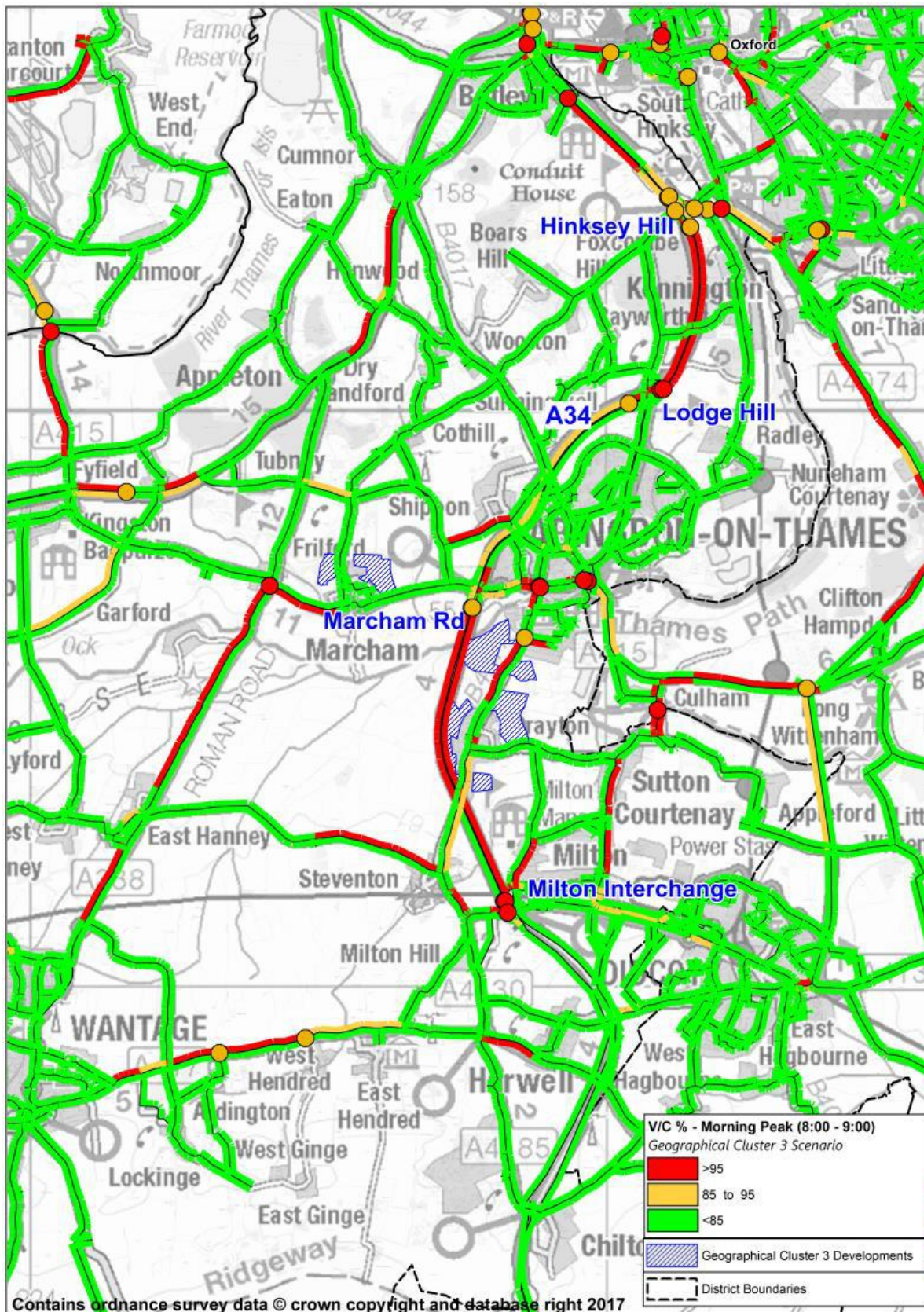
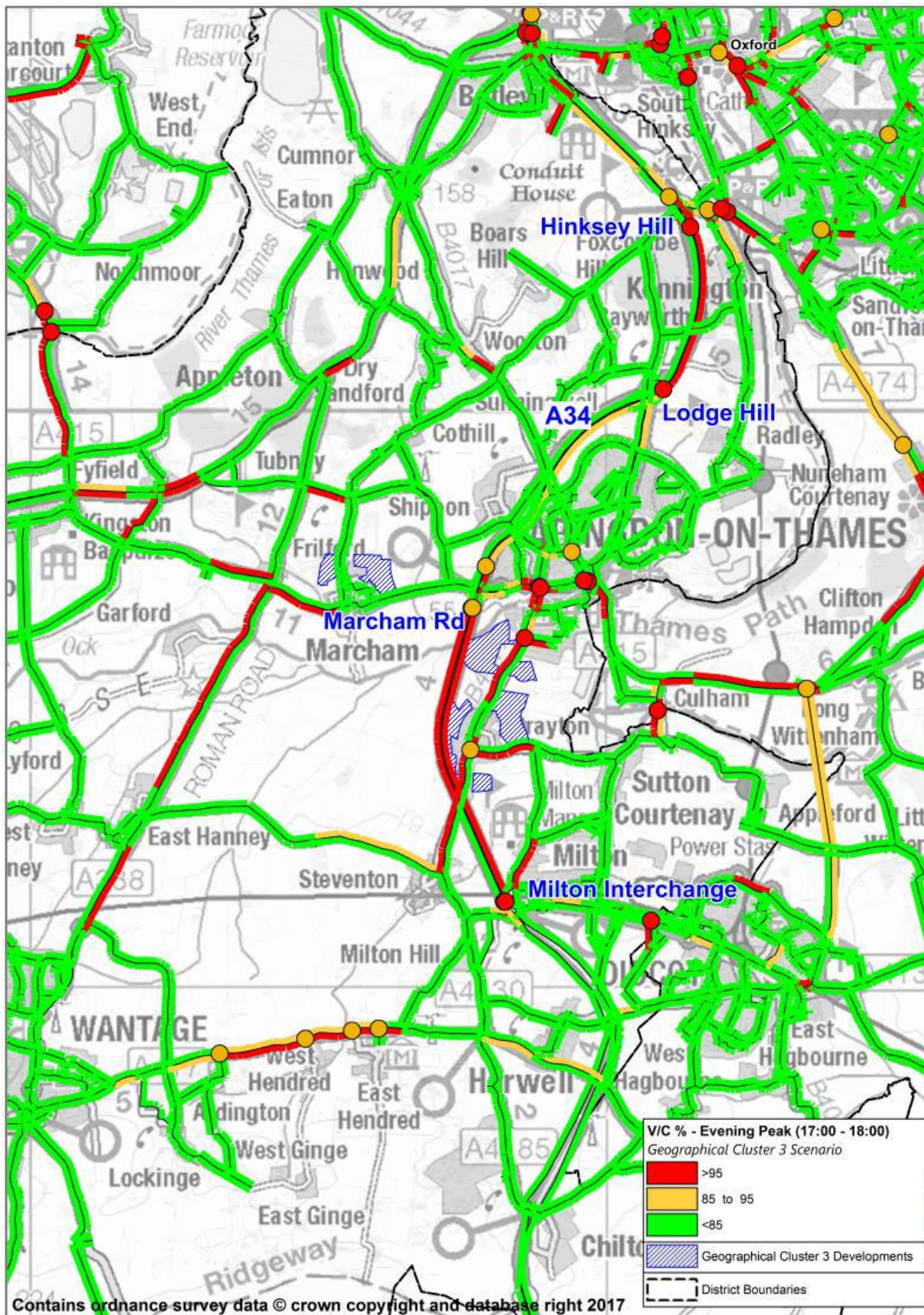


Figure 22 A34 and A415 corridor V/C for links and junctions– 2031 Cluster 3 PM peak hour



7.5. Cluster 4

7.5.1. Network Performance

The modelled highway network performance within the Vale of White Horse district for both the Do-Minimum and the Cluster 4 are shown in the Table 38 and Table 39. These statistics give a high-level summary of how the model has responded to the changes in in network and land use assumptions.

The trips generated by the 2,200 additional dwellings are forecast to increase delays, travel times and travel distances within the Vale of White Horse district during the morning and evening peak hours. The average speed is decreasing in the morning peak hour with no change in the evening peak hours.

Table 38. Vale of White Horse District modelled network performance - morning peak 2031

	Vale of White Horse		
	Do-Minimum (DM)	Cluster 4 (C4)	% Difference (C4-DM)
Delay (pcu hr)	2147	2196	2%
Total Time (pcu hr)	11019	11120	1%
Total Distance (pcu km)	536607	539296	1%
Average Speed (km/h)	49	48	-2%

Table 39. Vale of White Horse District modelled network performance - evening peak 2031

	Vale of White Horse		
	Do-Minimum (DM)	Cluster 4 (C4)	% Difference (C4-DM)
Delay (pcu hr)	3130	3201	2%
Total Time (pcu hr)	12510	12656	1%
Total Distance (pcu km)	563210	566436	1%
Average Speed (km/h)	45	45	0%

7.5.2. Flow Impacts

Figure 23 and Figure 24 present the demand flow difference between Cluster 4 and Do-Minimum modelled along the A34 and A4130 corridors.

In the AM peak hour, in Cluster 4 the demand flow along A4130 is increasing in both the eastbound and westbound approaches. The change in demand flow along A34 between Chilton and Botley Interchange is in the range of +/-50pcu.

In the evening peak hour, in Cluster 4 the demand flow along A4130 is increasing in both the eastbound and westbound approaches. The change in demand flow along A34 is in the range of +/-50pcu.

Figure 23 A34 and A4130 corridor demand flow difference (PCU/hr) – 2031 AM peak hour

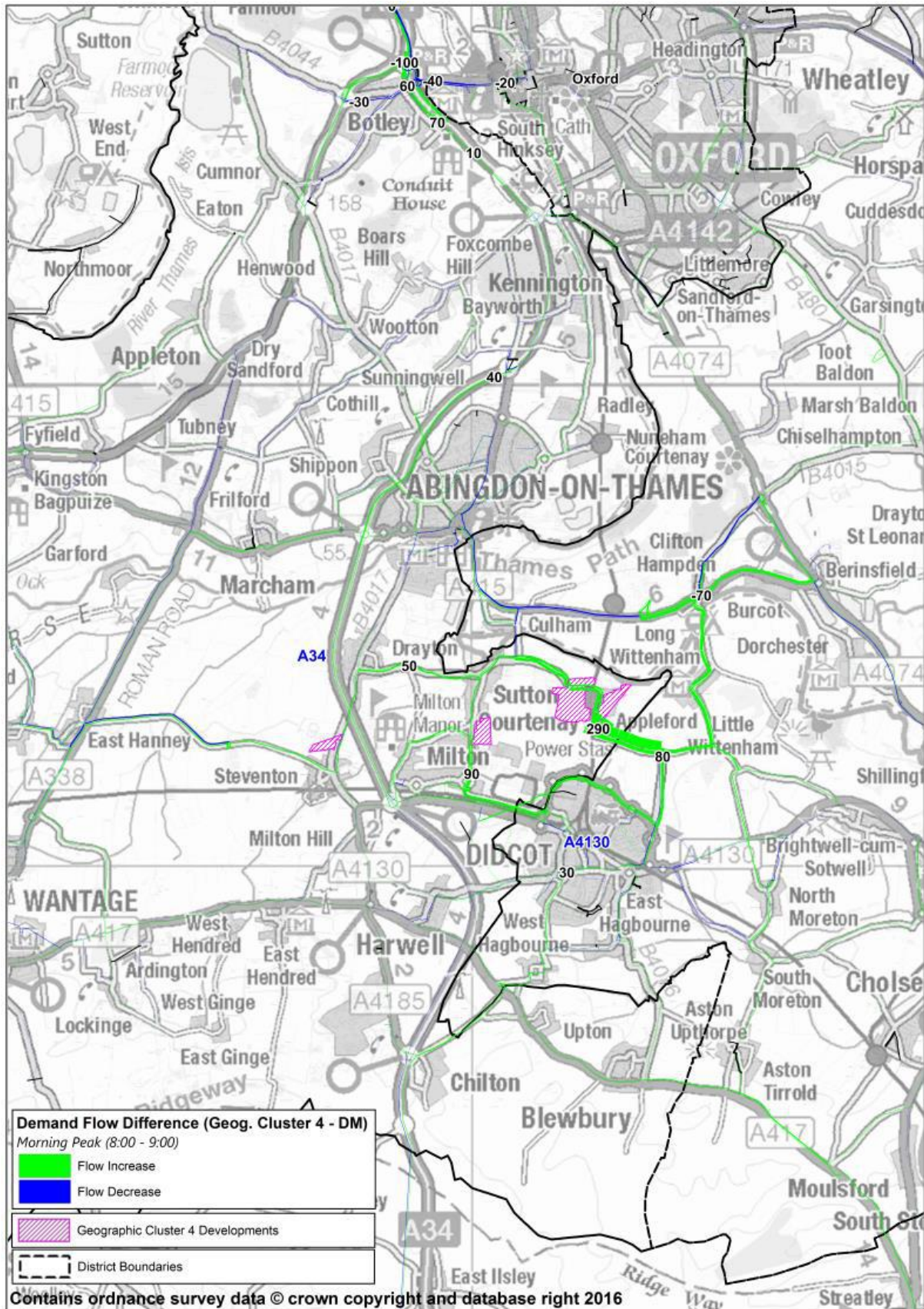
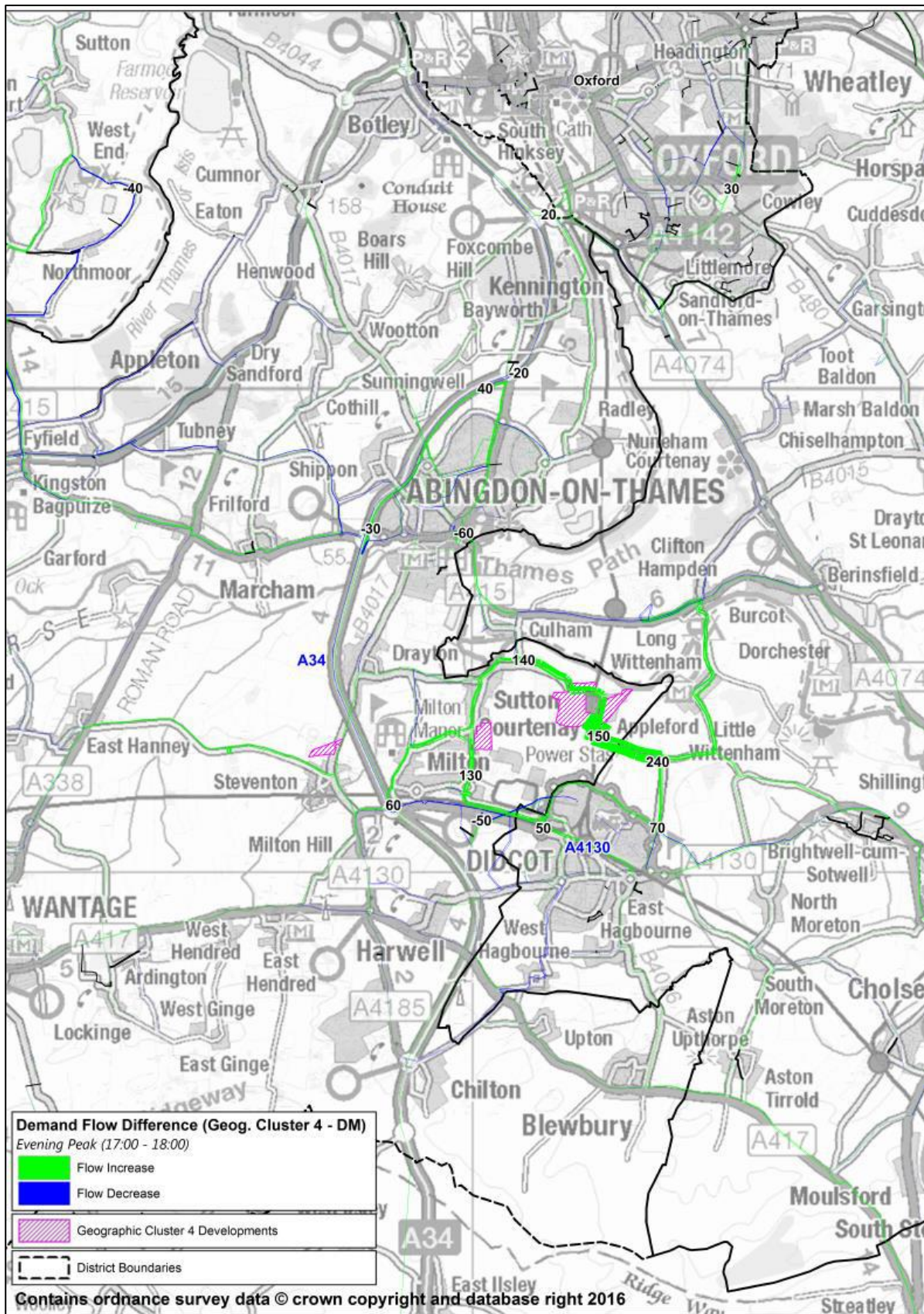


Figure 24 A34 and A4130 corridor demand flow difference (PCU/hr) – 2031 PM peak hour



7.5.3. Corridor Performance – A34 and A4130

Cluster 4 includes additional dwellings along the A34 and A4130 corridor located at Steventon and Appleford.

7.5.3.1. A34

Along the A34, in the morning peak hour, the increased level of demand generated by these sites is modelled to result in increased delays and total travel times while the average speed decreases. There is a slight increase in total distance. In the evening peak, the delay, total time increase while the average speed is decreasing as shown in Table 40 and Table 41.

Table 40. A34 Chilton – Hinksey Hill corridor performance in the morning peak hour in 2031

	Chilton - Hinksey		
	Do-Minimum (DM)	Cluster 4 (C4)	Difference (C4 - DM)
Delay (pcu hr)	640	662	3%
Total Time (pcu hr)	3011	3040	1%
Total Distance (pcu km)	191514	192117	0%
Average Speed (km/h)	64	63	-2%

Table 41. A34 Chilton – Hinksey corridor performance in the evening peak hour in 2031

	Chilton - Hinksey		
	Do-Minimum (DM)	Cluster 4 (C4)	Difference (C4 - DM)
Delay (pcu hr)	809	845	4%
Total Time (pcu hr)	3165	3207	1%
Total Distance (pcu km)	192834	193271	0%
Average Speed (km/h)	61	60	-2%

7.5.3.2. A4130

Along the A4130, in the morning peak hour, Table 42, the increased level of demand generated by these sites is likely to result in increased delays and total travel times while the average speeds decrease. In the evening peak, Table 43, the delay, total time and total distance increase while the average speed is modelled to remain the same.

Table 42. A4130 from Rowstock to Didcot corridor performance in the morning peak hour in 2031

	Rowstock to Didcot		
	Do-Minimum (DM)	Cluster 4 (C4)	Difference (C4 - DM)
Delay (pcu hr)	194	207	7%
Total Time (pcu hr)	571	591	4%
Total Distance (pcu km)	20771	21118	2%
Average Speed (km/h)	36	36	0%

Table 43. A4130 from Rowstock to Didcot corridor performance in the evening peak hour in 2031

	Rowstock to Didcot		
	Do-Minimum (DM)	Cluster 4 (C4)	Difference (C4 - DM)
Delay (pcu hr)	210	223	6%
Total Time (pcu hr)	594	614	3%
Total Distance (pcu km)	21525	21802	1%
Average Speed (km/h)	36	35	-3%

7.5.4. Network Capacity - A34 and A4130

Figure 25 to Figure 28 present the volume-capacity ratio for links and junctions for Do-Minimum and Cluster 4.

7.5.4.1. Do minimum

In Do-Minimum scenario, the performance of A34 and A4130 is as follows:

7.5.4.1.1. A4130

- In the morning peak hour, A4130 eastbound at A34 junction, A4130 eastbound approach at B4493 roundabout are exceeding capacity.
- In the evening peak hour, A4130 eastbound at A34 junction, A4130 eastbound approach at B4493 roundabout are exceeding capacity.

7.5.4.1.2. A34

- In the morning peak hour, sections of A34 in northbound and southbound directions between Milton and Marcham, northbound direction between Marcham and Lodge Hill, northbound and southbound directions between Lodge Hill and Botley Interchange are exceeding capacity.
- In the evening peak hour, sections of A34 in northbound and southbound directions between Milton and Marcham, southbound direction between Marcham to Lodge Hill and Lodge Hill to Botley Interchange are exceeding capacity.

7.5.4.2. Cluster 4

In Cluster 4, the performance of A34 and A415 is as follows:

7.5.4.2.1. A4130

- In the morning and evening peak hours, similar to Do-Minimum scenario A4130 eastbound at A34 junction, A4130 eastbound approach at B4493 roundabout are exceeding capacity.

7.5.4.2.2. A34

- In the morning and evening peak hours, the volume-capacity ratios are similar to Do-Minimum scenario and there is no significant reduction of flows along this corridor.

Figure 25 A34 and A4130 corridor V/C for links and junctions– 2031 DM AM peak hour

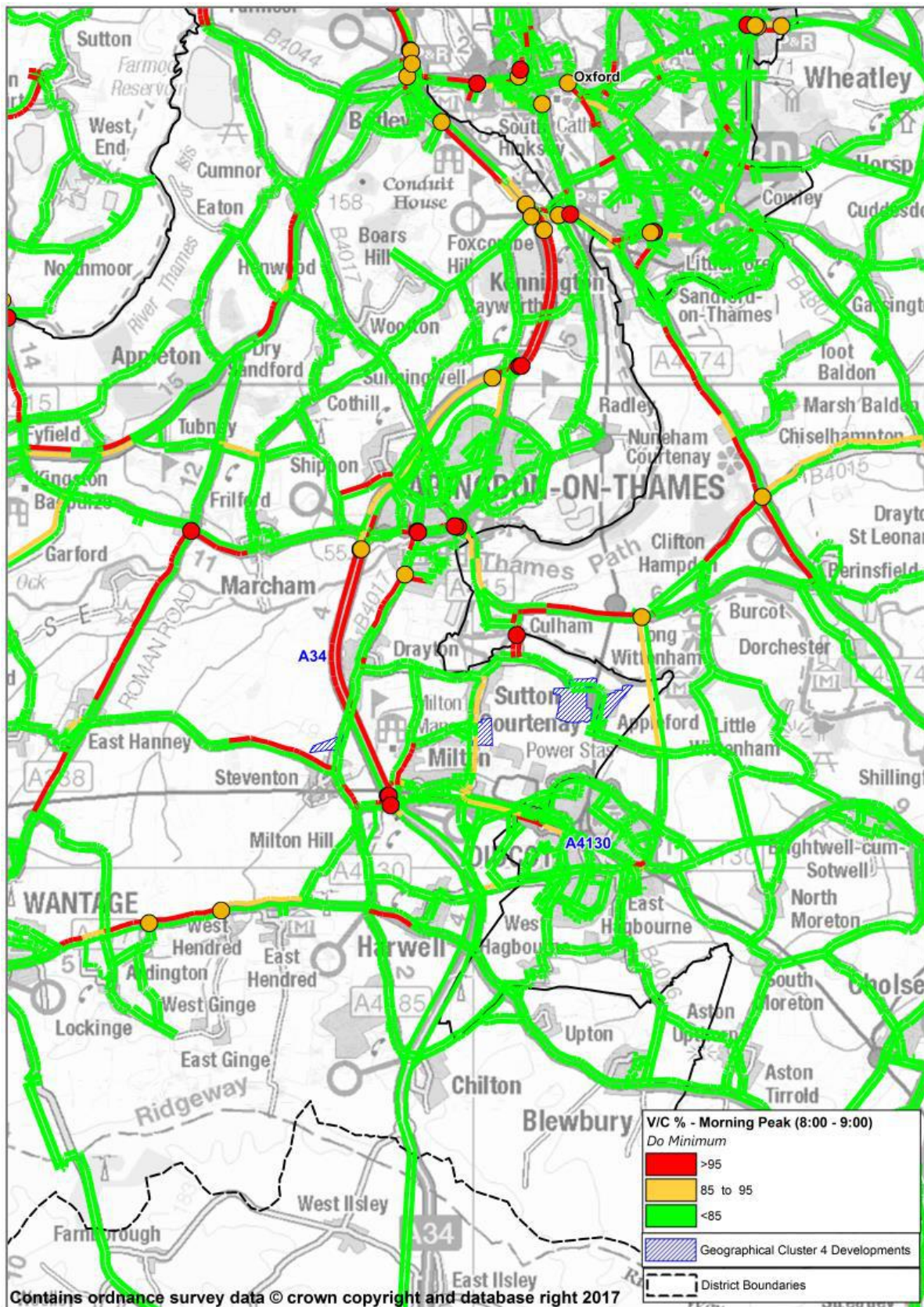


Figure 26 A34 and A4130 corridor V/C for links and junctions– 2031 DM PM peak hour

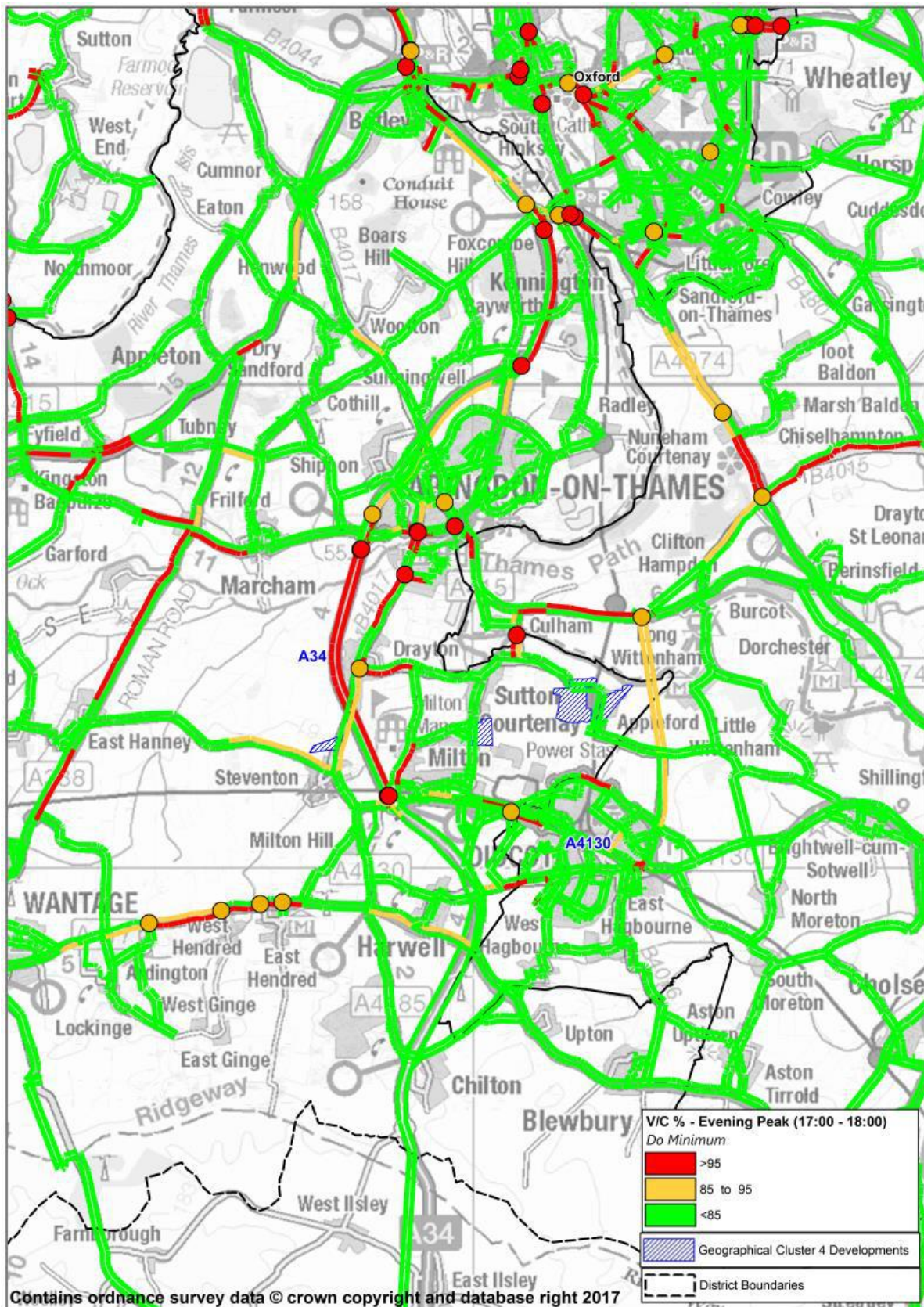


Figure 27 A34 and A4130 corridor V/C for links and junctions– 2031 Cluster 4 AM peak hour

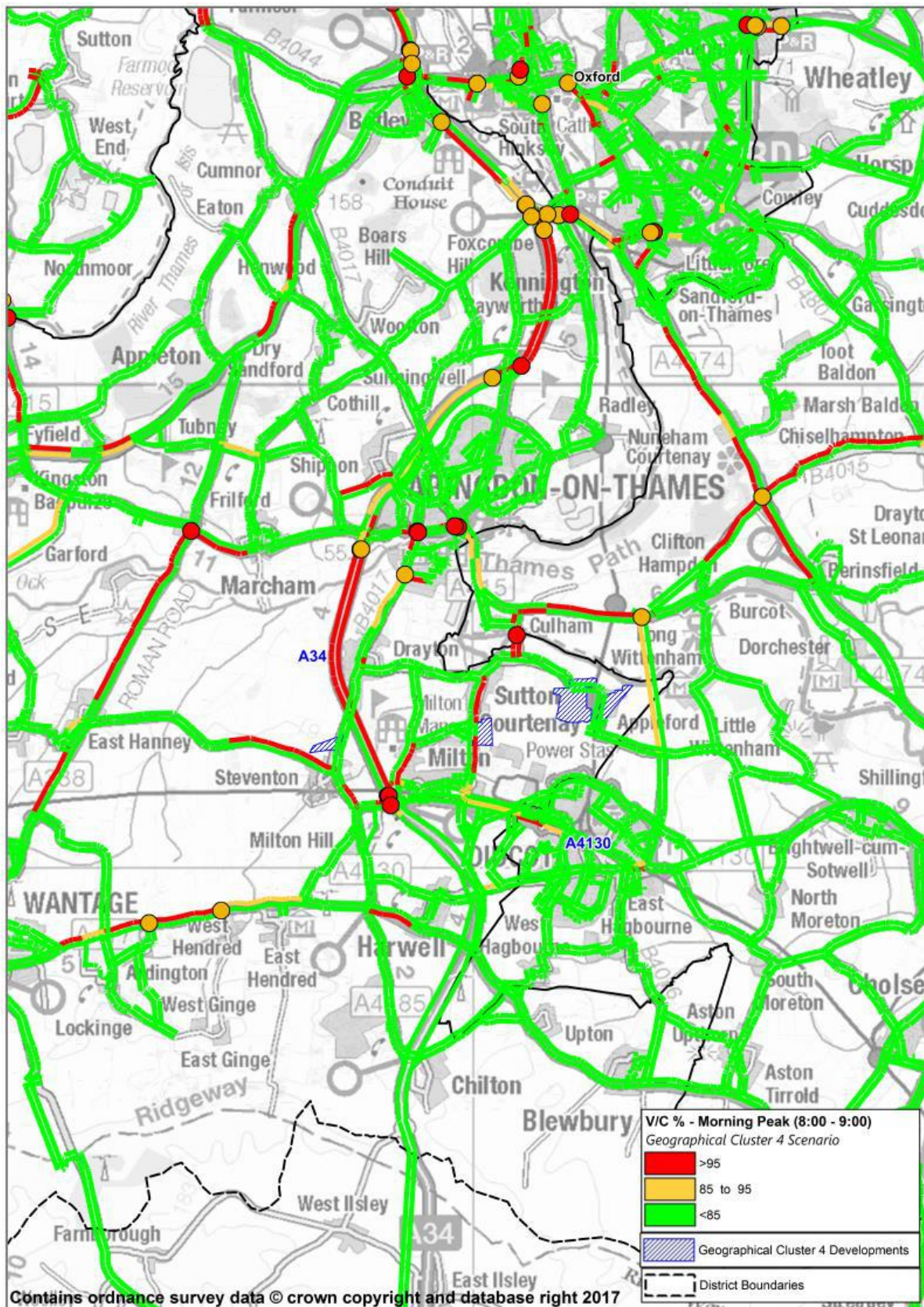
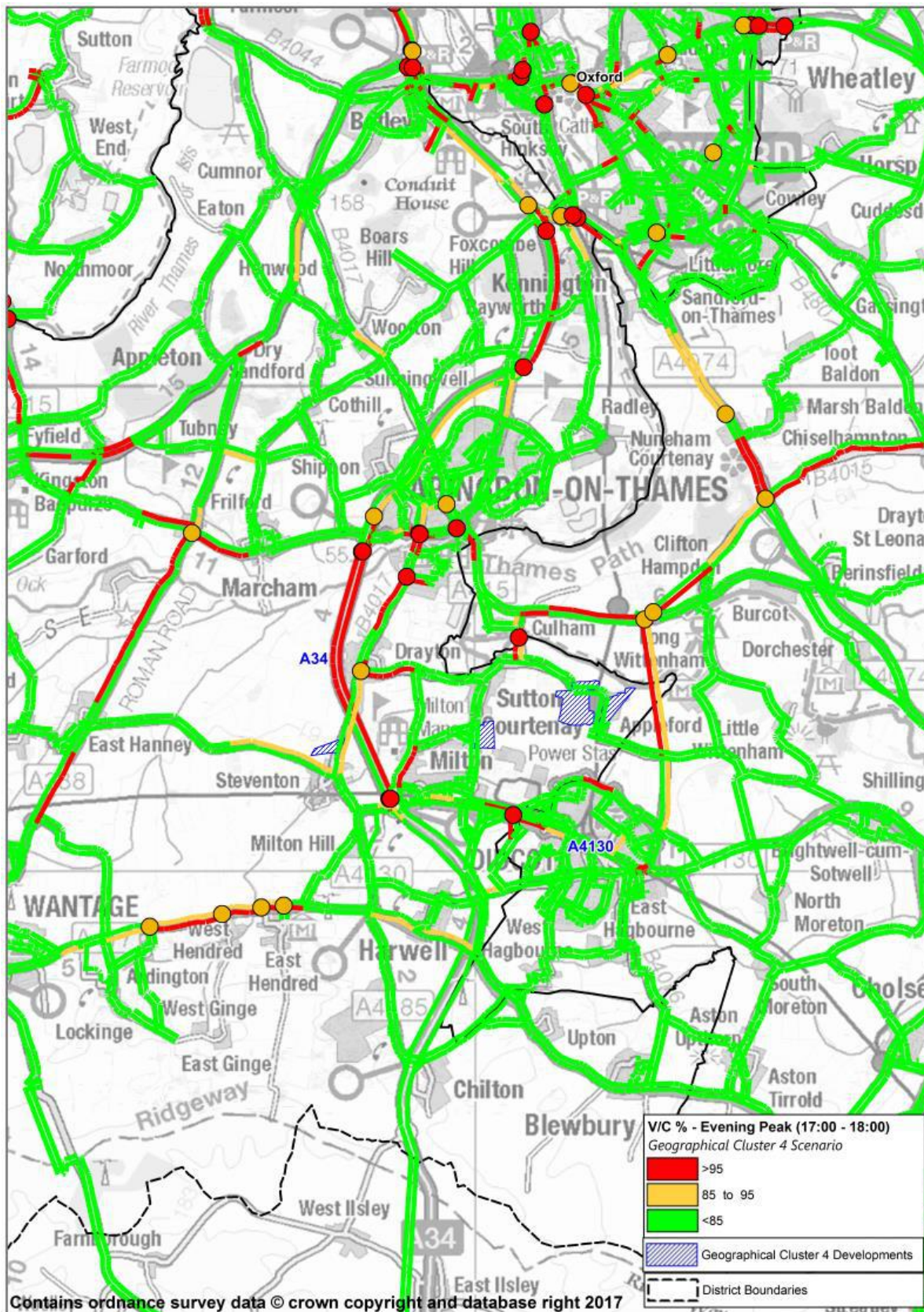


Figure 28 A34 and A4130 corridor V/C for links and junctions– 2031 Cluster 4 PM peak hour



7.6. Cluster 5

7.6.1. Network Performance

The modelled highway network performance within the Vale of White Horse district for both the Do-Minimum and the Cluster 5 are shown in the Table 44 and Table 45. These statistics give a high-level summary of how the model has responded to the changes in in network and land use assumptions.

The 4,600 additional dwellings are forecast to raise the number of trips generated which as a result is modelled to increase delays, travel times and travel distances within the Vale of White Horse district during the morning and evening peak hours. The average speed is decreasing in the morning and evening peak hours.

Table 44. Vale of White Horse District modelled network performance - morning peak 2031

	Vale of White Horse		
	Do-Minimum (DM)	Cluster 5 (C5)	% Difference (C5-DM)
Delay (pcu hr)	2147	2351	10%
Total Time (pcu hr)	11019	11405	4%
Total Distance (pcu km)	536607	545239	2%
Average Speed (km/h)	49	48	-2%

Table 45. Vale of White Horse District modelled network performance - evening peak 2031

	Vale of White Horse		
	Do-Minimum (DM)	Cluster 5 (C5)	% Difference (C5-DM)
Delay (pcu hr)	3130	3311	6%
Total Time (pcu hr)	12510	12891	3%
Total Distance (pcu km)	563210	571782	2%
Average Speed (km/h)	45	44	-2%

7.6.2. Flow Impacts

Figure 29 and Figure 30 present the demand flow difference between Cluster 5 and Do-Minimum modelled along the A34, A417, A4130 and A4185 corridors.

In the AM peak hour, in Cluster 5 the demand flow along A4130 is decreasing in both the eastbound and westbound approaches between Milton and B4493. On Featherbed Lane the demand flow in northbound direction is forecast to decrease by 200pcu due to increased delay at Steventon Hill junction. Figure 29 suggests a forecast increase in flow along A4130 between Rowstock and Milton Hill, this is associated with a modelled increase in delay on the eastbound approach to the Milton Interchange, flow along A4130 from the Milton Interchange is forecast to re-route along the B4493. The demand flow along A34 is forecast to increase slightly compared to the Do-Minimum scenario. The A417 is forecast to have decreased flows of 50pcu in the eastbound direction between Wantage and Featherbed Lane. The demand flow along A4185 is increasing in the northbound and southbound directions.

In the PM peak hour, in Cluster 5 the change in demand flow along A4130 is in the range of +/-50pcu between Milton and B4493. On the Featherbed lane the demand flow in northbound and southbound directions is forecast to decrease by 50pcu due to increased delay at Steventon Hill junction. The demand flow along A34 is forecast to increase slightly compared to the Do-Minimum scenario. The demand flow along A417 and A4185 is increasing in the northbound and southbound directions.

Figure 29 A34, A417, A4130 and A4185 corridor demand flow difference (PCU/hr) – 2031 AM peak hour

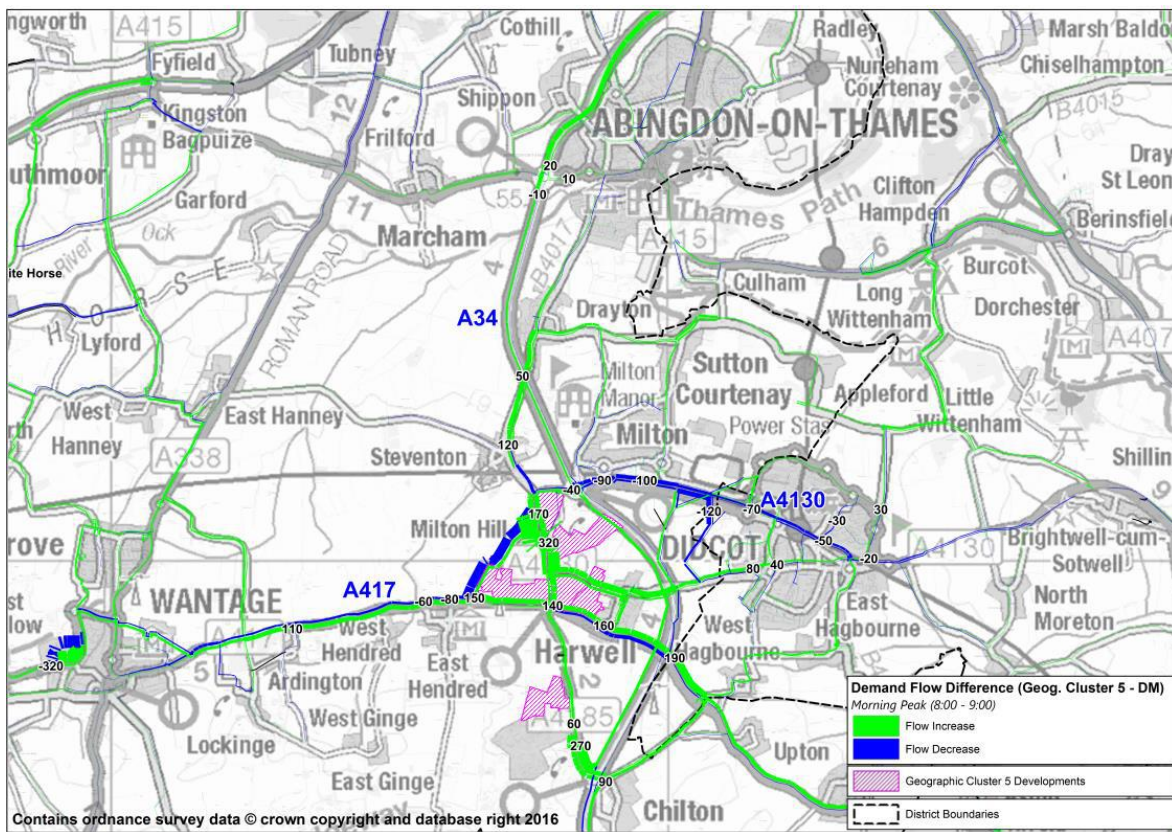
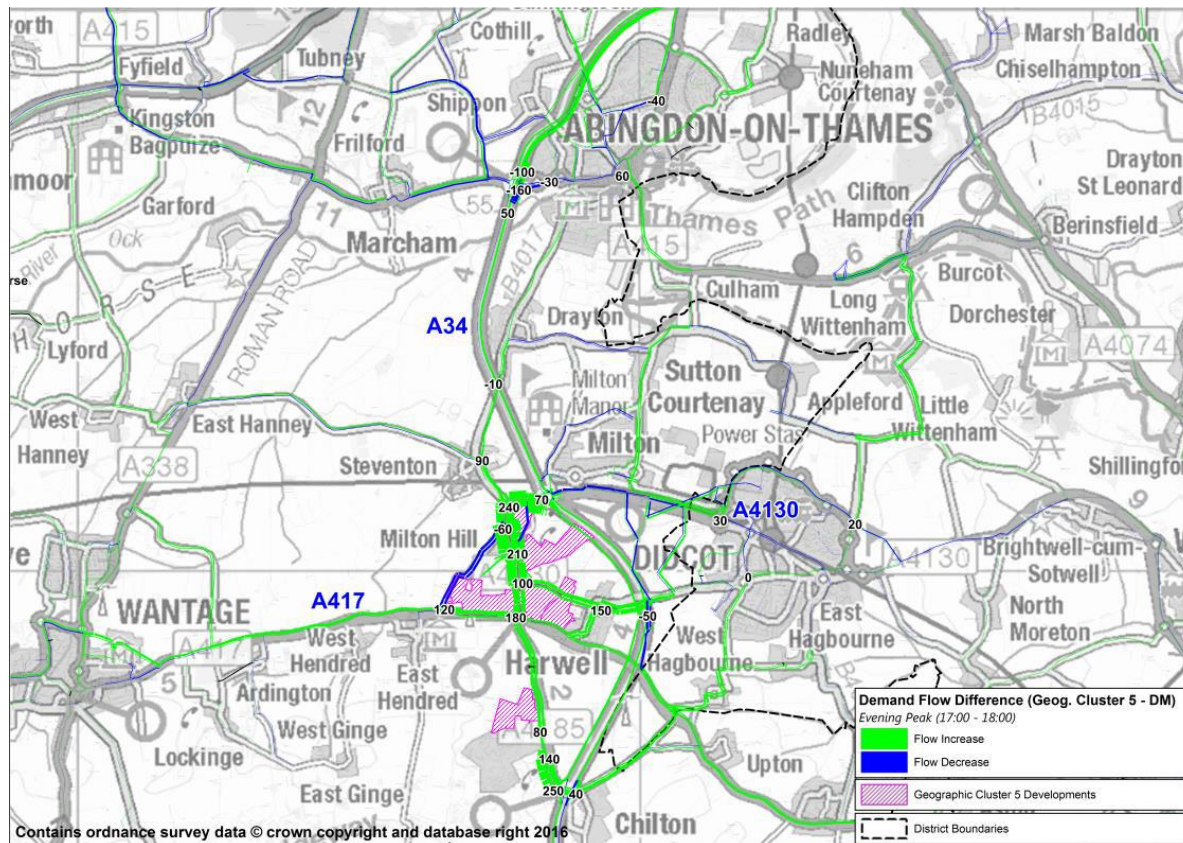


Figure 30 A34, A417, A4130 and A4185 corridor demand flow difference (PCU/hr) – 2031 PM peak hour



7.6.3. Corridor Performance – A34, A417, A4130 and A4185

Cluster 5 includes the additional dwellings along the A34, A417, A4130 and A4185 corridors located at Milton Heights, Rowstock, West of Harwell Village, Harwell Campus.

7.6.3.1. A34

Along A34, in the morning peak hour, the increased level of demand generated by these sites results in increased delays and total travel times while the average speed decrease. There is a slight increase in total distance. In the evening peak, the delay, total time increase while the average speed is decreasing as shown in Table 46 and Table 47 .

Table 46. A34 Chilton – Hinksey Hill corridor performance in the morning peak hour in 2031

	Chilton - Hinksey		
	Do-Minimum (DM)	Cluster 5 (C5)	Difference (C5 - DM)
Delay (pcu hr)	640	773	21%
Total Time (pcu hr)	3011	3180	6%
Total Distance (pcu km)	191514	194064	1%
Average Speed (km/h)	64	61	-5%

Table 47. A34 Chilton – Hinksey corridor performance in the evening peak hour in 2031

	Chilton - Hinksey		
	Do-Minimum (DM)	Cluster 5 (C5)	Difference (C5 - DM)
Delay (pcu hr)	809	945	17%
Total Time (pcu hr)	3165	3332	5%
Total Distance (pcu km)	192834	195182	1%
Average Speed (km/h)	61	59	-3%

7.6.3.2. A417

Along A417, in the morning peak hour, the increased level of demand generated by these sites results in increased total distance while the average speed and total time decrease. There is a slight decrease in delay in terms of actual numbers which are small. This is linked with a 68 second reduction in delay forecast between Ardington and East Hendred. This is in turn forecast to reduce total delay between Do-Minimum and Cluster 5. In the evening peak, the delay, total time and total distance increase while the average speed is decreasing as shown in Table 48 and Table 49.

Table 48. A417 Wantage – Upton corridor performance in the morning peak hour in 2031

	Wantage – Upton		
	Do-Minimum (DM)	Cluster 5 (C5)	Difference (C5 - DM)
Delay (pcu hr)	114	87	-24%
Total Time (pcu hr)	517	514	-1%
Total Distance (pcu km)	21680	22559	4%
Average Speed (km/h)	42	44	5%

Table 49. A417 Wantage – Upton corridor performance in the evening peak hour in 2031

	Wantage – Upton		
	Do-Minimum (DM)	Cluster 5 (C5)	Difference (C5 - DM)
Delay (pcu hr)	136	142	4%
Total Time (pcu hr)	594	628	6%
Total Distance (pcu km)	23292	24137	4%
Average Speed (km/h)	40	38	-5%

7.6.3.3. A4130

Along A4130, in the morning peak hour, the increased level of demand generated by these sites results in increased delays, travel distance and total travel times while the average speed decreases. In the evening peak, the delay, total time and total distance increase while the average speed decreases as shown in Table 50 and Table 51. In the morning peak hour, the percentages presented look high, however the change in actual numbers is not very significant.

Table 50. A4130 from Rowstock to Didcot corridor performance in the morning peak hour in 2031

	Rowstock to Didcot		
	Do-Minimum (DM)	Cluster 5 (C5)	Difference (C5 - DM)
Delay (pcu hr)	194	290	49%
Total Time (pcu hr)	571	682	19%
Total Distance (pcu km)	20771	21479	3%
Average Speed (km/h)	36	31	-14%

Table 51. A4130 from Rowstock to Didcot corridor performance in the evening peak hour in 2031

	Rowstock to Didcot		
	Do-Minimum (DM)	Cluster 5 (C5)	Difference (C5 - DM)
Delay (pcu hr)	210	236	12%
Total Time (pcu hr)	594	669	13%
Total Distance (pcu km)	21525	23154	8%
Average Speed (km/h)	36	35	-3%

7.6.3.4. A4185

Along A4185, in the morning peak hour, the increased level of demand generated by these sites results in increased delays, travel distance and total travel times while the average speed decreases. In the evening peak, the delay, total time and total distance increase while the average speed decreases as shown in Table 52 and Table 53. The percentages presented look high, however the change in actual numbers is not very significant.

Table 52. A4185 from Chilton to Rowstock corridor performance in the morning peak hour in 2031

	Chilton to Rowstock		
	Do-Minimum (DM)	Cluster 5 (C5)	Difference (C5 - DM)
Delay (pcu hr)	8	10	25%
Total Time (pcu hr)	65	73	12%
Total Distance (pcu km)	3698	4150	12%
Average Speed (km/h)	57	56	-2%

Table 53. A4185 from Chilton to Rowstock corridor performance in the evening peak hour in 2031

	Chilton to Rowstock		
	Do-Minimum (DM)	Cluster 5 (C5)	Difference (C5 - DM)
Delay (pcu hr)	8	9	13%
Total Time (pcu hr)	60	78	30%
Total Distance (pcu km)	3560	4176	17%
Average Speed (km/h)	60	53	-12%

7.6.4. Network Capacity - A34, A417, A4130 and A4185

Figure 31 to Figure 34 present the volume-capacity ratio for links and junctions for Do-Minimum and Cluster 5.

7.6.4.1. Do minimum

In Do-Minimum scenario, the performance of A34, A417, A4130 and A4185 is as follows:

7.6.4.1.1. A34

- In the morning peak hour, sections of A34 in northbound and southbound directions between Milton and Marcham, northbound direction between Marcham and Lodge Hill, northbound and southbound directions between Lodge Hill and Botley Interchange and Botley interchange are exceeding capacity.
- In the evening peak hour, sections of A34 in northbound and southbound directions between Milton and Marcham, southbound direction between Marcham and Lodge Hill, southbound direction between Lodge Hill and Botley Interchange and Botley interchange are exceeding capacity.

7.6.4.1.2. A417

- In the morning peak hour, eastbound approach from Wantage to Featherbed Lane, westbound approach at Rowstock junction are exceeding capacity.
- In the evening peak hour, eastbound and westbound approaches from Wantage to Featherbed Lane, westbound approach at Rowstock junction are exceeding capacity.

7.6.4.1.3. A4130

- In the morning peak hour, eastbound approach at A34 junction, westbound approach at A4130/B4493 junction are exceeding capacity.
- In the evening peak hour, eastbound and westbound approaches at A34 junction, eastbound and westbound approaches at A4130/B4493 junction are exceeding capacity.

7.6.4.1.4. A4185

- In the morning and evening peak hours, A4185 is performing within capacity.

7.6.4.2. Cluster 5

In Cluster 5, the performance of A34, A417, A4130 and A4185 is as follows:

7.6.4.2.1. A34

- In the morning peak hour, there is an increase of nearly 100 PCUs in the northbound direction from Chilton to Botley Interchange and there is no significant flow change in the southbound direction. Forecast flow along A34 in the Do-Minimum scenario is in the range of 4300 PCUs with an increase to 4400 PCUs in Cluster 5. Proposed developments at Mitlon Heights and Rowstock are modelled to join the A4130 (between Rowstock and Milton Hill) and the A417, the increase in flow associated with the developments is forecast to be in the range of 300 PCUs.
- In the evening peak hour, there is an increase of nearly 50 PCUs and 116 PCUs in the northbound and southbound directions respectively from Hinksey Hill to Lodge Hill.

7.6.4.2.2. A417

- In the morning peak hour, there is a reduction of 70 PCUs in the eastbound approach from Wantage to Featherbed Lane, nearly 100 PCUs on westbound approach from Upton to Rowstock junction. This is due to the reduction of volume-capacity ratio along these links in Cluster 5 compared to Do-Minimum scenario.
- In the evening peak hour, there is an increase of flow from Wantage to Upton in both eastbound and westbound directions.

7.6.4.2.3. A4130

- In the morning and evening peak hours, there is a reduction of nearly 100 PCUs and 65 PCUs respectively in the eastbound approach from Milton Interchange. This traffic which is avoiding Botley Interchange is getting re-routed along B4017 from Steventon to Abingdon.

7.6.4.2.4. A4185

- In the morning and evening peak hours, there is an increase of flow along A4185 in both northbound and southbound directions.

Figure 31 A34, A417, A4130 and A4185 corridor V/C for links and junctions– 2031 DM AM peak hour

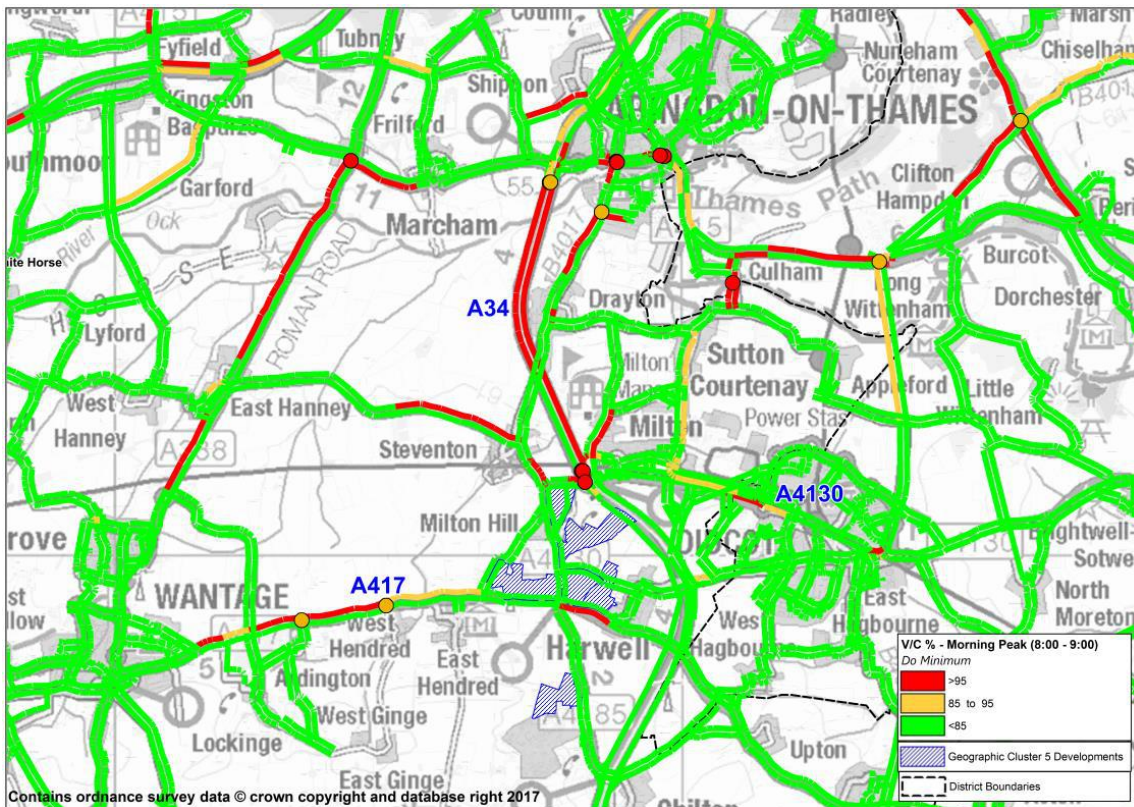


Figure 32 A34, A417, A4130 and A4185 corridor V/C for links and junctions– 2031 DM PM peak hour

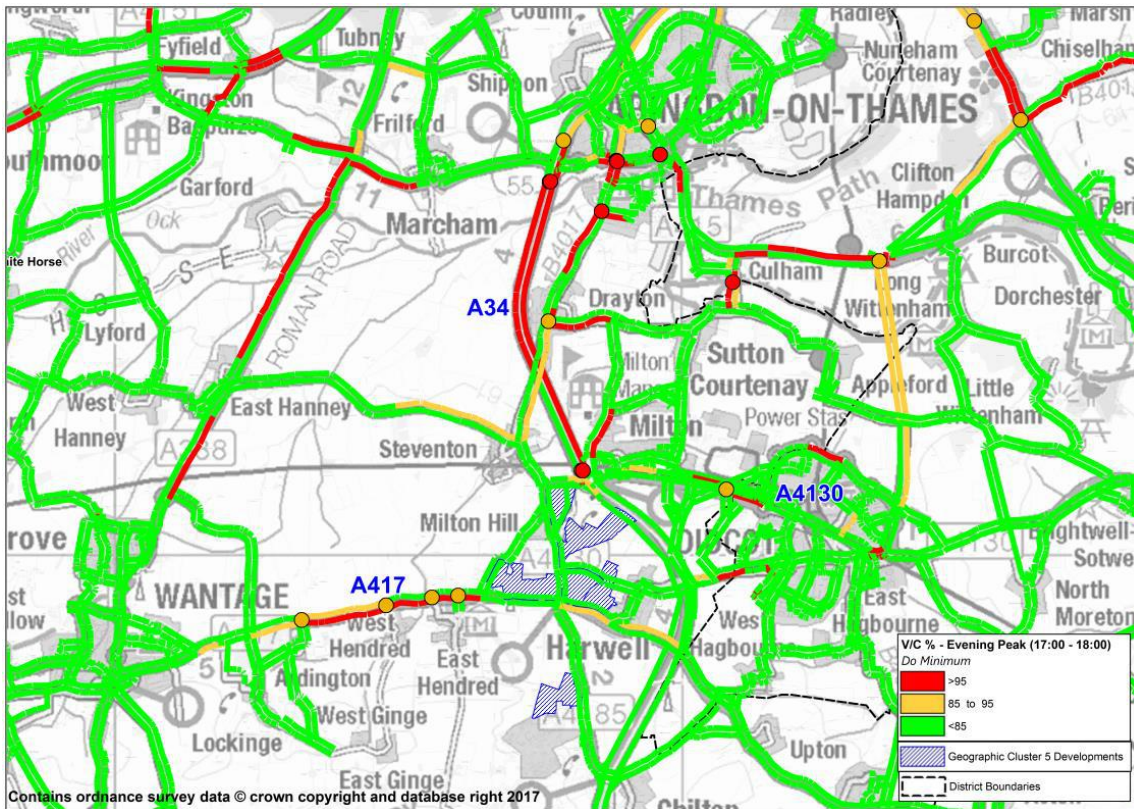


Figure 33 A34, A417, A4130 and A4185 corridor V/C for links and junctions– 2031 Cluster 5 AM peak hour

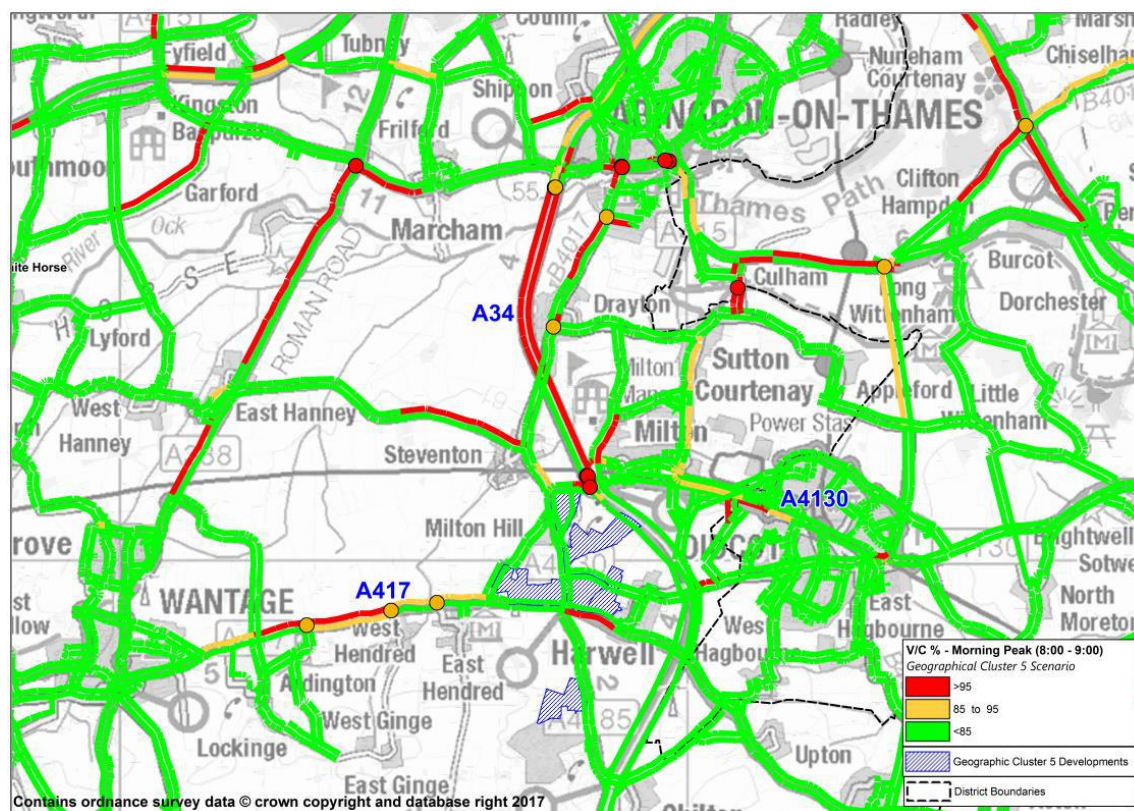
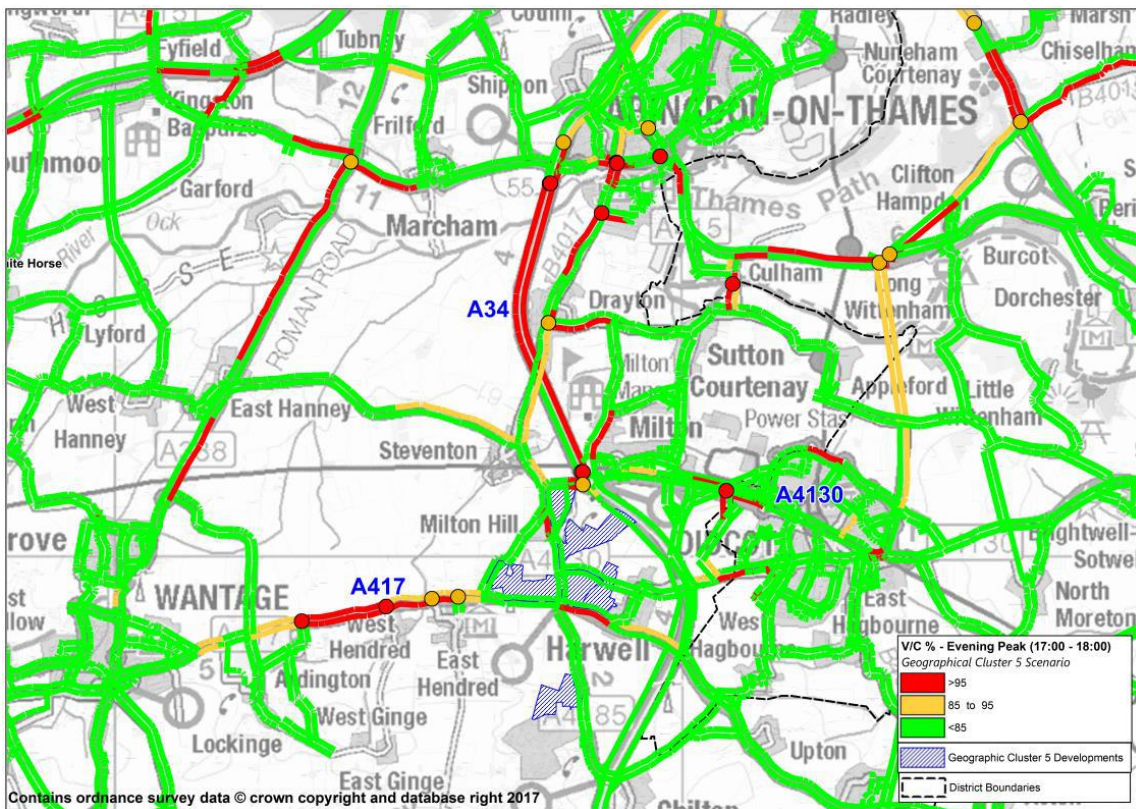


Figure 34 A34, A417, A4130 and A4185 corridor V/C for links and junctions– 2031 Cluster 5 PM peak hour



7.7. Cluster 6

7.7.1. Network Performance

The modelled highway network performance within the Vale of White Horse district for both the Do-Minimum and the Cluster 6 are shown in the Table 54 and Table 55. These statistics give a high-level summary of how the model has responded to the changes in in network and land use assumptions.

The trips generated by the 4,295 additional dwellings are forecast to increase delays, travel times and travel distances within the Vale of White Horse district during the morning and evening peak hours. The average speed is decreasing in the morning and evening peak hours.

Table 54. Vale of White Horse District modelled network performance - morning peak 2031

	Vale of White Horse		
	Do-Minimum (DM)	Cluster 6 (C6)	% Difference (C6-DM)
Delay (pcu hr)	2147	2310	8%
Total Time (pcu hr)	11019	11384	3%
Total Distance (pcu km)	536607	545053	2%
Average Speed (km/h)	49	48	-2%

Table 55. Vale of White Horse District modelled network performance - evening peak 2031

	Vale of White Horse		
	Do-Minimum (DM)	Cluster 6 (C6)	% Difference (C6-DM)
Delay (pcu hr)	3130	3308	6%
Total Time (pcu hr)	12510	12899	3%
Total Distance (pcu km)	563210	572148	2%
Average Speed (km/h)	45	44	-2%

7.7.2. Flow Impacts

Figure 35 and Figure 36 present the demand flow difference between Cluster 4 and Do-Minimum modelled along the A34 and A4130 corridors.

In the AM peak hour, in Cluster 6 the change in demand flow along A338 is in the range of +/-50pcu. The demand flow along A417 is forecast to increase slightly compared to the Do-Minimum scenario.

In the PM peak hour, in Cluster 6 along A338 there is an increase of 100pcu between Wantage and East Hanney. The demand flow along A417 is forecast to increase slightly compared to the Do-Minimum scenario.

Figure 35 A338 and A417 corridor demand flow difference (PCU/hr) – 2031 AM peak hour

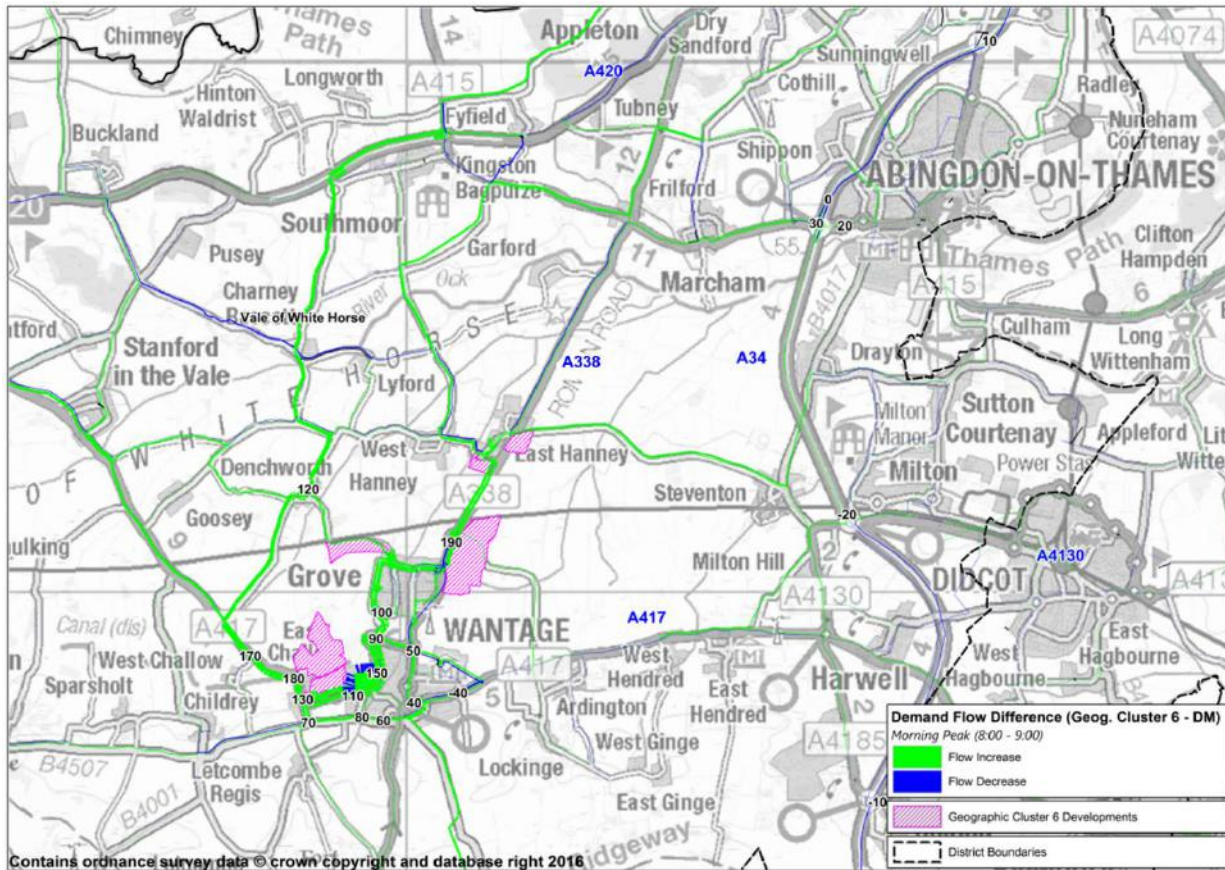
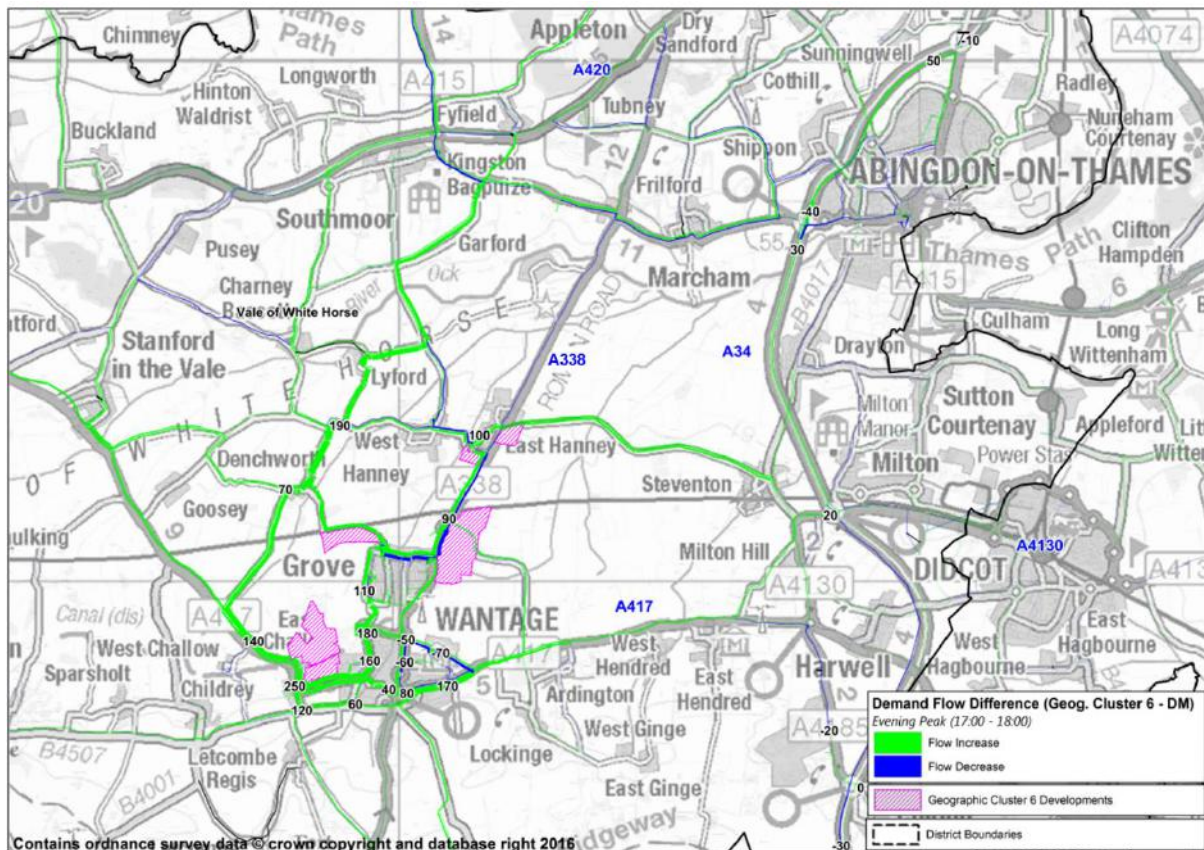


Figure 36 A338 and A417 corridor demand flow difference (PCU/hr) – 2031 PM peak hour



7.7.3. Corridor Performance – A338 and A417

Cluster 6 includes the additional dwellings along the A338 and A417 corridors located at West of Wantage, North West of Grove, East of Grove, East of East Hanney, South of East Hanney.

7.7.3.1. A338

Along A338, in the morning peak hour, the increased level of demand generated by these sites results in increased delays, total distance and total travel times while the average speed decreases. In the evening peak, the delay, total time and total distance increase while the average speed decreases as shown in Table 56 and Table 57.

Table 56. A338 Wantage to A420 corridor performance in the morning peak hour in 2031

	Wantage – A420		
	Do-Minimum (DM)	Cluster 6 (C6)	Difference (C6 - DM)
Delay (pcu hr)	111	144	30%
Total Time (pcu hr)	415	460	11%
Total Distance (pcu km)	18110	18671	3%
Average Speed (km/h)	44	41	-7%

Table 57. A338 Wantage to A420 corridor performance in the evening peak hour in 2031

	Wantage – A420		
	Do-Minimum (DM)	Cluster 6 (C6)	Difference (C6 - DM)
Delay (pcu hr)	153	203	33%
Total Time (pcu hr)	480	535	11%
Total Distance (pcu km)	18217	18431	1%
Average Speed (km/h)	38	34	-11%

7.7.3.2. A417

Along A417, in the morning peak hour, the increased level of demand generated by these sites results in increased delays, total distance and total travel times while the average speed decreases. In the evening peak, the delay, total time and total distance increase while the average speed is decreases as shown in Table 58 and Table 59.

Table 58. A417 Wantage – Upton corridor performance in the morning peak hour in 2031

	Wantage – Upton		
	Do-Minimum (DM)	Cluster 6 (C6)	Difference (C6 - DM)
Delay (pcu hr)	114	163	43%
Total Time (pcu hr)	514	569	11%
Total Distance (pcu km)	21680	21811	1%
Average Speed (km/h)	42	38	-10%

Table 59. A417 Wantage – Upton corridor performance in the evening peak hour in 2031

	Wantage – Upton		
	Do-Minimum (DM)	Cluster 6 (C6)	Difference (C6 - DM)
Delay (pcu hr)	136	182	34%
Total Time (pcu hr)	594	650	9%
Total Distance (pcu km)	23292	23637	1%
Average Speed (km/h)	40	36	-10%

7.7.4. Network Capacity - A338 and A417

Figure 37 to Figure 40 present the volume-capacity ratio for links and junctions for Do-Minimum and Cluster 6.

7.7.4.1. Do minimum

In Do-Minimum scenario, the performance of A338 and A417:

7.7.4.1.1. A338

- In the morning peak hour, the northbound approach between Grove and Frilford is exceeding the operational capacity.
- In the evening peak hour, the southbound approach between Grove and East Hanney and northbound approach between East Hanney and Frilford are forecast to exceed the operational capacity.

7.7.4.1.2. A417

- In the morning peak hour, the eastbound approach between Wantage and Featherbed lane and westbound approach at Rowstock Roundabout is forecast to be at or above operational capacity.

- In the evening peak hour, sections of eastbound and westbound approaches between Wantage and Featherbed lane and westbound approach at Rowstock Roundabout are forecast to be at or above operational capacity.

7.7.4.2. Cluster 6

In Cluster 6, the performance of A338 and A417 is as follows:

7.7.4.2.1. A338

- In the morning peak hour, there is a reduction of 40 PCUs along A338 northbound direction at Grove. This is due to the increased delays in the northbound direction at East Hanney and Frilford.
- In the evening peak hour, there is an increased delay of 60 seconds and 110 seconds in the northbound and southbound sections of A338 at Frilford junction.

7.7.4.2.2. A417

- In the morning peak hour, there is an increase of 100 seconds delay on the eastbound approach at West Hendred.
- In the evening peak hour, there is an increase of 100 seconds delay on the westbound approach at West Hendred.

Figure 37 A338 and A417 corridor V/C for links and junctions– 2031 DM AM peak hour

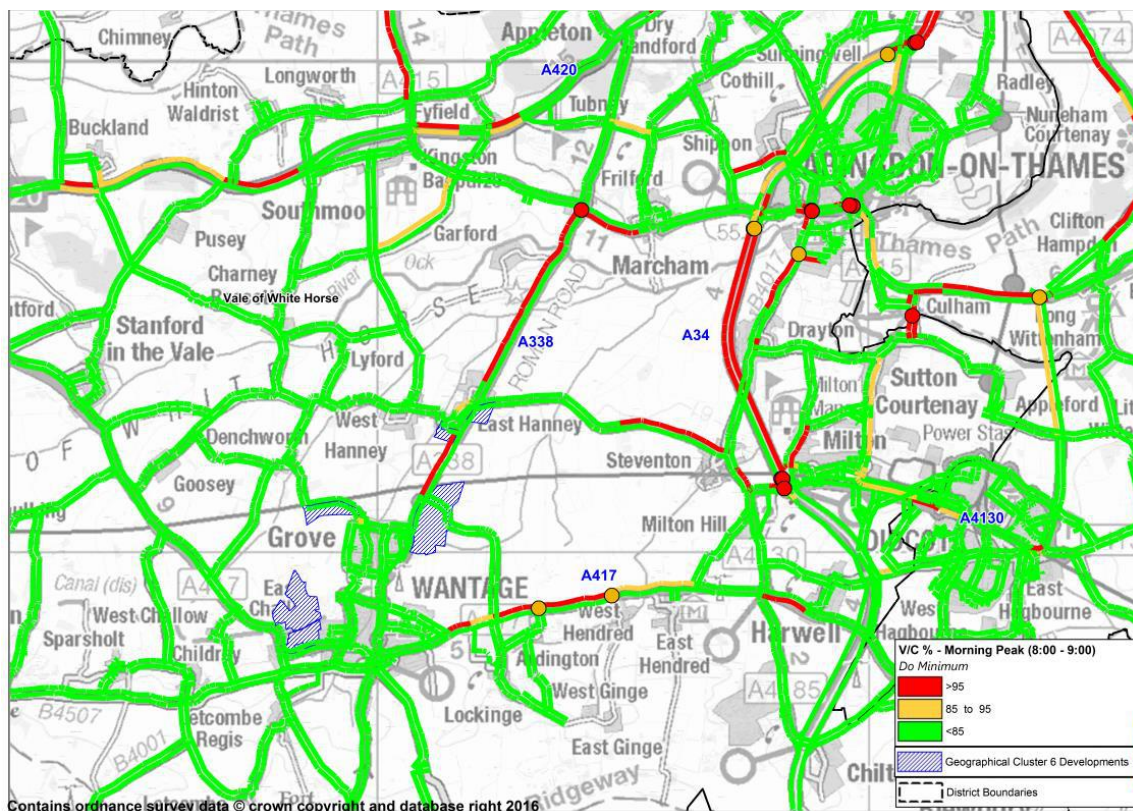


Figure 38 A338 and A417 corridor V/C for links and junctions– 2031 DM PM peak hour

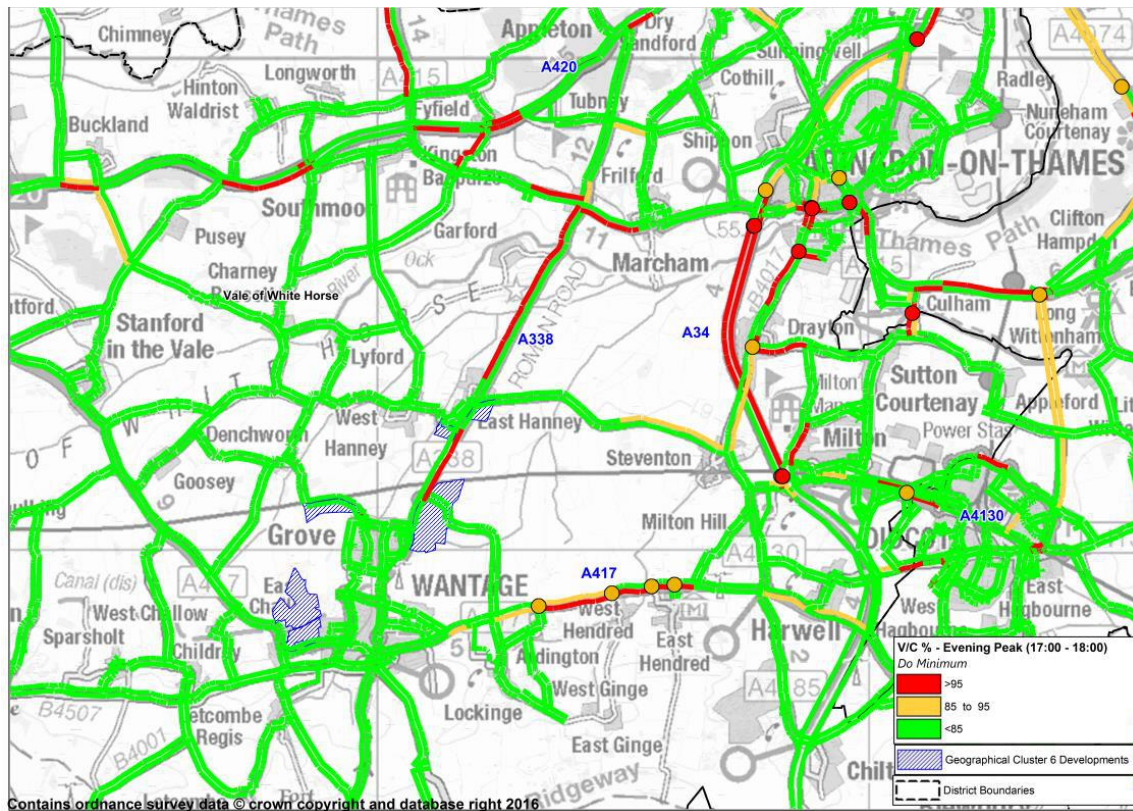


Figure 39 A338 and A417 corridor V/C for links and junctions– 2031 Cluster 6 AM peak hour

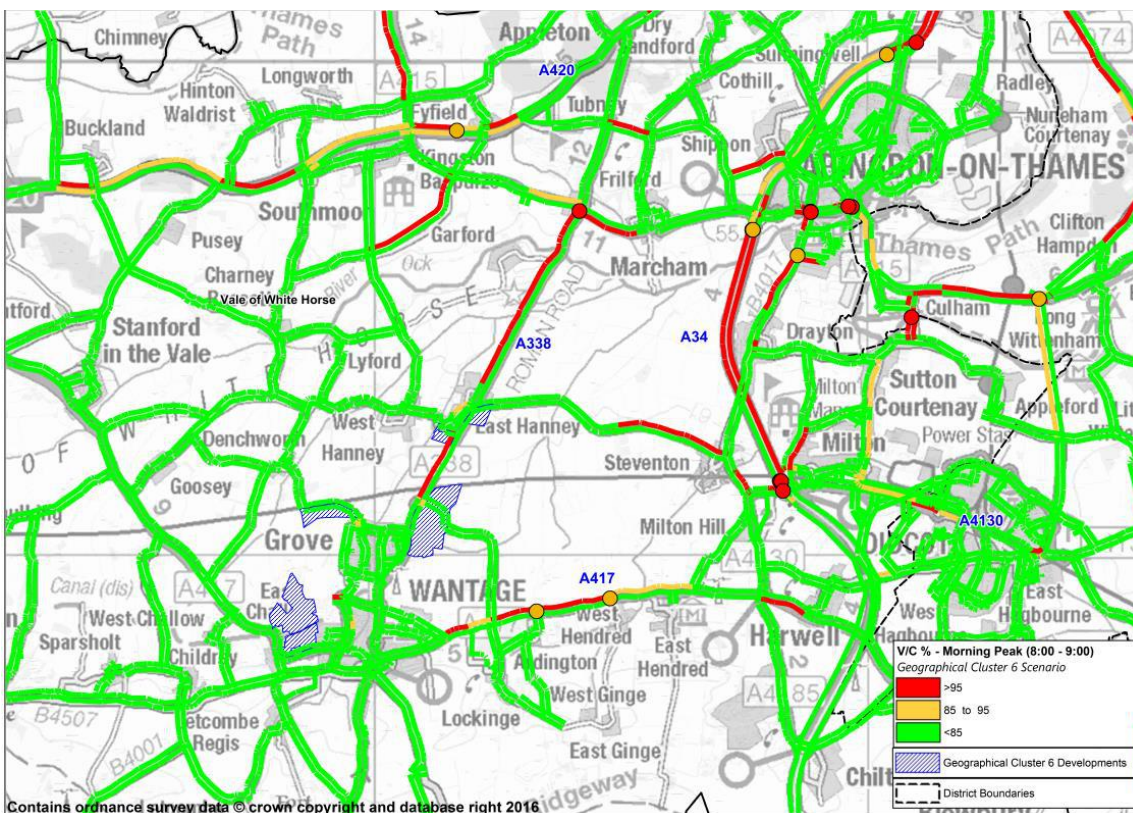
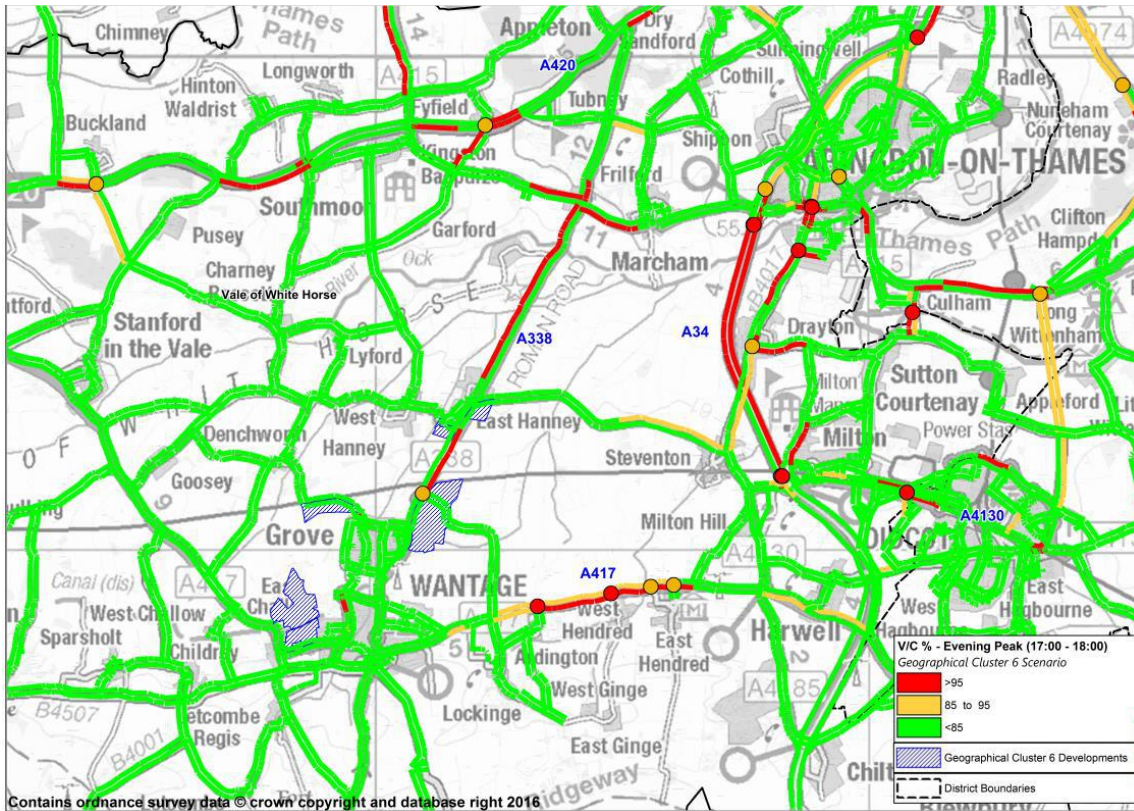


Figure 40 A338 and A417 corridor V/C for links and junctions– 2031 Cluster 6 PM peak hour



8. LPP2 Stage 1: Clusters: Analysis Summary

This study utilises different modelling tools to earlier analysis (ETI Local Plan 2031: Part 1 study which was carried out by Atkins in November 2014), although analysis undertaken during Local Plan Part 1 showed that the different modelling tools will still have resulted in similar conclusions, even though there are different growth assumptions in the other Oxfordshire districts. As such, key issues in the Do-Minimum scenario have been highlighted and confirmed as consistent with the earlier work as follows:

- The A34 is forecast to be operating at or above operational capacity in most sections from Chilton to Botley Interchange
- The A415 is forecast to be operating at or above operational capacity between Frilford and Abingdon and the eastbound approach to Marcham junction
- The A420 is forecast to be operating at or above operational capacity at sections between Buckland and Longworth, Fyfield and Cumnor.
- The A417 is forecast to be operating at or above operational capacity between Wantage and Featherbed Lane and at sections of Rowstock junction.
- The A338 is forecast to be above operational capacity in the northbound direction between East Hanney and Frilford. This is due to the signal at Frilford junction.
- The A4130 is forecast to be exceeding the operating at capacity between Milton Interchange and A4130/B4493 junction.
- The A4185 is performing within capacity.

The Clusters each contain different numbers of housing allocations, each located in a specific geographic cluster. The Clusters and the number of houses is shown in Table 60.

Table 60. Summary of Cluster housing allocation

Number	Dwellings	Location
Cluster 1	6680	Along the A420
Cluster 2	3840	Around Abingdon
Cluster 3	4590	Around Drayton
Cluster 4	2200	Around Didcot
Cluster 5	4600	South of Harwell Village
Cluster 6	4295	Around Wantage

The impact of the development Clusters is presented in Table 63 and it can be seen that congestion is forecast to increase as follows:

- Cluster 1 would affect the A420 at Botley interchange;
- Cluster 2 would affect the already congested A34;
- Cluster 3 would affect the already congested A34 and the A415;
- Cluster 4 would affect the already congested A34 but have some limited impact on the A4130;
- Cluster 5 would affect the already congested A34 and affect the A417 and A4130, but have some limited impact on the A415 and A4185; and
- Cluster 6 would have limited impacts on the A338, A417.

A further way to summarise the impact of the Clusters is to compare speeds along the key corridors (Table 61 and Table 62, with key corridor statistics highlighted). In relation to the morning peak hour:

- Cluster 1, with dwellings around the A420, is forecast to reduce speeds on the A420 by 4% and also to reduce speeds in the A34 corridor by 3%;
- Cluster 2, with dwellings around Abingdon, is forecast to reduce speeds on the A34 by 2%, which is a smaller impact than Cluster 1;
- Cluster 3, with dwellings around Drayton, is forecast to reduce speeds on the A34 by 2% and to reduce speeds on the A415 by 7%;
- Cluster 4, with dwellings around Didcot, is forecast to reduce speeds on the A34 by 1% and to reduce speeds on the A4130 by 2%;
- Cluster 5, with dwellings to the south west of Harwell Village is forecast to reduce speeds on the A34 by 5%, the A417 by 5%, the A4130 by 13% and A4185 6%; and
- Cluster 6, with dwellings around Wantage, is forecast to reduce speeds on the A338 by 9% and the A417 by 8%.

Table 61. Change in average speed with respect to Do-Minimum scenario- Morning Peak

Corridor	Morning Peak Hour (percentage Difference)					
	C1	C2	C3	C4	C5	C6
A34	-3%	-2%	-2%	-1%	-4%	-1%
A338	-3%	0%	1%	0%	-2%	-7%
A415	-4%	0%	-7%	-1%	-1%	0%
A417	-4%	0%	-1%	0%	5%	-8%
A420	-4%	0%	1%	0%	0%	-1%
A4130	0%	-1%	-2%	-2%	-13%	-1%
A4185	-1%	-1%	0%	0%	-6%	0%
Vale	-3%	-1%	-2%	0%	-2%	-2%

Table 62. Change in average speed with respect to Do-Minimum scenario- Evening Peak

Corridor	Evening Peak Hour (percentage Difference)					
	C1	C2	C3	C4	C5	C6
A34	-5%	-3%	-3%	-1%	-4%	-1%
A338	-2%	-1%	1%	-1%	-1%	-9%
A415	2%	-7%	-8%	2%	5%	1%
A417	-2%	-1%	-2%	0%	-2%	-7%
A420	-6%	-2%	-2%	-1%	-1%	-1%
A4130	-2%	-2%	-3%	-2%	-4%	-1%
A4185	-1%	0%	0%	0%	-6%	0%
Vale	-3%	-2%	-3%	0%	-1%	-1%

Table 63. Summary of highway capacity impacts - Stage 1

Cluster	Time	Road						
		A420	A34	A415	A4130	A417	A4185	A338
Do Min	Morning peak	The A420 eastbound is forecast to be above operational capacity at Faringdon, eastbound section between Buckland and Longworth, eastbound and westbound directions at Fyfield and eastbound direction at Cumnor.	A34 is forecast to be operating at or above operational capacity in the northbound and southbound directions between Botley and Lodge Hill and between Marcham and Lodge Hill in the northbound direction and in the northbound and southbound directions between Marcham and Milton Interchange.	The A415 is forecast to be operating below operational capacity in the westbound direction except at Frilford junction and Abingdon. In the eastbound direction the A415 is forecast to be operating at or above operational capacity at the approach to Marcham junction and in Abingdon.	The A4130 is forecast to exceeding the operating at capacity at eastbound approach to Milton Interchange and the westbound approach at A4130/B4493 junction.	A417 is operating at or above operational capacity in the eastbound direction between Wantage and Featherbed Lane.	A4185 is performing within capacity.	The A338 is forecast to be above operational capacity in the northbound direction between East Hanney and Frilford.
	Evening peak	The A420 is forecast to be operating above operational capacity at Buckland in both directions, Fyfield in both directions and Cumnor in the westbound direction.	The northbound section between Milton and Marcham is above operational capacity. In the southbound direction the A34 is operating at or above operational capacity between Botley and Lodge Hill, Lodge Hill and Marcham and Marcham and Milton Interchange.	The eastbound and westbound directions at Frilford, eastbound approach at Marcham junction and eastbound and westbound directions in Abingdon are forecast to perform above operational capacity.	The A4130 is forecast to exceeding the operating at capacity at eastbound approach to Milton Interchange and the westbound approach at A4130/B4493 junction.	The eastbound and westbound directions between Wantage and Featherbed Lane and the westbound direction at Rowstock are operating at or above operational capacity.	A4185 is performing within capacity.	The A338 is forecast to be operating above operational capacity in the northbound and southbound directions at Frilford junction and in the southbound direction between East Hanney and Wantage.
Cluster 1	Morning peak	In the morning peak hour, Botley Interchange and A420 northbound direction at Botley, A420 northbound direction near Cumnor, northbound and southbound directions at Fyfield, northbound direction at Kingston Bagpuize.						
	Evening peak	Botley Interchange, A420 southbound direction near Cumnor, northbound and southbound directions at Fyfield, northbound and southbound directions at Kingston Bagpuize are exceeding capacity in the evening peak hour.						
Cluster 2	Morning peak		Sections of the A34 in both the Northbound and Southbound directions from Hinksey Hill to Milton interchange are exceeding capacity in the morning peak hour. Due to this there is a reduction of 50pcu in the southbound direction between Botley and Lodge Hill. This reduced traffic is getting re-routed along the local roads namely Kennington Road.					
	Evening peak		In the evening peak hour, sections of A34 in Northbound and Southbound directions from Hinksey Hill to Milton interchange are exceeding capacity					
Cluster 3	Morning peak		In the morning peak hour, the volume-capacity ratio and delays are similar to Do-Minimum scenario and there is a reduction of nearly 50 PCUs in the southbound direction from Botley Interchange to Marcham junction.	In the morning peak hour, the volume-capacity ratio and delays are similar to Do-Minimum scenario and there is a reduction of 70 PCUs along A415 from A420 to Frilford Road, nearly 100 PCUs on eastbound slip at Marcham junction.				

Cluster	Time	Road						
		A420	A34	A415	A4130	A417	A4185	A338
	Evening peak		In the evening peak hour, the volume-capacity ratio and delays are similar to Do-Minimum scenario and there is a reduction of nearly 40 PCUs in the northbound direction from Marcham junction to Hinksey Hill.	In the evening peak hour, the volume-capacity ratio and delays are similar to Do-Minimum scenario and there is a reduction of 60 PCUs along A415 from Frilford Road to A420, nearly 44 PCUs on eastbound slip at Marcham junction and 60 PCUs on westbound A415 at Abingdon.				
Cluster 4	Morning peak		In the morning and evening peak hours, the volume-capacity ratios are similar to Do-Minimum scenario and there is no significant reduction of flows along this corridor		In the morning and evening peak hours, similar to Do-Minimum scenario A4130 eastbound at A34 junction, A4130 eastbound approach at B4493 roundabout are exceeding capacity			
	Evening peak							
Cluster 5	Morning peak		In the morning peak hour, the volume-capacity ratio and delays are similar to Do-Minimum scenario. There is an increase of nearly 100 PCUs in the northbound direction from Chilton to Botley Interchange and there is no significant flow change in the southbound direction.		In the morning and evening peak hours, the volume-capacity ratio and delays are similar to Do-Minimum scenario. There is a reduction of nearly 100 PCUs and 65 PCUs respectively in the eastbound approach from Milton Interchange. This traffic which is avoiding Botley Interchange is getting re-routed along B4017.	In the morning peak hour, the volume-capacity ratio and delays are similar to Do-Minimum scenario. There is a reduction of 70 PCUs in the eastbound approach from Wantage to Featherbed Lane, nearly 100 PCUs on westbound approach from Upton to Rowstock junction.	In the morning and evening peak hours, the volume-capacity ratio and delays are similar to Do-Minimum scenario and there is an increase of flow along A4185 in both northbound and southbound directions.	
	Evening peak		In the evening peak hour, the volume-capacity ratio and delays are similar to Do-Minimum scenario. There is an increase of nearly 50 PCUs and 116 PCUs in the northbound and southbound directions respectively from Hinksey hill to Lodge hill.			In the evening peak hour, the volume-capacity ratio and delays are similar to Do-Minimum scenario. There is an increase of flow from Wantage to Upton in both eastbound and westbound directions.		
Cluster 6	Morning peak					In the morning peak hour, the volume-capacity ratio and delays are similar to Do-Minimum scenario and there is an increase of 100 seconds delay on the eastbound approach at West Hendred.		In the morning peak hour, there is a reduction of 40 PCUs along A338 northbound direction at Grove. This is due to the increased delays in the northbound direction at East Hanney and Frilford and the volume-capacity ratio is similar to Do-Minimum scenario.
	Evening peak					In the evening peak hour, the volume-capacity ratio and delays are similar to Do-Minimum scenario and there is an increase of 100 seconds delay on the westbound approach at West Hendred.		In the evening peak hour, there is an increased delay of 60 seconds and 110 seconds in the northbound and southbound sections of A338 at Frilford junction and the volume-capacity ratio is similar to Do-Minimum scenario.

9. LPP2 Stage 1: Development Scenarios: Summary of alternatives tested

9.1. Modelled Scenarios and Land-use assumptions

Six geographical clusters were considered in Stage 1 as alternative scenarios. From these six geographical clusters, five Local Plan scenarios were outlined to inform preferred option selection. The proposed scenarios, provided by VOWH, contain additional dwellings, when compared with the Do-Minimum scenario, to meet the VOWH assessed housing need. Each scenario provides additional growth from the Do Minimum scenario, growth is not cumulative. The location of each site is shown in Figure 41 and the quantum of development is summarised in Table 64.

Figure 41 Local Plan Part 2 – key development locations

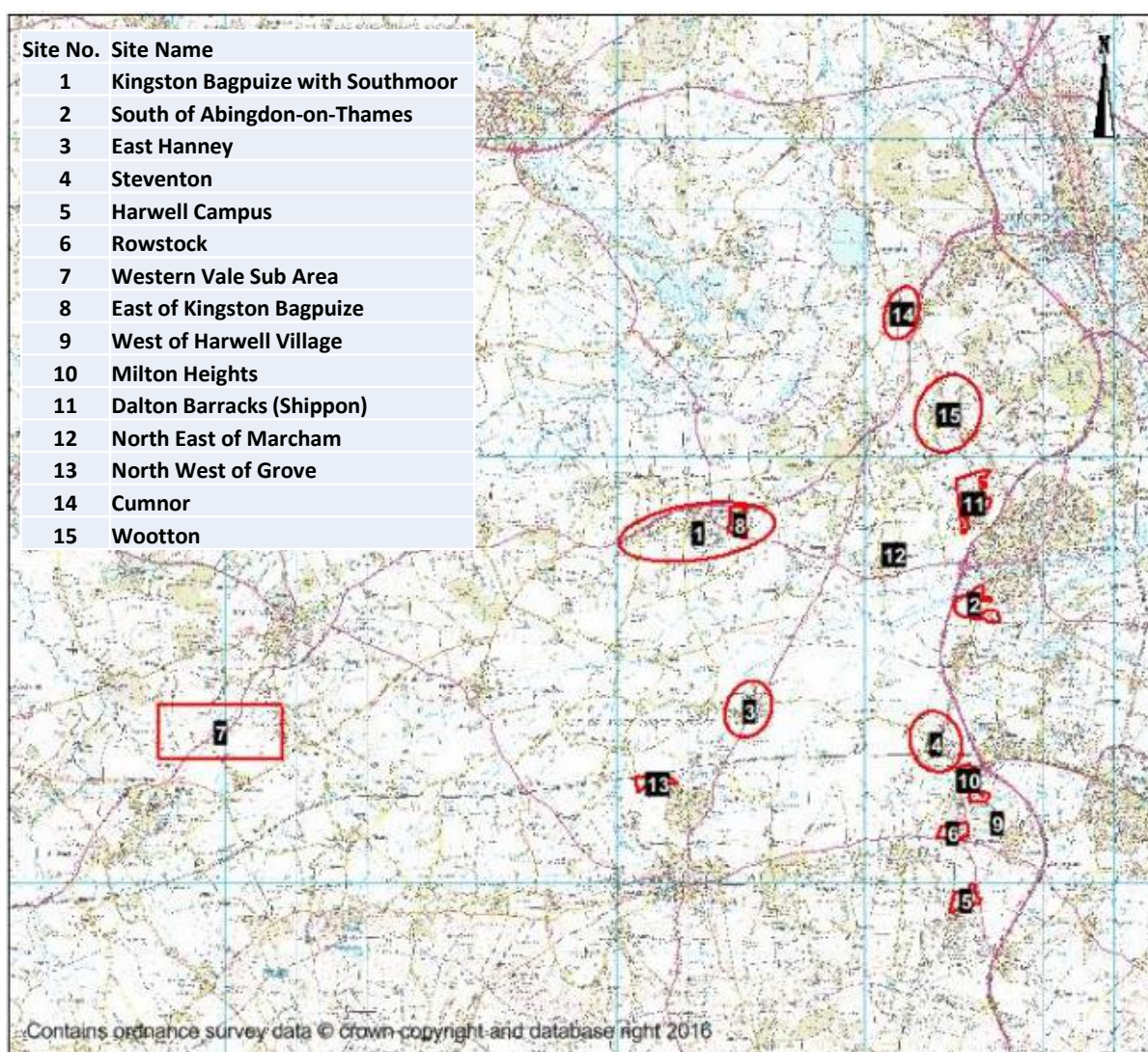


Table 64. Local Plan Part 2 - ETI Scenario Tests

Scenario	Site	Capacity (No. of dwellings)	Map reference (Figure 41)
Scenario 1	Harwell Campus	1,000	5
	West of Harwell Village	150	9
	Milton Heights	250	10
	Dalton Barracks (Shippon)	1,350	11
	North East of Marcham	250	12
	East of Kingston Bagpuize with Southmoor	600	1, 8
	Total	3,600	-
Scenario 2	Harwell Campus	400	5
	West of Harwell Village	150	9
	Milton Heights	550	10
	Western Vale 1 (area of search)	150	7
	Western Vale 2 (area of search)	150	7
	South Abingdon	525	2
	Dalton Barracks (Shippon)	525	11
	East Hanney (area of search)	150	3
	North East of Marcham	250	12
	Steventon (area of search)	150	4
	East of Kingston Bagpuize with Southmoor	600	1, 8
	Total	3,600	-
Scenario 3	Harwell Campus	250	5
	West of Harwell Village	150	9
	Rowstock	700	6
	Western Vale 1 (area of search)	150	7
	Western Vale 2 (area of search)	150	7
	South Abingdon	200	2
	Cumnor (area of search)	150	14
	Wootton (area of search)	150	15
	Dalton Barracks (Shippon)	200	11
	East Hanney (area of search)	150	3
	North East of Marcham	250	12
	Steventon (area of search)	150	4
	Kingston Bagpuize with Southmoor (area of search)	950	1, 8
	Total	3,600	-
Scenario 4	Scenario 1 + South Abingdon 1800 dwellings without mitigation	5,400	-
Scenario 5	Scenario 1 + South Abingdon 1800 dwellings with South Abingdon By-pass	5,400	-

Table 65 is a summary of the land use assumptions for each of the alternative scenarios in Vale district (the only difference is the number of dwellings as the employment does not change).

Table 65. Summary of tested land use assumptions

Developments 2031	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5
Houses	25,348	25,348	25,348	27,148	27,148
Jobs	26,379	26,379	26,379	26,379	26,379

9.2. Transport Supply Assumptions

There are no differences between the Do Minimum and the modelled scenario tests in terms of transport supply assumptions (highway, park and ride and public transport) except that scenario 5 includes the South-Abingdon By-pass.

10. LPP2 Stage 1: Development Scenarios: Demand Model results

In this chapter, the results for the 2031 forecast year (post demand model) are compared with the 2013 Base year and geographical scenario runs.

10.1. Convergence

The convergence of the Demand Model is checked for all scenarios before preparing the results/outputs. WebTAG guidance suggests a convergence level of 0.2 within 25 iterations, which was achieved for the Do Minimum scenario and all the alternative scenarios.

10.2. Growth in demand

Table 66 summarises the growth in travel demand between the 2013 base year, the 2031 Do Minimum scenario and the five scenario test across the model area. Between the 2013 base year and the 2031 Do Minimum scenario, overall travel demand for all districts is forecast to grow by 42% over a 12 hour-period. Between the 2031 Do Minimum scenario and the Local Plan scenarios, overall travel demand is estimated to additionally increase by 0.7% for scenario1, scenario 2 and scenario 3 whereas the increase is 1% for scenarios 4 and 5. The table does not include LGV and HGV demand.

Table 66. Summary of Demand Model results for the entire model – 12 hour period

Entire model	Base Year (BY)	Do Minimum (DM)	Scenario 1 (S1)	Scenario 2 (S2)	Scenario 3 (S3)	Scenario 4 (S4)	Scenario 5 (S5)
Reg car (veh.)	974,474	1,375,107	1,384,451	1,384,559	1,384,578	1,389,331	1,389,356
P&R (veh.)	6,477	8,150	8,377	8,289	8,323	8,290	8,291
Bus only (pax)	102,649	137,086	137,572	137,631	137,644	137,908	137,870
Rail (pax)	30,238	56,839	57,555	57,471	57,442	57,814	57,820
TOTAL (persons)	1,358,105	1,921,775	1,934,906	1,934,918	1,934,963	1,941,505	1,941,505

The Car and Public Transport mode share for all the scenarios are consistent when compared to Do-Minimum scenario as presented in Table 66 and Table 67. In comparison with Stage 1 (Table 18), generally, the trips per dwelling and the mode share are consistent between the two stages.

Table 67. Mode share – 12 hour period

Entire model	Scenario 1 (S1)	Scenario 2 (S2)	Scenario 3 (S3)	Scenario 4 (S4)	Scenario 5 (S5)
No. of additional dwellings	3,600	3,600	3,600	5,400	5,400
Trips per dwelling over 12-hour	3.65	3.65	3.65	3.65	3.65
Car mode share	89%	89%	89%	89%	89%
PT mode share	11%	11%	11%	11%	11%

Table 68 and Table 69 summarise travel demand across the District. The growth in travel demand between the 2013 base year and the 2031 Do Minimum scenario shows an increase of 76% for the VOWH as an origin and an increase of 74% for VOWH as a destination when considering the trips to/from other districts over a 12-hour period. The growth in travel demand between the 2031 Do Minimum scenario and 2031 Scenarios shows an additional increase of:

- 3% for VOWH as origin and 3% for VOWH as destination for Scenario 1
- 3% for VOWH as origin and 3% for VOWH as destination for Scenario 2
- 3% for VOWH as origin and 3% for VOWH as destination for Scenario 3
- 5% for VOWH as origin and 4% for VOWH as destination for Scenario 4
- 5% for VOWH as origin and 4% for VOWH as destination for Scenario 5.

Since the demand model is constrained to departures/dwellings, the increase in dwellings in each scenario satisfies more jobs which otherwise would be suppressed.

Table 68. Summary of Demand Model results for VOWH - Origins 12 hour

VOWH as origin	Base Year (BY)	Do Minimum (DM)	Scenario 1 (S1)	Scenario 2 (S2)	Scenario 3 (S3)	Scenario 4 (S4)	Scenario 5 (S5)
Reg car (veh.)	165,567	291,400	300,130	300,140	300,169	304,516	304,601
P&R (veh.)	795	1,184	1,269	1,266	1,280	1,275	1,275
Bus only (pax)	8,351	12,351	12,682	12,694	12,694	12,863	12,858
Rail (pax)	2,128	5,717	6,115	6,075	6,051	6,299	6,283
TOTAL (persons)	218,312	383,620	395,355	395,337	395,364	401,210	401,295

Table 69. Summary of Demand Model results for VOWH - Destinations 12 hour

VOWH as destination	Base Year (BY)	Do Minimum (DM)	Scenario 1 (S1)	Scenario 2 (S2)	Scenario 3 (S3)	Scenario 4 (S4)	Scenario 5 (S5)
Reg car (veh.)	165,626	288,354	296,575	296,521	296,538	300,670	300,882
P&R (veh.)	748	1,165	1,249	1,254	1,285	1,249	1,249
Bus only (pax)	8,181	12,467	12,793	12,800	12,799	12,970	12,970
Rail (pax)	1,732	5,413	5,818	5,760	5,738	5,986	5,976
TOTAL (persons)	217,769	379,604	390,704	390,591	390,622	396,167	396,422

11. LPP2 Stage 1: Development Scenarios: Highway Network Performance

11.1.Introduction

The highway network performance of the different scenarios is measured using the metrics discussed in section 4.1.

To ascertain the extent to which the proposed dwellings impact different scenarios, Table 70 and Table 71 below show the impact of each scenario on delay in the corridor.

Table 70. Forecast changes in delay by corridor and scenario with respect to Do-Minimum Scenario - AM peak

Corridor	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5
A34	8%	9%	7%	13%	10%
A338	1%	1%	1%	-2%	-3%
A415	5%	6%	5%	13%	-1%
A417	4%	3%	2%	6%	8%
A420	0%	1%	5%	-2%	-1%
A4130	2%	9%	12%	3%	0%
A4185	12%	6%	5%	12%	12%
B4017	4%	-3%	4%	-3%	-16%
Vale	6%	5%	5%	8%	5%

Table 71. Forecast changes in delay by corridor and scenario with respect to Do-Minimum Scenario - PM peak

Corridor	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5
A34	10%	12%	11%	18%	15%
A338	1%	4%	4%	3%	3%
A415	3%	1%	1%	2%	-9%
A417	4%	5%	5%	8%	10%
A420	12%	11%	13%	14%	13%
A4130	4%	7%	7%	1%	4%
A4185	17%	10%	8%	17%	15%
B4017	3%	3%	3%	5%	0%
Vale	5%	6%	5%	7%	5%

The analysis in the remainder of the chapter focuses on those corridors where delays are forecast to increase by more than 5%.

This section thus presents for each scenario the impact of the development on those corridors where delay is forecast to increase by more than 5% and will also describe the changes in flow and volume-capacity ratio between different scenarios.