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Upper Tier Tool Report



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1 Introduction

1.1 Lincolnshire Local Planning Tool

Mouchel, working as part of the Lincolnshire County Council Highways Alliance, has been appointed to undertake the Lincolnshire Local Planning Tool (LLPT) project. The project has developed a tool to identify the potential impact of growth in the seven individual Lincolnshire districts on the County's highway infrastructure.

1.1.1 Context

The County of Lincolnshire is administered at a district level by seven councils but will be covered by four local plans either adopted or being developed by two Local Planning Authorities (LPAs) and two Joint Planning Units (JPUs). The local plans will set out the scale and location of development within the four plan areas for the next 15-20 years. The four local plans covering Lincolnshire include:

- East Lindsey – being developed By East Lindsey District Council
- Central Lincolnshire – being developed by the Central Lincolnshire Joint Planning Unit (City of Lincoln Council, North Kesteven District Council and West Lindsey District Council)
- South East Lincolnshire – being developed by the South Lincolnshire Joint Planning Unit (Boston Borough Council and South Holland District Council)
- South Kesteven – adopted by South Kesteven District Council in 2010 but with new Local Plan now under development

Before any of the emerging local plans can be adopted as policy, they must be examined by an independently appointed Planning Inspector, who must be satisfied that the plan is sound. Sites allocated for development in the plan must be deliverable, and any allocated sites where deliverability may be compromised by infrastructure constraints are likely to be challenged. There is therefore a need for both the LPAs and JPUs and the County Council to have the evidence to demonstrate that the county's highway infrastructure is able to support the planned development that will be set out in the local plans.

For growth to be deliverable targeted improvements to the county's highway infrastructure may be required. There is therefore the need for evidence of the likely impacts of development on the capacity of the County's highway network.

There will also be a need for the evidence showing current and future capacity of the County's highway network in order to assess planning applications which may have an impact upon capacity, and as a basis for setting developer contributions to highway infrastructure through Community Infrastructure Levy (CIL) systems or Section 106 mechanisms.

The LLPT project will provide the evidence needed to demonstrate the combined impact of development in the emerging local plans on the county's highway infrastructure at a strategic level and identify the locations where there may be a need for future interventions to support growth. However, the outputs from the project do not replace the normal planning application and development control processes, including the production and review of Transport Assessments and Statements, which need to assess the impacts of development at a local level.

1.1.2 *Approach*

The LLPT project is divided into two tiers: an Upper Tier, which provides a high-level assessment of the whole county, and a Lower Tier, which provides a more detailed assessment of individual settlements, initially of the Greater Lincoln area. The Lower Tier Assessments will be informed by the outputs from the Upper Tier Assessment.

The Upper Tier work comprises the development and use of the LLPT itself whilst the Lower Tier work will use one or more of the existing strategic traffic models already in place for the major settlements in Lincolnshire.

1.1.3 *Land Use Assumptions Used in LLPT*

The LLPT study work has been undertaken in parallel to the processes to deliver the four individual local plans, all of which are being developed to different programmes. As this LLPT Upper Tier work provides a high level assessment of the potential development impacts across the whole County and has been undertaken prior to land use allocations being confirmed, broad informed assumptions have had to be made for each local plan area on what land use proposals, in terms of both quantity and location, would be appropriate for inclusion in this assessment.

The land use assumptions made to enable the LLPT Upper Tier work to be undertaken have been made on the basis of assessing a worst case and highest possible level of growth that might take place across the county up to 2036. This enabled the modelling to provide a worst case assessment of the emerging local plans, as the higher the growth, the more likely the capacity of the network may be stretched. If the actual growth promoted in one or more of the four Local Plan areas was then lower than this worst case, there would be confidence that the outcome of the LLPT work would remain robust.

The scenarios assessed in this report should therefore not be interpreted as containing the level of growth that will be promoted by the Local Plans. Furthermore they should not be interpreted as containing the sites assessed as suitable for allocation within the four plan areas nor indeed as the sites that ultimately will or should come forward for development.

Since the completion of the technical elements of this Upper Tier phase of work, the Local Plans have progressed. For example, the Central Lincolnshire Local Plan (October 2015) is proposing lower growth (1,540 homes per annum) than the assumed growth (1,800 homes per annum) used for the basis of the analysis

described in this report. This demonstrates that the analysis undertaken as part of the LLPT Upper Tier work is robust and has been undertaken on a worst case basis.

1.2 Stakeholder Engagement

This commission has included a process of stakeholder engagement through which the seven districts and two Joint Planning Units have both fed into the process and received feedback. To date, the following engagement process has been undertaken as part of this project:

- Stakeholder Workshop 1 – November 2014

This first workshop, to which representatives from all seven local authorities were invited, introduced the project and its aims and objectives, as well as identifying what information was needed to support the development of the Tool. The workshop also provided the opportunity for local authorities to feed into the process and help to shape its outputs.

- Local Authority Data Collection – December 2014 to February 2015
- Following the first workshop the local authorities were asked to supply information on the assumptions on Local Plan land use quantities and allocations that they wished to be included in the LLPT process. These assumptions were provided in the detail available at that time and were based on worst case, highest potential level of development that could possibly be included in the Local Plans. With the four Local Plans at different stages of development, a significant period was allowed to enable robust land use assumptions to be made by the districts. Following the supply of information, the project team provided technical notes for each of the four Local Plans setting out the land use assumptions agreed and for the LPA/JPU to approve.

- Stakeholder Workshop 2 – May 2015

A second workshop was held following the first full iteration of the Tool to provide feedback to the districts on the initial outputs.

- Local Authority Data Collection – May/June 2015

With the Local Plans continuing to be developed over the course of the development of the Tool, following the second workshop, the LPAs and JPUs were given the opportunity to amend the previously supplied land use assumptions so that a second iteration of the Tool could be run to take account of any changes that had occurred.

The information presented in subsequent sections of this report represent the outputs from the second iteration of the tool, which used updated land use assumptions agreed during the second round of local authority data collection.

However, it should be noted that the development of the local plans continues to be an ongoing process and the land use assumptions have continued to evolve since the second iteration of the Tool has been produced. This report therefore presents the worst case scenario that has been used as a basis for analysis throughout the LLPT Upper Tier work.

1.3 Purpose of this Report

The purpose of this report is to present the outcome of the Upper Tier work; describing the methodology taken in creating the LLPT and to present and discuss the findings.

1.4 Report Structure

Following on from this introduction, the remainder of this report is set out as follows:

- **Section 2** sets out the background and policy context for the study;
- **Section 3** describes the methodology used to create the LLPT;
- **Section 4** explains the future levels of housing and employment growth within Lincolnshire and elsewhere used as the basis on which the Upper Tier analysis has been undertaken;
- **Section 5** presents a County-wide overview of the results emerging from the LLPT;
- **Section 6** presents the results for East Lindsey;
- **Section 7** presents the results for Central Lincolnshire;
- **Section 8** presents the results for South East Lincolnshire;
- **Section 9** presents the results for South Kesteven;
- **Section 10** gives a summary of the findings; and
- **Section 11** discusses the next steps of the study.

2 Background

2.1 Purpose of the Study

The principal aim of the project is to provide a tool which will give a strategic view of the impact that potential growth in housing and employment across Lincolnshire will have on the county's highway infrastructure. In turn, this will allow the identification of future highway capacity demands and investments. The project investigates the impact of traffic demand on highways links, rather than links and junctions, to provide a high level, strategic overview of potential constraints and impacts.

Whilst the locations of the most significant planned major developments across the County are generally known, their likely combined impact across the County's highway network has been less well understood. The approach of this project has therefore been to assess the likely highway impacts of developments within each individual district and also collectively across the County, in order to provide an informed overall picture of the impact of this development upon the County's highway network. This has been achieved by predicting the demand for and distribution of travel associated with individual developments and, in this initial phase of the study, identifying likely congestion 'hotspots' and other potential constraints to development.

The LLPT project will provide the LPAs, JPUs and LCC with the information that they need in order to shape future development at a strategic level and guide investment in future transport schemes. Importantly, the tool will provide evidence that can be presented at Examination in Public or used in discussions with developers.

Whilst the project will provide information, at a strategic level, on the combined impact of development allocations across the county, it will not provide evidence of individual developments at a local level. The LLPT therefore does not replace the normal planning application and development control processes.

2.2 Scope of the Study

2.2.1 Geographical Area

The geographical scope of the highway network for this study is the whole of the administrative area covered by Lincolnshire County Council. Additionally, in order to assess the impact on Lincolnshire's highway network of trips which start or end outside the county, planned growth in immediately neighbouring administrative areas has also been taken into account. This is further explained in the planned growth section of this report.

2.2.2 Road Types

The LLPT is primarily concerned with changes in demand on the highway.

The scope of the road network contained within the LLPT (the Upper Tier part of the project) has been defined as those roads that provide strategic movements across the County; these will primarily be A-roads and B-roads.

2.2.3 *Development Period*

The project covers the development period from 2014 to 2036. The end of the period in 2036 aligns with the furthest end date of the four local plans.

2.2.4 *Land Uses*

The study takes into account assumptions on major land use changes which are likely to create significant numbers of trips on the highway network. In practice, the only specific developments that have emerged from consultation with stakeholders at LPAs and JPU's are either housing or employment developments.

2.3 **Policy Context**

2.3.1 *National Planning Policy Framework*

The National Planning Policy Framework (NPPF) was published in March 2012. The document sets out the Government's planning policies for England and explains how these are expected to be applied.

Paragraphs 7 and 8 of the document explain that the purpose of the planning system is to contribute to the achievement of sustainable development. This includes:

- an economic role – contributing to building a strong economy, by ensuring that sufficient land of the right type is available to support growth and innovation; and by identifying and coordinating development requirements, including the provision of infrastructure;
- a social role – supporting strong, vibrant and healthy communities, by providing the supply of housing required to meet the needs of present and future generations; and
- an environmental role – contributing to the protection and enhancement of the natural, built and historic environment.

Paragraph 31 of the NPPF states that local authorities should work with neighbouring authorities and transport providers to develop strategies for the provision of viable infrastructure necessary to support sustainable development.

Paragraph 47 of the NPPF discusses the need for local authorities to provide sufficient land for housing, and states that land identified for housing should be 'deliverable' or 'developable'. One aspect of 'deliverability' and 'developability' is the suitability of the site for housing, taking into account all potential constraints to residential development on the site, including that of highway capacity. Thus, identified housing land must not place an excessive demand on highway capacity. This point is reinforced by paragraph 32 of the document, which states that '*development should only be prevented or refused on transport grounds where the residual cumulative impacts of development are severe*'.

Paragraphs 150-162 of the NPPF discuss the approach to plan making. The document states that '*Local Plans must be prepared with the objective of contributing*

to the achievement of sustainable development. ... Local planning authorities should seek opportunities to achieve each of the economic, social and environmental dimensions of sustainable development, and net gains across all three. Significant adverse impacts on any of these dimensions should be avoided and, wherever possible, alternative options which reduce or eliminate such impacts should be pursued.'

Paragraph 162 of the document states that when making plans, local authorities should 'work with other authorities and providers to:

- *assess the quality and capacity of infrastructure for transport, water supply, wastewater and its treatment, energy (including heat), telecommunications, utilities, waste, health, social care, education, flood risk and coastal change management, and its ability to meet forecast demands; and*
- *take account of the need for strategic infrastructure including nationally significant infrastructure within their areas.'*

Thus, the NPPF makes clear that there is a need when making plans to take account of the impact of planned development on existing infrastructure and consider the need for infrastructure provision.

2.3.2 Planning Practice Guidance – Local Plans

In March 2014, the Department for Communities and Local Government (DCLG) launched the planning practice guidance web-based resource to provide advice and clarification for practitioners on all aspects of the planning system. Planning Practice Guidance provides advice to local authorities and practitioners about various aspects of the planning process. The Section on Local Plans (last updated in March 2015) contains advice on the preparation of a Local Plan.

Paragraph 18 of the section on Local Plans contains advice on how local planning authorities should demonstrate that a Local Plan is capable of being delivered, including provision for infrastructure. This paragraph states that the Local Plan should identify what infrastructure is required, and explain how it can be funded and brought on stream at the appropriate time. The guidance goes on to state that:

'Early discussion with infrastructure and service providers is particularly important to help understand their investment plans and critical dependencies. ... The Local Plan should make clear, for at least the first five years, what infrastructure is required, who is going to fund and provide it, and how it relates to the anticipated rate and phasing of development. ... For the later stages of the plan period less detail may be provided as the position regarding the provision of infrastructure is likely to be less certain. If it is known that a development is unlikely to come forward until after the plan period due, for example, to uncertainty over deliverability of key infrastructure, then this should be clearly stated in the draft plan.'

Where the deliverability of critical infrastructure is uncertain then the plan should address the consequences of this, including possible contingency arrangements and alternative strategies. However, the key infrastructure requirements on which delivery of the plan depends should be contained in the Local Plan itself.

The evidence which accompanies an emerging Local Plan should show how the policies in the plan have been tested for their impact on the viability of development, including (where relevant) the impact which the Community Infrastructure Levy is expected to have.

2.3.3 *Existing and Emerging Local Plans*

All LPAs and joint planning units within Lincolnshire are currently in the process of producing local plans. The current status of these documents is set out below.

- **Central Lincolnshire:** the three authorities of West Lindsey, City of Lincoln, and North Kesteven have formed the Central Lincolnshire Joint Planning Unit and are currently jointly working on the production of the new Central Lincolnshire Local Plan. The Central Lincolnshire Local Plan will establish policies for the growth and regeneration of Central Lincolnshire for the period up to 2036. The final draft is expected to be completed in early 2016 (following two periods of consultation), and adoption of the plan is expected in November 2016. This follows previous work on the Central Lincolnshire Core Strategy which was withdrawn in January 2014. The Local Plan is expected to include many of the policies and strategic allocations that were set out in the draft Core Strategy.
- **South Kesteven:** the District Council's Core Strategy was adopted in 2010, and its Site Allocation and Policies Development Plan Document was adopted in early 2014. The scale and location of development in the District in the period from 2013 to 2026 is set out in these two documents. The Council is now working on a new Local Plan which will replace these documents and which will cover the period to 2036; this is currently expected to be adopted in 2017.
- **East Lindsey:** the Council is currently working on a new Local Plan; this will be made up of a Core Strategy and a settlement proposals document, and will be accompanied by a proposals map. The Draft Core Strategy was produced in October 2012, and the Council is currently producing the draft settlement proposals document. The new Local Plan will guide growth and development in East Lindsey up to 2028.
- **South East Lincolnshire:** Boston Borough Council and South Holland District Council are working together on the production of a joint South East Lincolnshire Local Plan which will guide development across the two authorities over the period to 2036. The South East Lincolnshire Joint Planning Unit is currently preparing the Draft Local Plan with the document expected to be completed by summer 2016, with examination expected in

autumn 2016 and adoption of the Local Plan expected in early 2017. The Councils were previously working on a joint Core Strategy, which reached Preferred Options stage before being superseded by the new emerging Local Plan.

All four emerging Local Plans will set out the expected levels of growth in households and employment over the plan periods. Although as noted previously these plans are not yet adopted, and are therefore subject to change, the overall assumptions for growth in housing and employment used for the LLPT Upper Tier work are set out in the table below. As stated above, these figures are a worst case and should not be interpreted as being the levels of growth that will be promoted in each Local Plan area.

Table 2-1 – Worst Case Housing and Employment Targets in Emerging Local Plans

Planning Unit		Housing Growth (Households)			Employment Growth (Jobs)		
	District	Plan Period	Across Plan Period	2014-2036	Forecast Period	Across Forecast Period	2014-2036
East Lindsey		2016-2031	9,091	13,333	2016-2031	2,880	4,224
Central Lincolnshire	City of Lincoln				2012-2036	8,572	7,858
	North Kesteven				2012-2036	8,518	7,808
	West Lindsey				2012-2036	5,380	4,932
	Total	2011-2036	45,000	42,555	2012-2036	22,470	20,598
South East Lincolnshire	Boston	2011-2036	9,180	8,677			
	South Holland	2011-2036	14,000	13,434			
	Total	2011-2036	23,180	22,111	2012-2031	6,081	7,041
South Kesteven		2011-2036	17,650	15,316	2008-2026	3,164	3,867
Total				93,315			35,730
<p>Notes:</p> <p>Housing and Employment Growth 2014-2036 is calculated by removing units completed during that part of the plan period prior to 2014 and/or by extrapolating housing growth and employment growth from the end of the plan period to 2036.</p> <p>Central Lincolnshire JPU has not disaggregated housing targets by its component Districts.</p> <p>The South East Lincolnshire Employment Land Review does not disaggregate jobs by District.</p> <p>The above figures were used in the second iteration of the LLPT run in June 2015 and may be subject to change as the local plans are developed.</p> <p>Source: East Lindsey DC, Central Lincolnshire JPU, South East Lincolnshire JPU, South Kesteven DC</p>							

2.3.4 DCLG Housing Forecasts

In February 2015, DCLG released household projections based upon 2012 population figures, replacing the previous household projections based upon the 2011-based interim projections. The 2012-based population figures showed a slightly slower rate of growth, with a nationwide projected household population growth of seven per cent between 2012 and 2022 (compared to an equivalent figure of nine per cent between 2011 and 2021 in the previous interim projections).

2012-based Household Growth Forecasts for the Lincolnshire authorities are shown in the table below.

Table 2-2 – DCLG Household Growth Forecasts 2015

Planning Unit	District	2012	2017	2022	2027	2032	2037	Change (2012-2037)
East Lindsey		61,000	63,000	65,000	67,000	69,000	71,000	10,000
Central Lincolnshire	City of Lincoln	40,000	41,000	42,000	44,000	45,000	46,000	6,000
	North Kesteven	47,000	49,000	51,000	53,000	55,000	57,000	10,000
	West Lindsey	39,000	41,000	42,000	43,000	45,000	46,000	7,000
	Total	126,000	131,000	135,000	140,000	145,000	149,000	23,000
South East Lincolnshire	Boston	27,000	29,000	30,000	32,000	33,000	34,000	7,000
	South Holland	37,000	40,000	42,000	44,000	46,000	48,000	11,000
	Total	64,000	69,000	72,000	76,000	79,000	82,000	18,000
South Kesteven		58,000	61,000	64,000	67,000	69,000	71,000	13,000
Total		309,000	324,000	336,000	350,000	362,000	373,000	64,000

For comparison purposes, the table below shows expected growth in housing 2014-2036 based upon TEMPRO forecasts, DCLG household growth projections and emerging LPA/JPU plans. It can be seen that there are large differences between the three forecasts, with the emerging LPA/JPU plans anticipating around 50% more housing than the TEMPRO forecasts, and around 66% more than the DCLG household projections.

Table 2-3 – Forecasts of Household Growth 2014-2036

Local Plan	District	TEMPRO	DCLG HH Projections	LPA/JPU
East Lindsey		2,994	8,949	13,333
Central Lincolnshire	City of Lincoln	15,845	5,391	10,106
	North Kesteven	14,430	8,781	21,344
	West Lindsey	3,431	6,158	10,994
	Total	33,706	20,330	42,445
South East Lincolnshire	Boston	1,031	5,918	8,677
	South Holland	9,845	9,202	13,434
	Total	10,876	15,120	22,111
South Kesteven		17,303	11,661	15,316
Total		64,878	56,060	93,205

3 Methodology

3.1 Overview

In this section, the methodology used to create the Upper Tier Tool is set out. The Lower Tier Models form a different stage of the study and will be described in a separate report.

3.2 Defining the Tool Structure

3.2.1 Zone Structure

Within the tool, England and Wales is divided into 196 zones based upon existing spatial boundaries (administrative areas and super output areas¹). Of these, 132 are within Lincolnshire, where a higher level of detail is needed to build a picture of the way traffic moves within the county. Each settlement of a significant size within Lincolnshire has its own zone, and larger settlements, such as Lincoln, are split into a number of zones.

The remaining 64 zones cover the rest of England and Wales, and are required in order to understand the routes for journeys through Lincolnshire which start or end outside of the county. In general, the further from Lincolnshire, the larger the zones, since small changes to start or end points a greater distance from Lincolnshire are unlikely to have any impact on the route taken through the county.

For each zone, existing numbers of households and jobs have been identified. In addition, other land uses which can be an origin or destination of vehicle trips (such as town centre retail areas) are also considered.

3.2.2 Network Structure

A representation of the highway network has been developed within the tool. Within Lincolnshire, all A-roads and B-roads in the county have been included in the network; at a strategic level, these are the roads which would be expected to bear the greatest weight of the traffic generated by any future growth in the county. Outside of Lincolnshire, the highway network is represented in a lower level of detail; as with the zone structure, the further from Lincolnshire, the less detail is needed.

Detailed assessment of the local road network, including lower class (Non A-roads and B-roads) will be undertaken using lower tier models and Transport Assessments.

¹ Super Output Areas (SOA) are geographic areas used for the analysis and interpretation of small area statistics. Middle Super Output Areas have population of between 5,000 and 15,000 people. The boundaries of SOAs are aligned to those of local authorities.

Various parameters are assigned to each road in the network, reflecting issues such as geometry and speeds, which are likely to influence demand for an individual route.

3.3 Building the Tool

3.3.1 *Assigning Journeys to the Model*

Using national travel survey data, together with data on commuting patterns from the 2011 Census, it is possible to understand the nature of vehicle journeys (for example, commuting, trips to school, shopping, and so forth) that average households of various types in the region make. Clearly no household is 'average', but when these figures are applied to large numbers of houses, an accurate picture emerges of the numbers of journeys generated. The software in the tool identifies destinations for these trips: workplaces, educational establishments, town centre retail areas, etc. Some of these may be very local – to the nearest town centre, for example – and some may be of a longer distance. These trips are assigned over a 24 hour period. The way the trips are assigned reflects evidence from the Census and other sources on how far people in Lincolnshire and elsewhere travel to work and for various other purposes. The return journeys associated with these trips are also considered.

The tool also identifies likely routes for these journeys, taking into account the time and distance difference, and assigns traffic to the most favourable route. Based on the combination of all assigned trips on highway network, the tool shows expected demand for journeys on each of the roads.

The tool has been created using a fixed speed network build; that is, it is assumed that traffic travels at appropriate speeds for the road (based on observed peak hour speeds for the base year) and is not slowed by additional congestion generated by future growth in traffic. This is a reasonable approach for a high-level tool; at the lower level models, lower road speeds resulting from congestion will be taken into account.

3.3.2 *Validation*

In order to validate the tool, cordons of counts were created around six of the main urban areas in Lincolnshire. These towns were selected due to the availability of existing count data. The level of traffic entering and leaving these towns in the tool has been compared to observed traffic levels. Following guidance from the DfT (set out in TAG unit M3.1), the extent to which modelled flows reflect observed flows is measured using the GEH statistic, which is a form of the Chi-squared statistic. The modelled flows entering and leaving the six towns considered are typically within 10% of the observed counts and over half of the sites considered achieve a GEH of less than 10%. For these reasons and the strategic nature of its coverage and usage, it is considered that validation is at an appropriate level for the tool's intended purpose.

3.4 Building the Future Year Scenario

Following validation of the tool, the future year scenario was built in order to take account of assumptions of potential future developments. There were two main aspects to this: assumed growth in land uses which generate journeys, such as housing and employment; and updates to the network: new roads, upgrades, and so forth, which may have an effect on the way traffic moves around the network.

In order to understand the possible impact of potential development, each of the LPAs/JPUs in Lincolnshire has supplied worst case assumptions on levels of growth up to 2036 (discussed in more detail in Section 4 of this report). This has included assumptions on specific development sites, and also broader target-based assumptions for housing and job growth, and reflects the work being carried out in producing the emerging Local Plans. This growth was then added to the future year scenario in the following way:

1. Large strategic sites (those where over 500 units may be developed in the period to 2036) are designated as new zones within the Tool, with the 2036 levels of housing and employment assigned to those zones.
2. The housing or employment associated with other specific sites are added to the 2014 housing and employment figures for the existing zones of the Tool which contain those sites; this generates figures for housing and employment in 2036.
3. Assumptions on specific housing or job targets (excluding those which may come forward at the sites identified above) for individual settlements are added to the 2014 housing and employment figures for the zones containing those settlements.

Any remaining growth is assigned to other areas, in proportion with existing numbers of households or jobs within those areas.

Using the above approach, most of the zones in the Tool are forecast to have higher numbers of households and jobs in 2036 than in 2014.

Similarly, housing and employment growth in the period to 2036 has been identified from adopted and emerging policy documents for councils adjacent to Lincolnshire and assigned to zones of the 2036 model in the same way. For the remainder of the country, levels of growth in housing and employment have been assessed from TEMPRO, the Department for Transport's traffic forecasting system.

At this stage of the study it has been assumed that existing patterns of household composition will continue in the period to 2036. In reality, there is evidence from DCLG statistics and elsewhere that household size is likely to shrink somewhat (that is, there will be fewer individuals per household); however, by assuming that patterns of household size remain the same a worst case scenario in terms of trip growth can be presented.

Planned changes to the highway network – such as new roads – are also built into the 2036 version of the model, based upon information from Lincolnshire County Council, Highways England, and LPAs.

4 Growth Assumptions

4.1 Introduction

In this section, the approach to identifying the amount of growth which may come forward in the period up to 2036 is described, and the assumptions used are set out. As identified previously, for the purpose of robustness, the land use assumptions contained in this report are a worst case.

4.2 Approach

Input was sought from each LPA and JPU within Lincolnshire in order to gain a full understanding of the potential pattern of development in the period to 2036. Each authority contributed assumptions for the following:

- Potential increases in household numbers across the District or Joint Planning Area
- Any identified geographical disaggregation of these targets (for example, settlement-specific targets)
- Any identified sites of at least 50 dwellings on which development may be allocated for the period to 2036 (together with any other relevant information available, such as housing types, access arrangements, and so on)
- Potential increases in employment numbers across the District or Joint Planning Area
- Any identified disaggregation of these targets
- Any identified significant employment sites that may be allocated for the period up to 2036.
- Any other significant potential developments which could lead to an increase in trips

Based upon this information, figures for growth in housing and jobs were assigned to each of the zones in the Tool. For large strategic sites (Sustainable Urban Extensions and other residential developments expected to deliver in excess of 500 units in the period to 2036), new zones were created.

It should be noted that the information received for growth in jobs was generally at a lower level of detail than that for growth in housing, with fewer specific sites identified and fewer geographical disaggregation. Most job growth identified was therefore assigned to the zones in the tool by distributing the growth assigned to each district in proportion to current patterns of jobs based on 2011 TEMPRO figures. In the case of the planned Sustainable Urban Extensions, it was ensured that job growth reflected the jobs to population ratio of the towns or cities to which they were

adjacent, so that the pattern of jobs was reflective of the future 'urban' land use of the area rather than the existing 'rural' land use.

The pattern of potential growth in each authority is discussed in more detail below.

4.3 East Lindsey

4.3.1 Housing

For the purposes of establishing assumptions for development in East Lindsey, the district is divided into the coastal and inland zones. Based upon the work being done in putting together the emerging Local Plan, East Lindsey District Council (ELDC) has provided dwelling target assumptions for these zones as shown in the table below. It should be noted that the Local Plan is not yet adopted and the figures used in the Local Plan may ultimately differ from those shown below. However, these figures are likely to be the highest targets that the District might adopt, and will therefore represent a 'worst-case scenario' in terms of vehicle trip generation. For the purposes of robustness in the development of the Upper Tier Tool these figures are therefore the most appropriate to use.

Table 4-1 – Housing Targets for East Lindsey

Area	Targets 2016-2031	Dwellings Required 2014-2036 (by extrapolation)
Coastal Zone	1,400	2,053
Inland Zone	7,691	11,280
Total	9,091	13,333

Coastal Zone

The coastal zone is defined in the draft Core Strategy as the area falling within the Environment Agency's coastal flood hazard zones. In the coastal zone there is an assumed target of 1,400 dwellings in the period 2016-2031, which is expected to be made up largely of existing commitments. Large (>50 dwellings) commitments in the coastal zone are set out in the table below.

Table 4-2 – East Lindsey: Large Settlements in the Coastal Zone

Application Reference	Name	Dwellings
N/031/0652/11	Land off South Road, Chapel St. Leonards	111
E/90/2392/89	Land off Anchor Lane, Ingoldmells	188
N/110/1291/13	Land South of Jacklin Crescent, Mablethorpe	212
S/153/1352/06	Land at Beacon Park, off Churchill Avenue, Skegness	337
N/172/2265/04	Land off Alford Road, Marine Avenue West, Sutton on Sea	123
Total		971
Target for Coastal Zone 2014-2036		2,053
Remainder		1,082

Assumptions on the number of dwellings to come forward at each of these large sites has been assigned to the zone in which they are located. The remaining dwellings have been divided between all zones making up the coastal area in proportion to existing numbers of households.

Inland Zone

ELDC has supplied the following assumed targets for residential development in the inland zone. For each settlement, the dwelling target has been added to the LLPT zone which contains that settlement. Strategic sites which are expected to deliver in excess of 500 dwellings in the period to 2036 have been identified and are treated as separate zones.

Table 4-3 – Residential Development Targets for Settlements in the Inland Zone

Settlement	Dwellings
Louth (Excluding Strategic Site)	1,982
Louth (Strategic Site: Land Rear of Agarth and Southfield Farms)	970
Alford	595
Coningsby	566
Horncastle	1,245
Spilsby	549
Tattershall	434
Binbrook	169
Burgh le Marsh	439
Friskney	103
Grainthorpe	122
Grimoldby	161
Hogsthorpe	160
Holton le Clay	620
Huttoft	97
Legbourne	110
Manby	126
Mareham-le-fen	172
Marshchapel	125
North Thoresby	192
Sibsey	345
Stickney	175
Tetford	81
Tetney	282
Wainfleet All Saints	330
Woodhall Spa	817

Settlement	Dwellings
Wragby	315
Total	7,691

4.3.2 *Employment*

The document 'Demographic Forecasts for East Lindsey' (published November 2013) contains a number of forecasts for likely numbers of jobs created per year for the District, ranging from 192 to -314. In order to take the most robust view, it is appropriate to work on the basis of the highest forecast, which may generate the highest number of trips, i.e. 192 jobs per year. Conversation with officers at ELDC confirms that this is the most appropriate approach to take.

Consequently, it has been assumed that there may be net growth of **4,224** jobs in the period 2014-2036.

The growth in jobs has been distributed in proportion to existing distributions of employment across the District.

4.4 **Central Lincolnshire**

4.4.1 *Housing*

Central Lincolnshire-Wide Targets

The maximum overall housing target for Central Lincolnshire assumed for the period 2011-2036, as used for this Upper Tier work is 45,000 (1,800 per annum). Of these, 2,555 houses have been completed across Central Lincolnshire in the period 2011-2014, leaving a worst case total of 42,445 to be delivered for the period 2014-2036. The estimates of the proportions to be delivered in each of the sub-areas are a set out below.

Table 4-4 – Dwelling Targets for Sub-Areas of Central Lincolnshire

Area	Proportion (%)	Total Dwellings
Central Lincolnshire	100	42,445
Lincoln Area	64	27,165
Sleaford	13	5,518
Gainsborough	13	5,518
Other Areas	10	4,245

Lincoln Area

The Lincoln Area covers the City of Lincoln and its suburbs in North Kesteven and West Lindsey, as well as the surrounding small towns and villages such as Saxilby, Cherry Willingham, Bardney and Metherringham. Within the Lincoln Area, it has been assumed that 27,165 dwellings may come forward between 2014 and 2036. The project team has been advised to assume that 14,165 of these may come forward at eight strategic locations (each accommodating in excess of 500

dwelling), including three Sustainable Urban Extensions (SUEs), as set out in the table below.

Table 4-5 – Specific Strategic Locations in Lincoln Area

Site Name	Dwellings
Western Growth Corridor (SUE)	3,120
South East Quadrant (SUE)	3,300
North East Quadrant (SUE)	1,400
Grange Farm	2,000
Witham St Hughs	1,245
Waterside North and South	2,000
Firth Road	500
Riseholme	600
Total	14,165

Each of these sites is designated as an individual zone, with the number of dwellings expected to come forward in the period to 2036 assigned to that zone.

Additionally, an assumption has been made that a further three large sites (in excess of 50 dwellings) will accommodate a further 355 dwellings. These are set out in the table below.

Table 4-6 – Specific Large Sites in the Lincoln Area

Site Name	Dwellings
Headland Way, Navenby	78
Church Hill, Washingborough	92
South of Fen Road, Washingborough	185
Total	355

The dwellings from each of these sites are assigned to the zones in which the sites are located.

On the basis of the information set out in the emerging Local Plan, it has been assumed 200 dwellings may come forward in each of the tier 1 Lincoln Area villages defined in the emerging Local Plan and specific development locations, and 100 dwellings in each of the tier 3 villages that fall within the Lincoln Area. Development has therefore been allocated to the locations in the table below (these are in addition to the strategic locations and large sites identified above).

Table 4-7 – Specific Development Locations in Lincoln Area

Location	Location Type	Dwellings
North Hykeham	Tier 1 Location	200
Waddington Lower Field	Tier 1 Location	200
South Hykeham Fosseway	Tier 1 Location	200
Bracebridge Heath	Tier 1 Village	200
Branston	Tier 1 Village	200
Cherry Willingham	Tier 1 Village	200
Dunholm	Tier 1 Village	200
Heighington	Tier 1 Village	200
Nettleham	Tier 1 Village	200
Saxilby	Tier 1 Village	200
Bardney	Tier 3 Village	100
Metheringham	Tier 3 Village	100
Total		2,200
Note: these dwellings are in addition to those strategic and large sites identified in the previous tables.		

Again, the dwellings in each of these locations is assigned to the zone in which each is located.

These specific sites and development locations set out above provide a total of 16,720 dwellings out of a target of 27,165. This leaves a further 10,445 dwellings across the Lincoln Area for which no specific site or location has been identified. This is summarised in the table below.

Table 4-8 – Summary of Supply from Specific Sites and Locations in Lincoln Area

	Dwellings
Target	27,165
Supply from Strategic Sites	14,165
Supply from Other Large Sites	355
Supply from Specific Locations	2,200
Residuum	10,445

This residuum has been divided between all zones making up the Lincoln Area, proportionally to the number of households in each zone.

Sleaford

A significant proportion of the dwellings which may come forward in Sleaford over the plan period may be from two SUEs. The SUEs set out in the table below are anticipated.

Table 4-9 – Supply from SUEs in Sleaford

Site	Dwellings
Sleaford South Quadrant	1,600
Sleaford West Quadrant	900
Total supply from SUEs	2,500
Target for Sleaford	5,518
Residuum	3,018

Each of these SUEs is allocated to its own zone, with the number of dwellings identified assigned to that zone. The residuum has been allocated to the three zones in the model which make up Sleaford, in proportion to existing numbers of households in those zones.

Gainsborough

As with Sleaford, a significant proportion of the dwellings which may come forward in Gainsborough over the plan period may be from SUEs. The SUEs set out in the table below are anticipated.

Table 4-10 – Supply from SUEs in Gainsborough

Site	Dwellings
Gainsborough Southern Neighbourhood	2,500
Gainsborough Northern Neighbourhood	2,400
Gainsborough Eastern Neighbourhood	2,100
Total	7,000

The total supply from these SUEs exceeds the assumption for the target for Gainsborough (5,518). As the SUE at Gainsborough South is further through the planning process than the others, it has been assumed for the purposes of this exercise that the target will be made up of this SUE and as much of the remaining SUEs as is necessary to make up the target. This is shown in the table below.

Table 4-11 – Apportionment of Supply to Gainsborough SUEs

Development	Dwellings
Gainsborough Southern Neighbourhood	2,500
Gainsborough Northern Neighbourhood	1,509
Gainsborough Eastern Neighbourhood	1,509

Each of these SUEs is allocated to its own zone in the tool, with the number of dwellings identified assigned to that zone.

Other Areas

A worst case assumption of 4,245 dwellings has been used for the 'Other Areas' of Central Lincolnshire (see Table 4-4). The following locations are identified as Tier 3 villages in the preliminary draft Local Plan. Using the approach that was used for locations of this type within the Lincoln Area, allocations of 100 dwellings have been assumed for each Tier 3 village as shown in the Table below.

Table 4-12 – Specific Development Locations in Other Areas

Location	Location Type	Dwellings
Heckington	Tier 3 Village	100
Ruskington	Tier 3 Village	100
Billinghay	Tier 3 Village	100
Keelby	Tier 3 Village	100
Middle Rasen	Tier 3 Village	100
Market Rasen	Tier 3 Village	100
Caistor	Tier 3 Village	100
Navenby	Tier 3 Village	100
Total		800

The following numbers of additional dwellings have been assumed for the Other Areas.

Table 4-13 – Remaining Supply to be Identified in Other Areas

	Dwellings
Target	4,245
Supply from Specific Locations	800
Residuum	3,445

This residuum has been allocated to the zones which make up the Other Areas in proportion to existing numbers of households in those zones.

4.4.2 Employment

The following increase in jobs across Central Lincolnshire has been assumed.

Table 4-14 – Distribution of Job Growth Across Central Lincolnshire Districts

District	Jobs 2012-2036	Jobs 2014-2036 (by extrapolation)
City of Lincoln	8,572	7,858
North Kesteven	8,518	7,808
West Lindsey	5,380	4,932

Job growth in the City of Lincoln and North Kesteven are apportioned to zones in the LLPT model in proportion with the existing distribution of jobs (with the exception that areas designated as SUEs have been assumed to start from a job distribution typical of the urban area to which they are adjacent).

Within West Lindsey, two particular sites have been taken into account: Hemswell Cliff and Lincolnshire Showground, each of which may accommodate a significant number of jobs in the period to 2036. Each of these has been designated as a zone in the model, to which the following number of jobs have been allocated.

Table 4-15 – Large Employment Sites in West Lindsey

Site	Jobs
Hemswell Cliff	1,586
Lincolnshire Showground	446
Total	2,032
Target for West Lindsey	4,932
Residuum	3,000

This residuum is distributed to the zones in West Lindsey in the LLPT model in proportion with the existing distribution of jobs (again, with the exception that areas designated as SUEs have been assumed to start from a job distribution typical of the urban area to which they are adjacent).

4.5 South East Lincolnshire

4.5.1 Housing

District-Wide Targets

South East Lincolnshire Joint Planning Unit (SELJPU) has provided the assumptions in the table below regarding housing targets for the Districts.

Table 4-16 – Dwelling Targets for South East Lincolnshire

Area	Targets 2011-2036	Completed 2011-2014	Dwellings Required 2014-2036
South East Lincolnshire	23,180	1,069	22,111
Boston Borough	9,180	503	8,677
Boston Town	7,000	360	6,640
Other Areas	2,180	143	2,037
South Holland District	14,000	566	13,434
Spalding	7,450	369	7,081
Other Areas	6, 550	197	6,353

Boston Town

SELJPU has identified the following large sites (>500 units) in Boston which may

contribute to the identified targets.

Table 4-17 – Strategic Sites in Boston Town

Site Name	Dwellings
South West Quadrant SUE	1,900
Large Strategic Sites on Western edge of Boston (2)	1,987
FEN014 (Land adjacent to Punchbowl Lane)	501
WYB009 (Land to the South of Tytton Lane East)	500
Total	4,888

A zone has been created for each of these sites.

The following potential sites between 50 and 499 units have been identified. Assumed levels of development at these sites has been allocated to the zone in which each site is located.

Table 4-18 – Other Large Sites in Boston Town

Site Name	Dwellings
FEN006	240
STS001 (Broadfield Lane)	200
CEN003 (Pilgrim Foods)	59
Roseberry Meadows	206
FIS014 / FIS015 (Land to the west of Toot Lane)	340
FIS031 (Land to the east of Toot Lane)	79
Total	1,124
Total from Strategic Sites	4,888
Target for Boston 2014-2036	6,640
Remainder	628

The remaining 628 units have been distributed among the zones making up Boston in proportion to existing numbers of households in these zones.

Remainder of Boston Borough

Based on information supplied by SELJPU, assumptions on the levels of development in the remainder of Boston Borough are set out as follows:

Table 4-19 – Residential Development in the Remainder of Boston Borough

Location	Dwellings 2011-2036	Completed 2011-2014	Dwellings 2014-2036
Kirton	700	2	698
Swineshead	500	30	470
Sutterton	350	4	346
Wrangle	160	81	79
Bicker	150	0	150
Fishtoft	100	0	100
Old Leake	100	14	86
Butterwick	70	2	68
Wigtoft	50	2	48
Total	2,180	135	2,045

Residential development for each of these zones is assigned to the zone in which that settlement is located. The total of 2,045 very slightly exceeds the assumed target for the remainder of Boston, a discrepancy included to allow for some flexibility. To account for this, the oversupply of eight units has been subtracted from all zones in Boston Borough outside of the town of Boston to which development has been assigned, in proportion with the amount of development assigned to those zones.

Spalding

SELJPU has identified the following large sites (>500 units) in Spalding which may contribute to the identified targets.

Table 4-20 – Strategic Sites in Spalding

Site Name	Dwellings
Holland Park Extension	2,250
Land north of Vernatt's Drain and west of Pinchbeck Road	4,250
Total	6,500

A zone has been created for each of these sites, and the number of dwellings expected at each site assigned to those zones.

The following sites of between 50 and 499 units have been identified as potential allocations. Development at these sites has been allocated to the zone in which each site is located.

Table 4-21 – Other Large Sites in Spalding

Site Name	Dwellings
Former Jewson's, Roman Bank	63
2-4 St. John's Road	53
Land to the East of Wygate Park	443
Land to the west of Hayfields	195
Total	754
Total from Strategic Sites	6,500
Target for Spalding 2014-2036	7,081
Surplus	173

The surplus of 173 units has been subtracted from all zones in Spalding to which development has been assigned, in proportion with the amount of development assigned to those zones.

Remainder of South Holland District

Based on information supplied by SELJPU, development expected in the remainder of South Holland District is set out as follows:

Table 4-22 – Residential Development in the Remainder of South Holland District

Location	Dwellings 2011-2036	Completed 2011-2014	Dwellings 2014-2036
Holbeach	1,750	25	1,725
Long Sutton	750	44	706
Crowland	500	44	456
Donington	500	31	469
Pinchbeck	250	37	213
Sutton Bridge	250	2	248
Gosberton	300	7	293
Moulton	250	0	250
Surfleet	200	0	200
Weston	300	2	298
Moulton Chapel	200	0	200
Whaplode	200	1	199
Fleet Hargate	150	0	150
Quadring	150	0	150
Tydd St. Mary	150	0	150
Cowbit	100	0	100
Deeping St. Nicholas	100	0	100
Gedney Church End	100	0	100

Location	Dwellings 2011-2036	Completed 2011-2014	Dwellings 2014-2036
Gedney Hill	100	0	100
Gosberton Clough / Risegate	50	0	50
Sutton St. James	100	1	99
Tydd Gote	100	0	100
Total	6,550	194	6,356

The total of 6,356 exceeds the assumed target of 6,353 by three dwellings. These additional three dwellings have been subtracted from the zones of South Holland outside of Spalding to which development has been assigned in proportion with the amount of development assigned to those zones.

4.5.2 *Employment*

The South East Lincolnshire Employment Land Review forecasts that there may be an increase of 6,081 jobs across all sectors in the period 2012-2031. Extrapolating to the 2014-2036 period, this gives an assumption of 7,041 jobs. B-class jobs are expected to be a relatively small proportion of these (less than 25%), with the main growth expected to be in retail, education, healthcare and related sectors.

The growth in jobs is distributed to zones of the model in proportion to existing distributions of employment across the two districts.

4.6 **South Kesteven**

4.6.1 *Housing*

South Kesteven District Council (SKDC) has provided the assumptions in the table below for housing targets for the District. These targets represent the highest housing requirement SKDC would consider using for its Local Plan, and therefore the most robust assumptions to use.

Table 4-23 – Dwelling Targets for South Kesteven

Area	Proportion (%)	Targets 2011- 2036	Built 2011-2014	Dwellings Required 2014-2036
South Kesteven	100	17,650	2,334	15,316
Grantham	56	9,884	809	9,075
Bourne	10	1,765	536	1,229
Stamford	10	1,765	274	1,491
The Deepings	10	1,765	268	1,497
Local Service Centres	10	1,765	338	1,427
Rural Areas	4	706	109	597

Grantham

SKDC has identified the following strategic sites (>500 units) sites in Grantham which may contribute to the identified targets.

Table 4-24 – Strategic Sites in Grantham

Site Name	Dwellings
North West Quadrant (Phase 1)	1,800
North West Quadrant (Phase 2)	1,700
Southern Quadrant	4,000
Land South of Belton Land and west of Manthorpe Road	550
Total	7,500

Each of these sites has been designated as a zone within the tool, with the number of potential dwellings identified assigned to each zone.

In addition to the sites above, the following potential large sites (>50 units) in Grantham have been identified.

Table 4-25 – Large Sites in Grantham

Site Name	Dwellings
Station Approach, Grantham	72
Springfield Road / Caunt Road, Grantham	62
S12/0484 Beacon Lane	55
Land north of Dysart Road, Grantham	190
Land south of Barrowby Road	270
S07/0798 Barirds Malt Ltd, Springfield Road, Grantham	76
Total	725
Total from Strategic Sites	8,050
Target for Grantham 2014-2036	9,075
Remainder	300

Dwellings for each of these sites are assigned to the zone in which the site is located.

The remaining 300 units have been distributed evenly among the zones making up Grantham.

Bourne, Stamford and The Deepings

Bourne, Stamford and The Deepings are each entirely within single zones of the LLPT, (with the exception of the Elsea Park SUE adjacent to Bourne, which is treated as a single zone). Dwellings assigned to each of these locations are therefore assigned to the zones in which these settlements are located.

Table 4-26 – Residential development in Bourne, Stamford and The Deepings

Location	Dwellings
Bourne (excluding the Elsea Park SUE)	179
Elsea Park SUE, Bourne	1,050
Stamford	1,491
The Deepings	1,497

Local Service Centres

An assumed target of 1,427 dwellings for local service centres has been identified by SKDC. These assumed dwellings have been divided evenly between the named settlements below, with the dwellings for each settlement assigned to the zone in which that settlement is located.

Table 4-27 – Residential development in Local Service Centres

Local Service Centre	Dwellings
Ancaster	89
Barrowby	89
Barkston and Syston	89
Baston	89
Billingborough & Horbling	89
Castle Bytham	89
Caythorpe & Frieston	89
Colsterworth and Wololsthorpe by Colsterworth	89
Corby Glen (1)	45
Corby Glen (2)	45
Great Gonerby	89
Harlaxton	89
Langtoft	89
Long Bennington	89
Morton & Hanthorpe	89
South Witham	89
Thurlby and Northorpe	89

Rural Areas

The assumed target of 597 for the rural areas has been divided evenly between the thirteen LLPT zones in South Kesteven which contain rural areas.

4.6.2 Employment

The South Kesteven Employment Land Review presents three alternative scenarios for job growth, giving potential job growth over the 2008-2026 period of between 85

and 3,164 jobs. In order to take a robust approach, the largest figure from these three scenarios has been used – that is, 3,164 jobs in the 2008-2026 period. Extrapolating to a 2014-2036 period, this gives a target of **3,867** jobs across the District in the 2014-2036 period. These are distributed in proportion with existing job distributions (with the exception of SUEs, which are assumed to start from a base level of job distribution typical of the settlements to which they are adjacent).

4.7 Adjacent Districts

In order to understand the impact of trips which start or end outside of Lincolnshire upon the county's highway network, potential growth within the Journey to Work Area (JTWA) has been identified using the adopted or emerging local plans of the authorities within the JTWA, as well as from conversations with officers.

The Councils' targets for housing and employment cover different periods from the study period. Consequently, target figures for housing and employment for each council area have been calculated as yearly figures, and multiplied by 22 to cover the 22 year period between 2014 and 2036. (In a small number of cases, targets are not consistent each year; these have been dealt with on a case by case basis).

In the small number of cases where no figure for predicted employment growth has been provided by the Council (Bassetlaw, Newark and Sherwood and Rutland), assumptions for job growth have been based on the amount of new employment land allocated.

Where policy documents contain disaggregations of targets by settlement or sub-area of the plan, these have been used to break down the targets to individual LLPT zones within each district.

The assessed targets for housing and employment growth for each district in the JTWA is set out in the table below, with significant developments and growth points identified. These are the assumed figures used as a basis for this exercise and are not necessarily the firm, adopted plans of the local authorities.

Table 4-28 – Housing and Growth Targets in the Journey to Work Area

Local Planning Authority	Dwellings 2014-2036	Jobs 2014-2036	Assumptions used for LLPT
North East Lincolnshire	12,217	10,189	The bulk of the residential dwellings are expected in and around the urban areas of Grimsby, Cleethorpes and Immingham. Large new employment sites (such as Europarc IV) have been identified close to the Humber.
North Lincolnshire	16,588	12,100	82% of new housing will be in Scunthorpe, including the planned SUE of Lincolnshire Lakes. Around half of the jobs are expected at South Humber Bank, with Scunthorpe, Lincolnshire Lakes, Sandtoft Airfield and Humberside Airport also providing significant locations for job growth.
Doncaster	27,060	46,596	Significant locations for growth include Robin Hood Airport Doncaster Sheffield and the DN8 development

Local Planning Authority	Dwellings 2014-2036	Jobs 2014-2036	Assumptions used for LLPT
			at Hatfield / Stainforth.
Bassetlaw	7,770	10,700	Main foci of growth are Worksop, Retford and Harworth Bircotes. Growth in B8 uses expected in locations close to A1.
Newark and Sherwood	16,280	22,000	Around half of this growth is expected at three new SUEs planned around Newark.
Rushcliffe	19,040	5,694	58% of housing growth will be in SUEs and other developments adjacent to Nottingham.
Nottingham	22,198	26,004	
Melton	5,390	2,087	The majority of this growth (60-70%) is expected to come forward in Melton Mowbray
Rutland	2,939	726	56% of housing growth and the majority of job growth is expected in Oakham.
East Northamptonshire	9,240	7,290	
Huntingdonshire	18,480	16,720	60% of the identified growth to be in Huntingdon, including the SUEs of Alconbury Weald and Wyton.
Peterborough	33,000	27,060	Large proportion of growth in planned SUEs around Peterborough
Fenland	12,100	7,920	The majority of the growth is focused in Wisbech, March and Chatteris
King's Lynn and West Norfolk	14,520	6,130	45% of housing and 76% of job growth expected to be in King's Lynn

4.8 Highway Schemes

The following table sets out the significant highway schemes within the defined travel to work area which have been taken account of in the development of the future model network for 2036 (it has been assumed, for the purposes of this exercise that these schemes will be delivered and opening by 2036). The following documents were used to obtain this information:

- Lincolnshire Local Transport Plan (LTP)
- North East Lincolnshire LTP
- North Lincolnshire LTP
- South Yorkshire Local LTP
- Nottinghamshire LTP
- Leicestershire LTP
- Peterborough LTP
- Cambridgeshire LTP

- Norfolk LTP
- Highways Agency Route Strategy: South Pennines
- Highways Agency Route Strategy: London to Leeds (East)
- Highways Agency Route Strategy: North and East Midlands
- Highways Agency Route Strategy: East of England

Additionally, discussions were held with the four planning authorities in Lincolnshire, and with the Highways Agency. Confirmation of schemes was sought and received from Highways Agency Areas 6, 7, 8 and 12.

Table 4-29 – Highway Schemes included in the LLPT Assessment

Location	Scheme	Status
Lincolnshire	Lincoln Eastern Bypass to remove the A15 from the city centre via a link between the A158 junction to the north to the A15 south of the urban area	Committed
Lincolnshire	Lincoln East-West Link creating new road in Lincoln City Centre	Committed
Lincolnshire	Boston Distributor Road or Bypass to remove both through traffic and local journeys from the urban area (links associated with Quadrant 1 and 2 only included in Second Iteration).	Aspirational
Lincolnshire	Spalding Western Relief Road linking B1172, north of the A1175, to the B1180 (linking to the A16)	Developer Funded
Lincolnshire	Spalding Intermodal Freight Terminal to facilitate the transfer of freight from road to rail	Aspirational (private sector led)
Lincolnshire	Upgrade to A17 / A151 junction , potentially making the junction a roundabout, and providing link roads to new planned development.	Developer funded
Lincolnshire	Skegness Western Relief Road between A52 and A158	Aspirational
Lincolnshire	South East Sleaford Regeneration Route , providing access to new sites close to the centre of Sleaford and improving circulation around the town centre.	Committed
Lincolnshire	Level Crossing on A1175 Tallington is identified by Network Rail for replacement by a bridge; there is also some demand for a bypass of the village	Aspirational
North Lincolnshire	A160 improvements to increase capacity and accommodate growth of South Humber Gateway	Committed
North Lincolnshire	De-trunking of the M181 to support the Lincolnshire Lake Development	Aspirational
North East Lincolnshire	A18 / A180 Link Road to connect eastern Lincolnshire to the Humber ports and the motorway network	Committed
Doncaster	Finningley and Rossington Regeneration Route Scheme (FARRRS) – new route linking Junction 3 of the M18 to Robin Hood Airport	Committed
Doncaster	Hatfield – Stainforth Link Road creating a new link road from Junction 5 of the M18 to Hatfield	Aspirational (likely to be developer funded)
Doncaster	Improvements to the M18 , including northbound widening between junctions 2 and 3 and capacity improvements at junction 5	Committed
Doncaster	Dualling of A630 in Doncaster between junction 4 of M18 and A18	Aspirational
Doncaster	A1(M) Doncaster Bypass improvements creating an extra lane of capacity	Committed
Doncaster	A1(M) Redhouse to Darrington upgrade to Motorway standard	Committed
Nottinghamshire	Elkesley Grade Separation Scheme creating a new grade separated junction over the A1 giving traffic a route between Elkesley and Retford avoiding the A1	Committed

Location	Scheme	Status
Nottinghamshire	Dualling of A453 between Nottingham and the M1	Committed
Peterborough	Improvements to junctions on the A47 north of Peterborough to support planned growth of the city	Committed
Peterborough	Dualling of the A47 between the A1 and Sutton	Committed
Peterborough	New roads and improvements to existing roads around urban extensions of Hampton and Great Haddon	Developer Funded
Cambridgeshire	Junction improvements at A47/A141 junction	Committed
Norfolk	Junction improvements on the A47	Committed
Norfolk	Dualling of the A47 between Norfolk and Dereham	Committed
Norfolk	Dualling of the whole of the A47 through Norfolk	Aspirational
Source: Lincolnshire County Council, North Lincolnshire Council, North East Lincolnshire Council, South Yorkshire LTP Partnership, Doncaster Metropolitan Borough Council, Nottinghamshire County Council, Peterborough City Council, Cambridgeshire County Council, Leicestershire County Council, Norfolk County Council, Central Lincolnshire JPU, South Kesteven District Council, East Lindsey District Council, South East Lincolnshire JPU, Highways Agency (Areas 6, 7, 8 and 12)		

5 Results – Overview

5.1 Introduction

The section of the report presents the outputs from the Tool for the whole county for 2014 and 2036. The outputs are based on the Core Scenario (see Section 11.2) and, as stated previously, are taken from the second run of the Tool following the feedback workshop with local authority stakeholders and are based on a worst case scenario for development.

The outputs from the Tool are presented in the following ways:

- Forecasts of traffic growth up to 2036
- AM Peak hour vehicle trip generation between zones
- Distributions of journey origins and destinations
- Traffic flow differences between 2014 and 2036 (AM Peak)
- Comparisons of demand flow to link capacity (links being the sections of carriageway between junctions)

These datasets are used in this section and the sections presenting the outputs for individual Local Plan area, to provide an understanding of the possible impact of potential development allocations.

In addition, to provide some context for the outputs from the Tool, the existing AM peak hour average speeds, taken from Trafficmaster, are presented alongside the traffic flow differences.

It should be noted that trips included in the following analysis are those that pass from one zone to another (inter-zonal trips). Trips that remain wholly within individual zones are excluded from the analysis as the Tool provides a strategic view of travel demand between zones rather than within zones.

The major highway schemes planned for implementation prior to 2036 (as identified in Table 4-29) have been included in this analysis and are shown in the outputs for that year.

5.2 Traffic Flow Forecasts

The table below shows forecast increases in traffic flows from 2014 to 2036, with TEMPRO forecasts included for comparison purposes. TEMPRO is the Department for Transport's Trip End Model Presentation Programme which is used to provide traffic growth forecasts from the National Trip End Model (NTEM) and is the industry standard system for providing traffic growth forecasts.

Table 5-1 – Forecast Growth in Traffic 2014-2036

Local Plan Area	TEMPRO	LLPT
East Lindsey	7%	20%
Central Lincolnshire	18%	28%
South East Lincolnshire	13%	29%
South Kesteven	17%	21%
Lincolnshire	15%	26%

It can be seen from the table above that the growth forecast by the LLPT over the 2014-2036 period is significant, with a growth of 26% forecast for the whole county, considerably higher than the 15% forecast by TEMPRO. It should be borne in mind that NTEM is likely to include older projections for household and employment growth than those included in the LLPT and that LLPT presents a 'worst-case' scenario with regard to current growth assumptions. Nevertheless, the differences between the two forecasts are considerable, and show that should Lincolnshire grow in line with the assumptions used for this exercise, traffic growth may be much higher than forecast by TEMPRO.

The table below shows the numbers of inter-zonal vehicle trips with origins and destinations in each plan area in Lincolnshire in the AM peak hour in 2014 and 2036.

Table 5-2 – Vehicle Trip Generation (AM Peak)

Local Plan Area	2014		2036	
	Origin	Destination	Origin	Destination
East Lindsey	11,809	10,607	14,233	12,706
Central Lincolnshire	27,311	26,647	35,457	33,555
South East Lincolnshire	14,797	14,173	19,038	17,467
South Kesteven	13,211	11,938	16,152	14,459
Lincolnshire	67,128	63,365	84,880	78,187

The table above shows that all four plan areas are net generators of trips in the AM peak, indicating that, for example, Lincolnshire as a whole has more workers than jobs. This pattern becomes more pronounced by 2036, as the working population is expected to grow by more than the number of jobs. An increase in out-commuting from the County can therefore be expected. It can also be seen in the table above that Central Lincolnshire is and may remain by some way the most significant generator and destination of trips.

The table below provides this information for the largest settlements within the county.

Table 5-3 – Vehicle Trip Generation by Settlement (AM Peak)

Settlement	2014		2036	
	Origin	Destination	Origin	Destination
Lincoln	12,921	15,149	17,451	19,143
Gainsborough	1,746	1,930	2,748	2,718
Sleaford	3,022	2,724	4,169	3,567
Louth	1,529	1,786	2,044	2,166
Boston	3,659	4,265	4,913	5,381
Spalding	3,400	3,819	4,793	4,948
Grantham	3,982	4,194	5,597	5,477
Other Lincolnshire	36,870	29,498	43,163	34,784
Lincolnshire Total	67,129	63,365	84,878	78,174

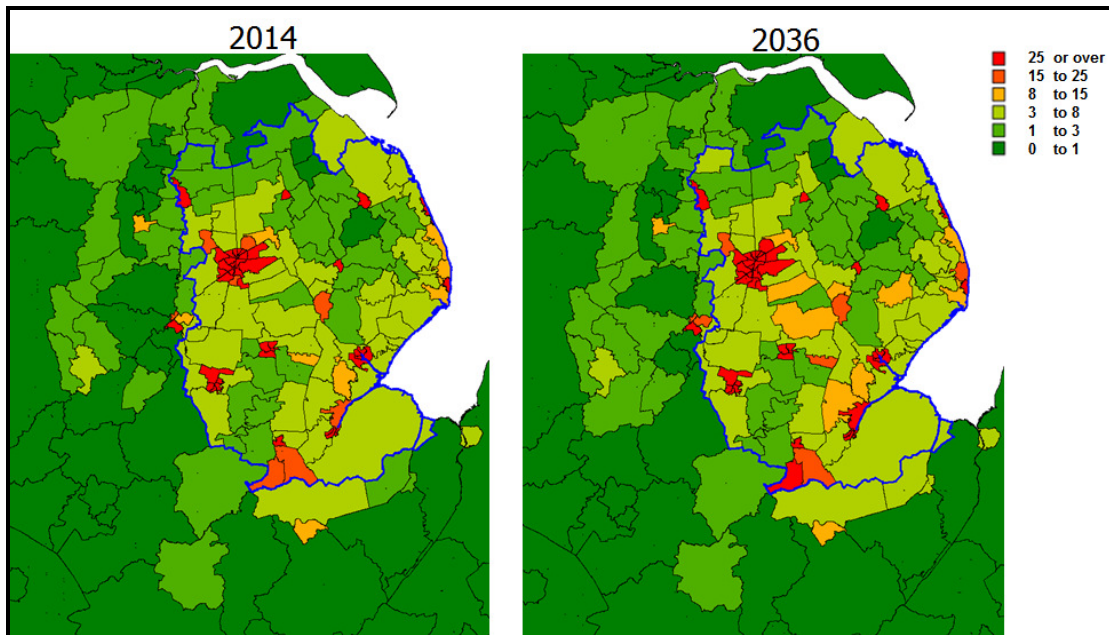
The table above provides more detail on the pattern of inter-zonal vehicle trip generation within Lincolnshire. It can be seen that in most cases, Lincolnshire's largest towns are net attractors of peak hour trips (the single exception being Sleaford, which generates more peak hour trips than it attracts). By far the greatest generator and attractor of trips in the county is Lincoln, which is the origin and destination of over three times as many trips as any other settlement, and is the origin for almost one fifth – and the destination for almost one quarter – of all the AM Peak hour trips in the county, reflecting its importance both as a centre of population and as a place of travel destination.

It can also be seen by comparing the above two tables that, as the towns are net attractors of trips, but the LPAs are net generators, that jobs are focussed on the LPAs' urban areas and to some extent outside the LPA areas.

These patterns are expected to continue in the period to 2036, with the dominance of Lincoln actually growing slightly. All the main settlements are expected to grow significantly: Lincoln is expected to increase vehicle trip generation by an additional 30%, Grantham and Sleaford by 35%, and Gainsborough by 49%.

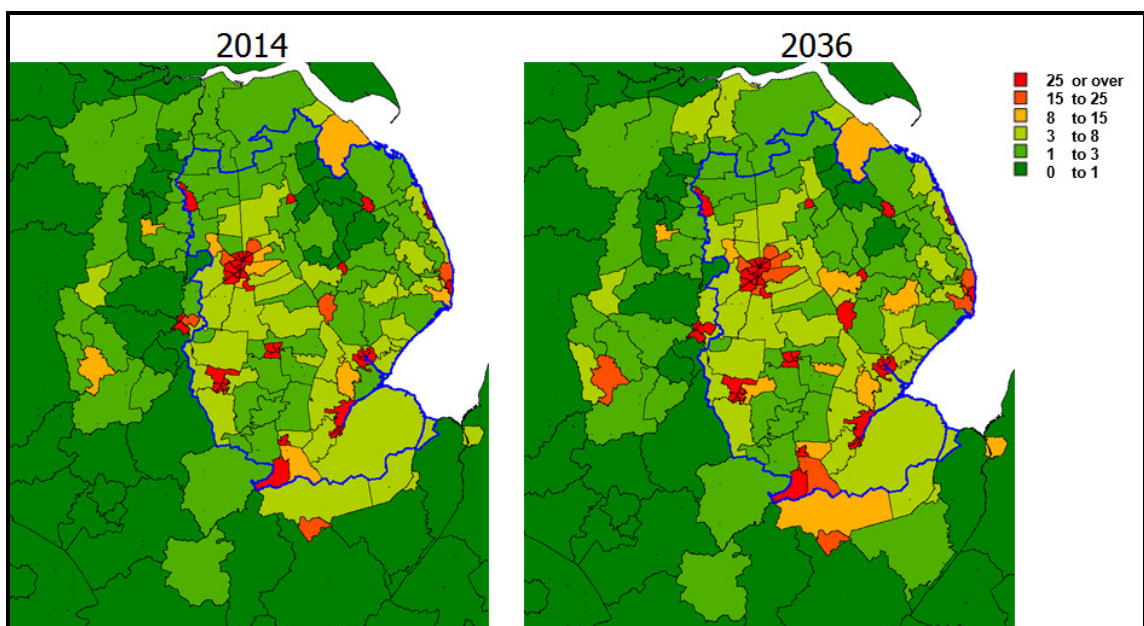
The figures below show the origins and destinations of peak hour trips to and from Lincolnshire in the AM Peak in 2014 and 2036. Note that in order to give appropriate prominence to zones of different geographical sizes, the maps show the number of journeys per square kilometre.

Figure 5-1 – Journey Origins to Lincolnshire, AM Peak



The figures above show that the main concentration of trip origins for trips in Lincolnshire is the Greater Lincoln area. The figures also highlight the other main towns in the county as important sources of peak hour trips, in particular Gainsborough, Grantham, Sleaford, Boston and Spalding. There is also a concentration of trips origins along the coast of East Lindsey. Outside of Lincolnshire, significant sources of trips include Peterborough, Newark, and Grimsby/Cleethorpes. This pattern is expected to remain broadly consistent in the period to 2036.

Figure 5-2 – Journey Destinations from Lincolnshire, AM Peak



The pattern of destinations for journeys is similar; again, the Greater Lincoln area is the most significant destination, followed by Grantham, Boston and Spalding. Outside the county, Peterborough is the most significant destination, followed by Grimsby/Cleethorpes; Nottingham and Newark are also significant destinations. By 2036, it is forecast that Nottingham and Peterborough may both have grown in importance as journey destinations, and that the importance of Scunthorpe as a destination may also have grown.

5.3 Comparison of Current and Future Travel Patterns

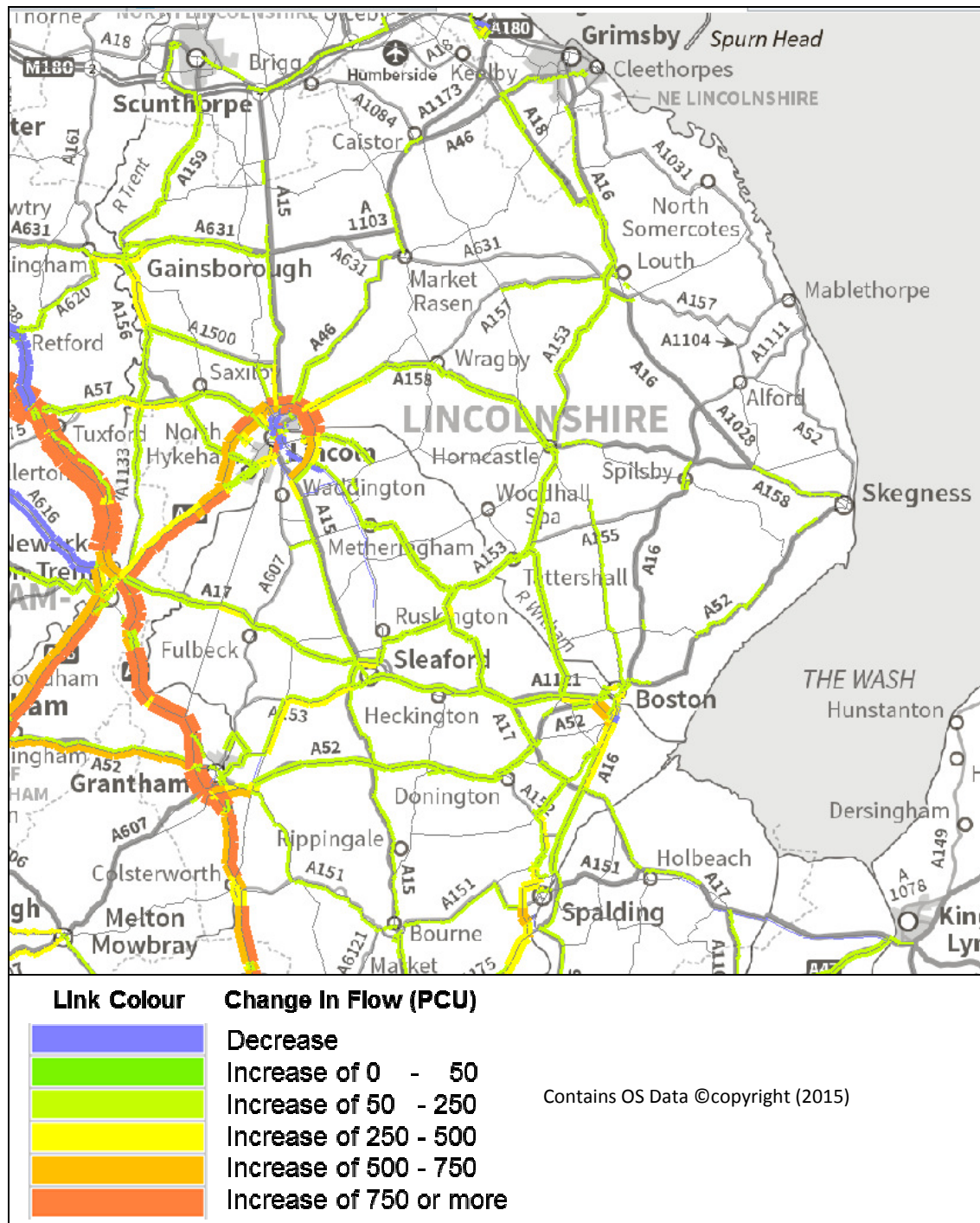
For ease of presentation and comprehension, analysis of current highway network speeds and traffic flows difference are presented in the separate sections for the individual Local Plan areas.

5.3.1 Flow Difference

The following figure shows the difference in traffic flows on the A and B-roads between 2014 and 2036². The flow differences are based on the changes in demand for journeys to be made on individual roads. More detail is provided in the sections of this report focussing on each local plan area, however, at this high level, it can be seen that the greatest growth in traffic flow is forecast to be concentrated around Lincoln. Other areas of significant growth in traffic flow may be in South East Lincolnshire and South Kesteven.

² Traffic flows are presented in PCUs (Passenger Car Units) – a method of aggregating overall traffic levels without breaking the data down into cars, buses, HGVs, etc.

Figure 5-3 – Flow Difference 2014 – 2036 – AM Peak – Lincolnshire



5.3.2 Comparison of Demand to Capacity

The figures below show assessments of traffic flow demand to link capacity for the AM and PM peaks for the whole of Lincolnshire in the 2014 base year and 2036 study year.

Figure 5-4 – Volume to Capacity Ratio 2014 AM Peak – Lincolnshire

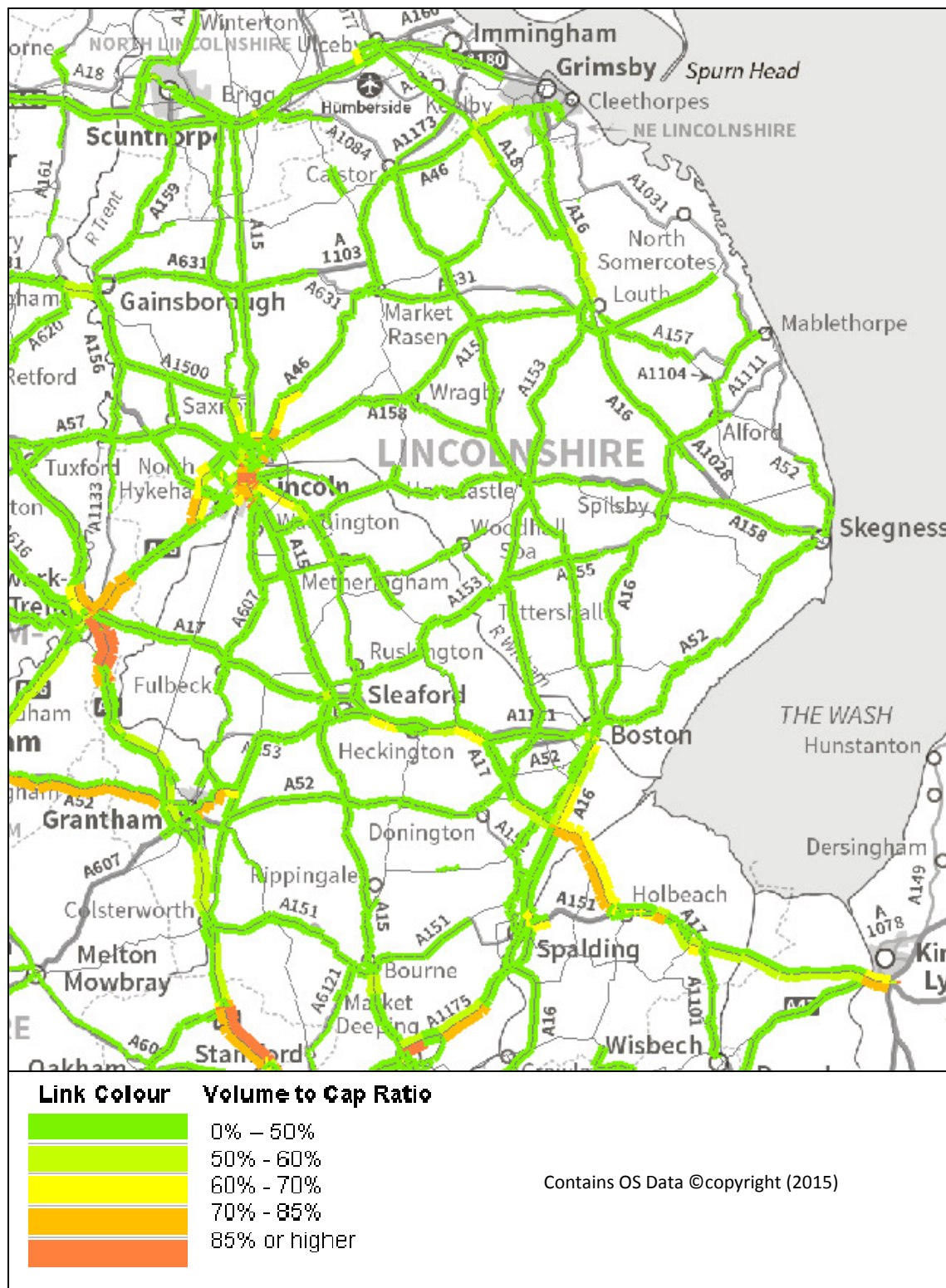


Figure 5-5 – Volume to Capacity Ratio 2036 AM Peak – Lincolnshire

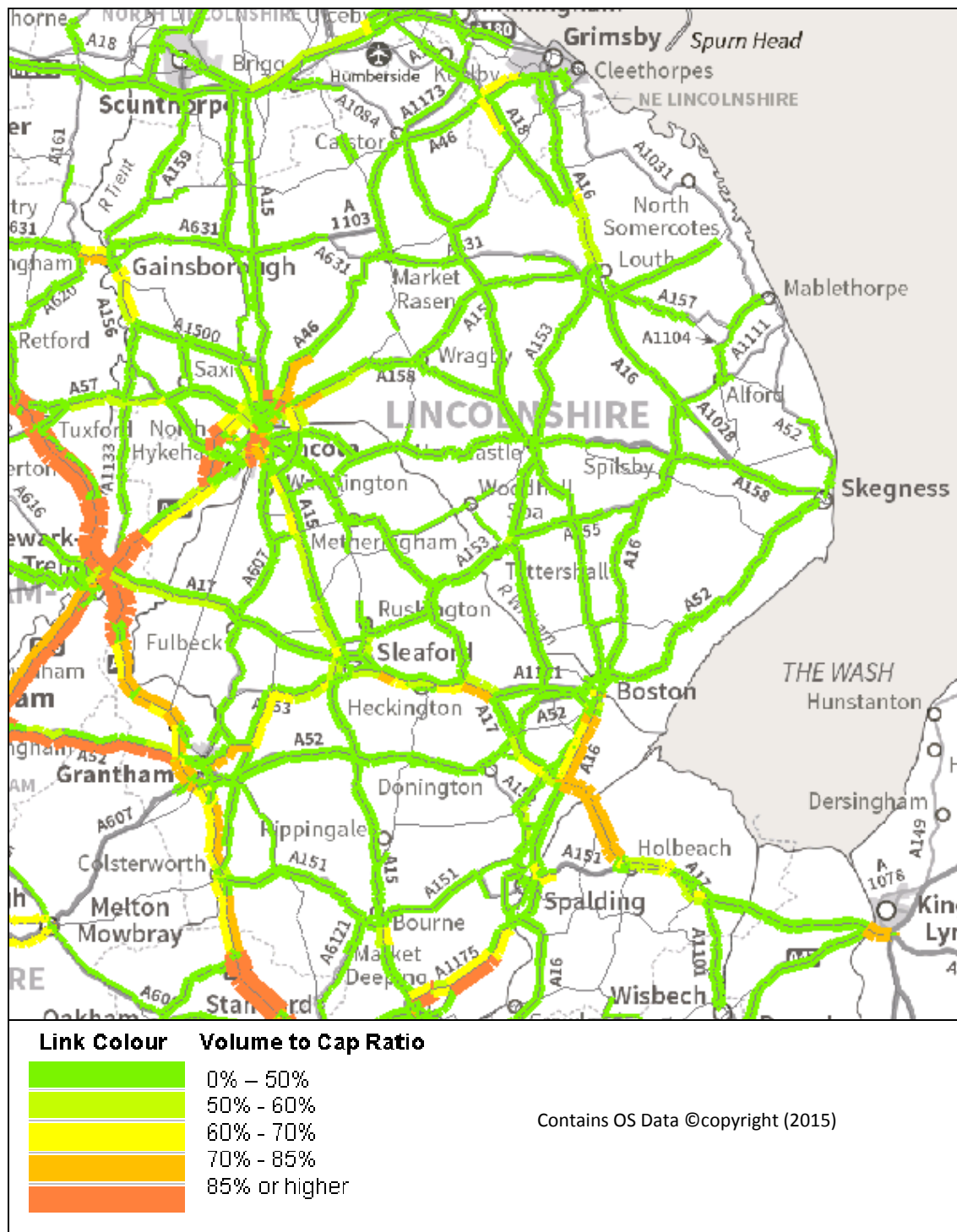


Figure 5-6 – Volume to Capacity Ratio 2014 PM Peak – Lincolnshire

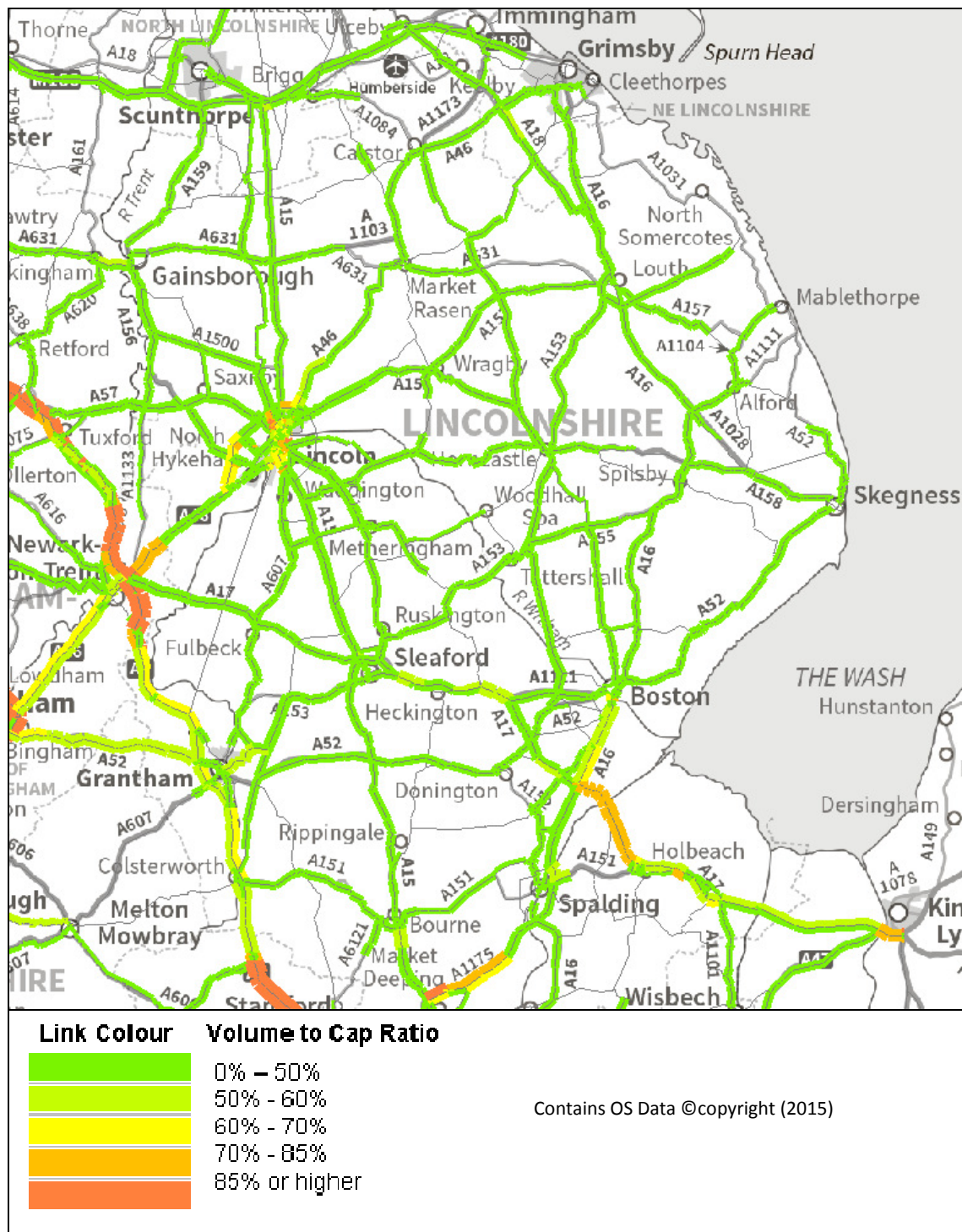
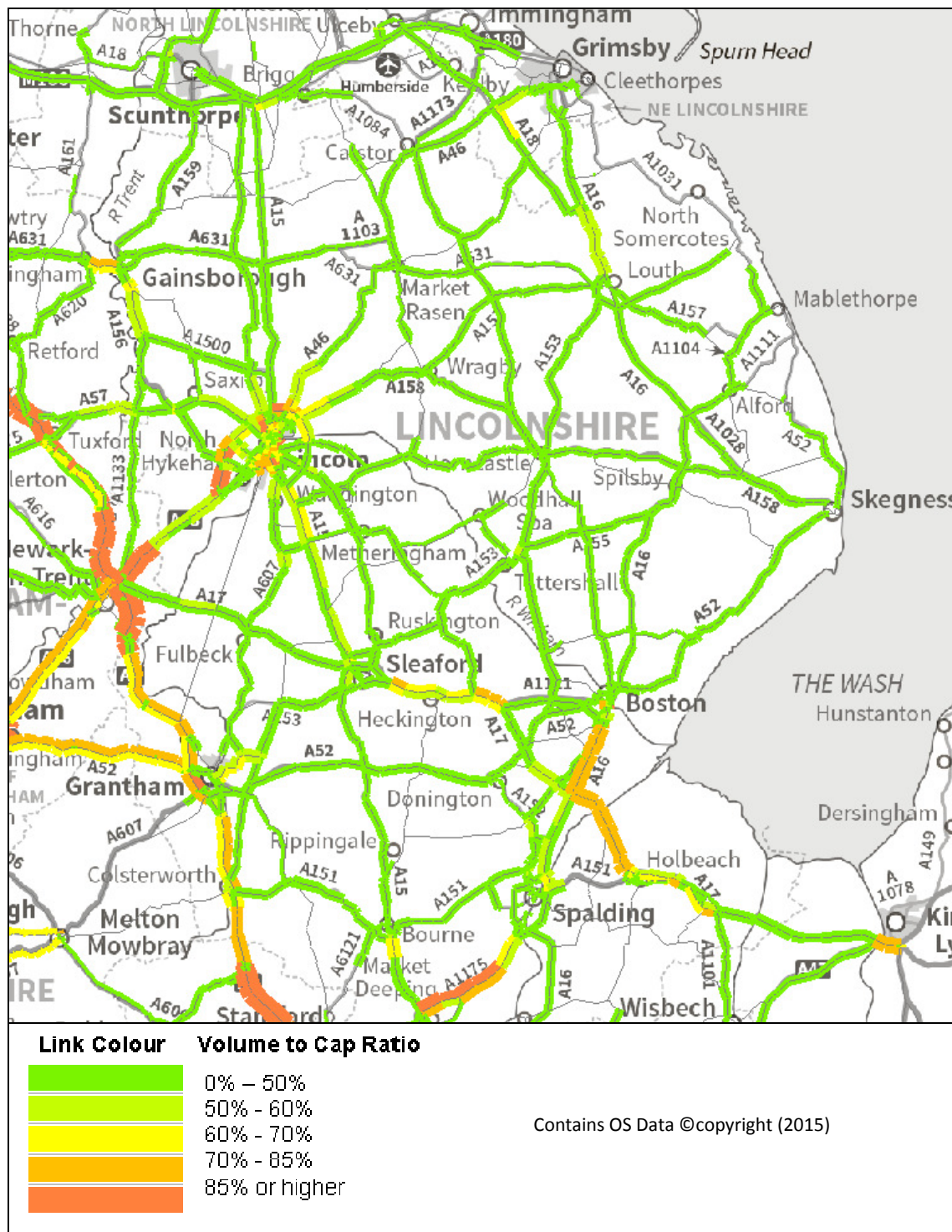


Figure 5-7 – Volume to Capacity Ratio 2036 PM Peak – Lincolnshire



The figures above show that the greatest stress on network capacity in 2014 is in the following locations:

- The network immediately surrounding Lincoln;
- The A17 east of the junction with the A16;
- The A1 near Stamford; and
- The A1175 east of Market Deeping.

Additionally, while it falls outside the county, it should be noted that the A1 and A46 close to Newark are also subject to significant levels of network stress, however, caution should be exercised in the use of analysis for areas outside of Lincolnshire due to the more coarse level of detail of the zoning system.

Although to an extent mitigated by the identified highway improvements, these areas are forecast to continue to suffer from network stress in 2036, with the levels of network stress getting worse in most cases. The following areas are forecast to also suffer from network stress by 2036:

- The A16 south of Boston;
- The A17 east of Sleaford;
- The A16 north of Louth;
- The A1 between Newark and Stamford; and
- The networks around Grantham and Gainsborough.

6 Results – East Lindsey

6.1 Introduction

In this Section, the outputs from the Tool for East Lindsey are presented for the 2014 and 2036 years, based upon the Core Scenario (see Section 11.2).

6.2 Plan Area and Status of Local Plan

The emerging East Lindsey Local Plan will cover the whole of the District of East Lindsey, and will guide growth and development in the District in the period to 2028. The Local Plan will be made up of the Core Strategy, which will set out the vision for development and the broad strategy, and the Settlement Proposals document, which will identify specific sites for development. The Draft Core Strategy document was produced in 2012 with adoption alongside settlement proposals expected in late 2016.

6.3 Results

6.3.1 Origins and Destinations

The tables and figures below show origins and destinations for inter-zonal trips to and from East Lindsey in the AM Peak hour, in 2014 and 2036.

Table 6-1 – Origins and Destinations for AM Peak Hour Trips – East Lindsey

Local Plan Area	Settlement	2014		2036	
		Origin (Trips from E Lindsey)	Destination (Trips to E Lindsey)	Origin (Trips from E Lindsey)	Destination (Trips to E Lindsey)
East Lindsey	Skegness	1,115	1,376	1,261	1,624
	Louth	978	1,248	1,316	1,561
	Other East Lindsey.	4,868	4,336	5,818	5,209
	Total East Lindsey.	6,960	6,960	8,395	8,395
Central Lincolnshire	Lincoln	401	646	548	772
	Other Central Lincolnshire	803	750	956	906
	Total Central Lincolnshire	1,204	1,396	1,504	1,679
South East Lincolnshire	Boston	438	633	589	779
	Other South East Lincs.	441	461	516	524
	Total South East Lincs.	879	1,094	1,105	1,302
South Kesteven	Total South Kesteven	185	207	228	246
External	Grimsby / Cleethorpes	574	954	570	1,136

Local Plan Area	Settlement	2014		2036	
		Origin (Trips from E Lindsey)	Destination (Trips to E Lindsey)	Origin (Trips from E Lindsey)	Destination (Trips to E Lindsey)
	Other External	804	1,198	904	1,475
	Total External	1,379	2,152	1,474	2,611
Total Outside East Lindsey		3,647	4,848	4,310	5,838
Total		10,607	11,809	12,705	14,233
For the purposes of clarity, note that 'origin' refers to the origin of trips whose destination is in East Lindsey; and that 'destination' refers to the destination of those trips whose origin is in East Lindsey.					

Figure 6-1 – Journey Origins to East Lindsey, AM Peak

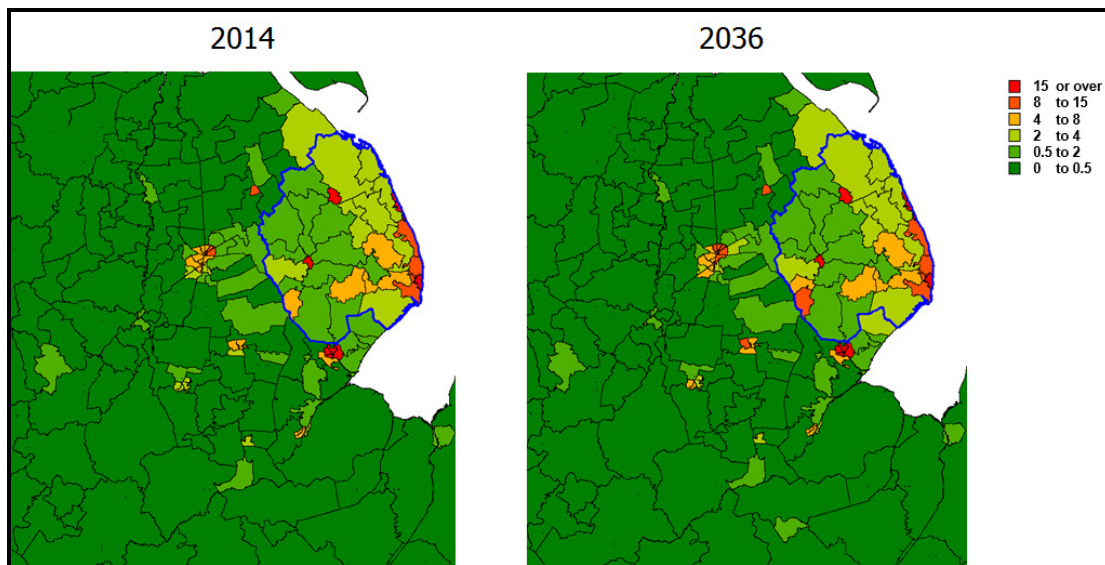
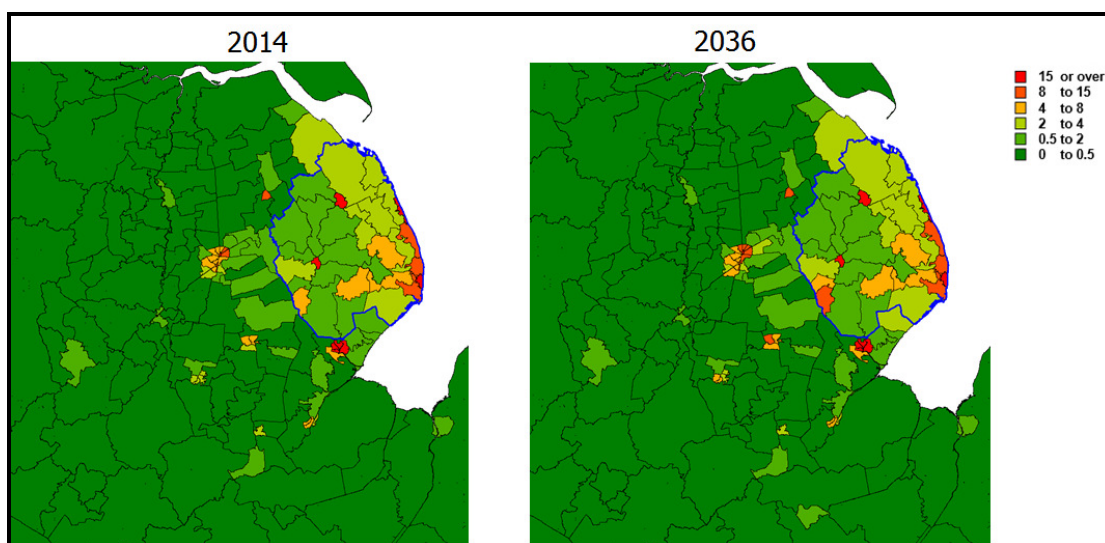


Figure 6-2 – Journey Destinations from East Lindsey, AM Peak



The table and figures above show that most peak hour inter-zonal trips generated within East Lindsey are internal to the District. Such trips account for around two thirds of AM peak hour inter-zonal trips to destinations in East Lindsey in the AM Peak, and around three fifths of AM peak hour trips starting in East Lindsey. The most significant concentrations of origins of trips are Skegness and the neighbouring coastal towns, and Louth.

The total of outgoing peak hour trips is around 33% greater than the total of incoming peak hour trips, showing that East Lindsey is a net generator of peak hour inter-zonal journeys to a greater extent than any of the other plan areas in Lincolnshire. By 2036, the differential between outgoing and incoming peak hour trips is forecast to increase to around 35%, but otherwise the patterns remain broadly consistent, although the overall volumes of trips will be around 20% greater.

Outside of East Lindsey, the most significant single origin of AM Peak hour inter-zonal trips to East Lindsey in 2014 is the Grimsby/Cleethorpes area. Boston and Lincoln are also significant origins of journeys to East Lindsey. These three origins are likely to remain important in 2036, with Boston and Lincoln both demonstrating a large growth in trips to East Lindsey.

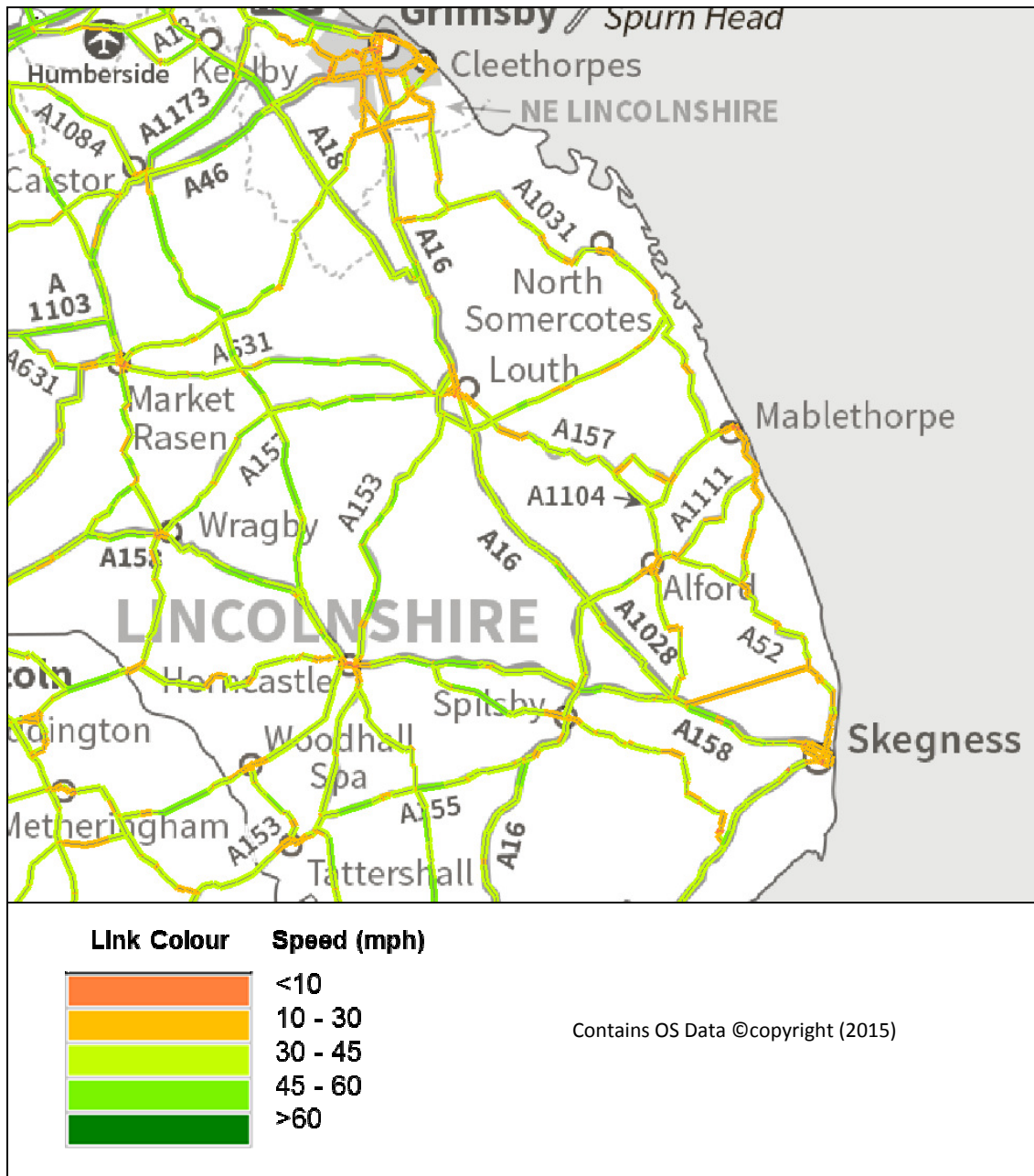
Destinations of trips from East Lindsey within the AM Peak show a similar pattern. In 2014, the most significant external destinations for peak hour traffic from East Lindsey are the Grimsby/Cleethorpes area, Boston, and the Greater Lincoln area; while internally, the most significant destinations are Louth and Skegness. This pattern remains the same in 2036.

This increase in trips is likely to have significance for several routes through the District, in particular the A16, which provides the main north/south route through the District, and provides connections to North East Lincolnshire, the M180 and the wider motorway network to the north; and to Boston and the fens to the south. The A157 and A158 which provide east/west links and which connect the District to the Greater Lincoln area may also be affected. The likely impacts are discussed in more detail below.

6.3.2 *Current Speeds*

The figure below shows current speeds on highway links in East Lindsey in the AM Peak.

Figure 6-3 – Current Link Speeds – East Lindsey

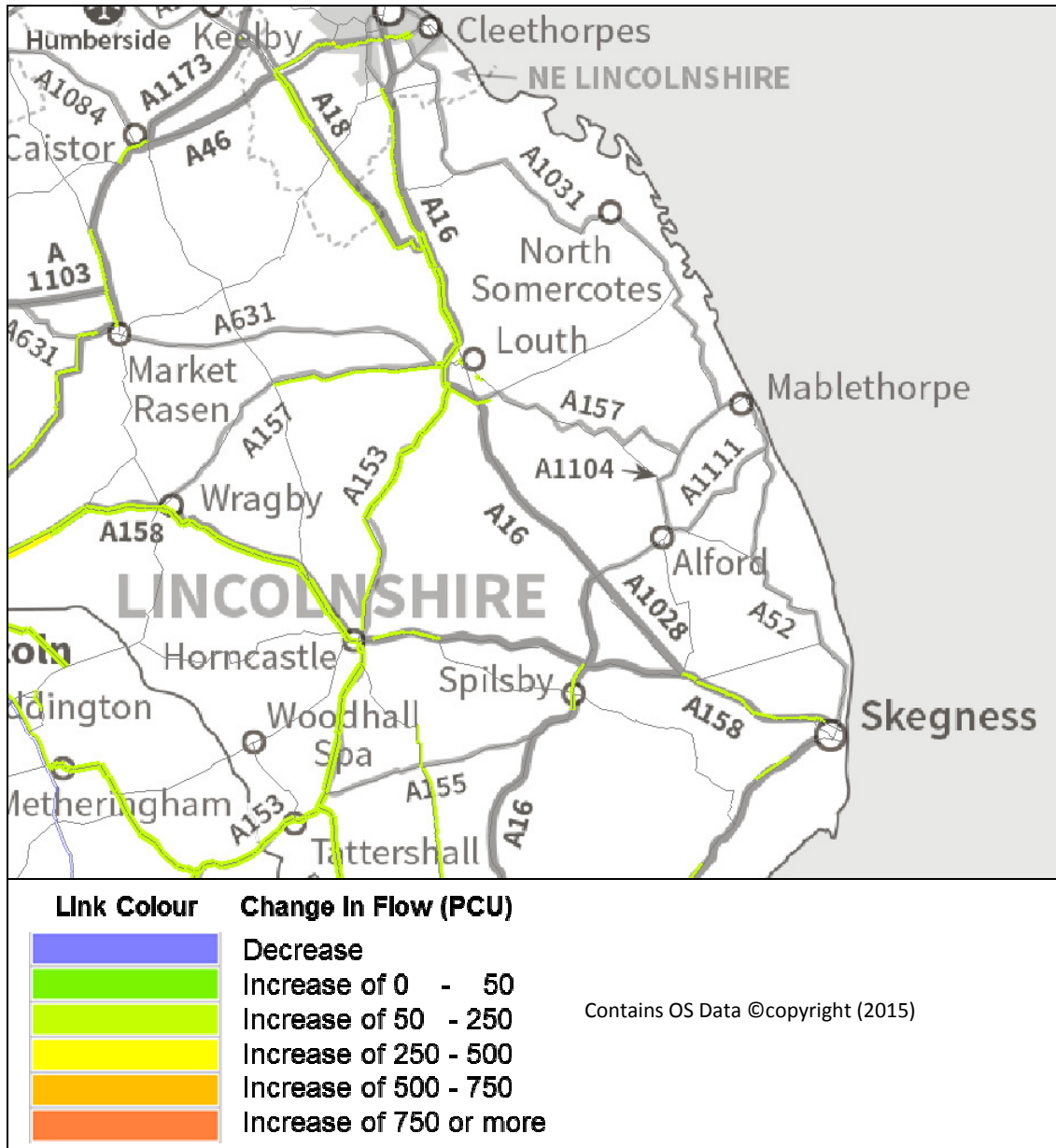


The figure above shows a number of areas of congestion, which are primarily focussed on the urban areas of East Lindsey. In terms of urban areas, where average speeds of below 10mph have been taken as an indication of congestion, the majority have very limited sections of carriageway with averages speeds at this level. However, of the urban areas in the District, Horncastle can be seen to be affected the most by congestion. It can also be noted that a number of rural links have average speeds significantly below the speed limits, however, the reasons for this may be numerous and not necessarily due to the amount of traffic, for example geometry of carriageways will cause traffic to travel significantly below the speed limit.

6.3.3 Flow Differences

The figure below show flow differences between 2014 and 2036 across East Lindsey in the AM peak hour as projected by the Tool.

Figure 6-4 – Flow Difference 2014 – 2036 – AM Peak – East Lindsey



It can be seen that there are no links in the district along which flow differences over the study period are expected to exceed 250 PCUs per hour. However, it can be noted that the most significant increases in flow appear to be focussed in the south-west of the District. Of particular note is the confluence of increases in flows through Horncastle, which as noted previously, currently experiences some congestion-related issues.

6.3.4 Comparison of Demand to Capacity

The figures below show the volume to capacity ratios of the A and B roads at peak times across East Lindsey, both in the base year of 2014 and the study year of 2036. This shows how congested these links are: the higher the volume to capacity ratio, the greater the likelihood of congestion. In general, volume to capacity ratios of over 85% show that there is likely to be congestion due to insufficient capacity.

Figure 6-5 – Volume to Capacity Ratio 2014 AM Peak – East Lindsey

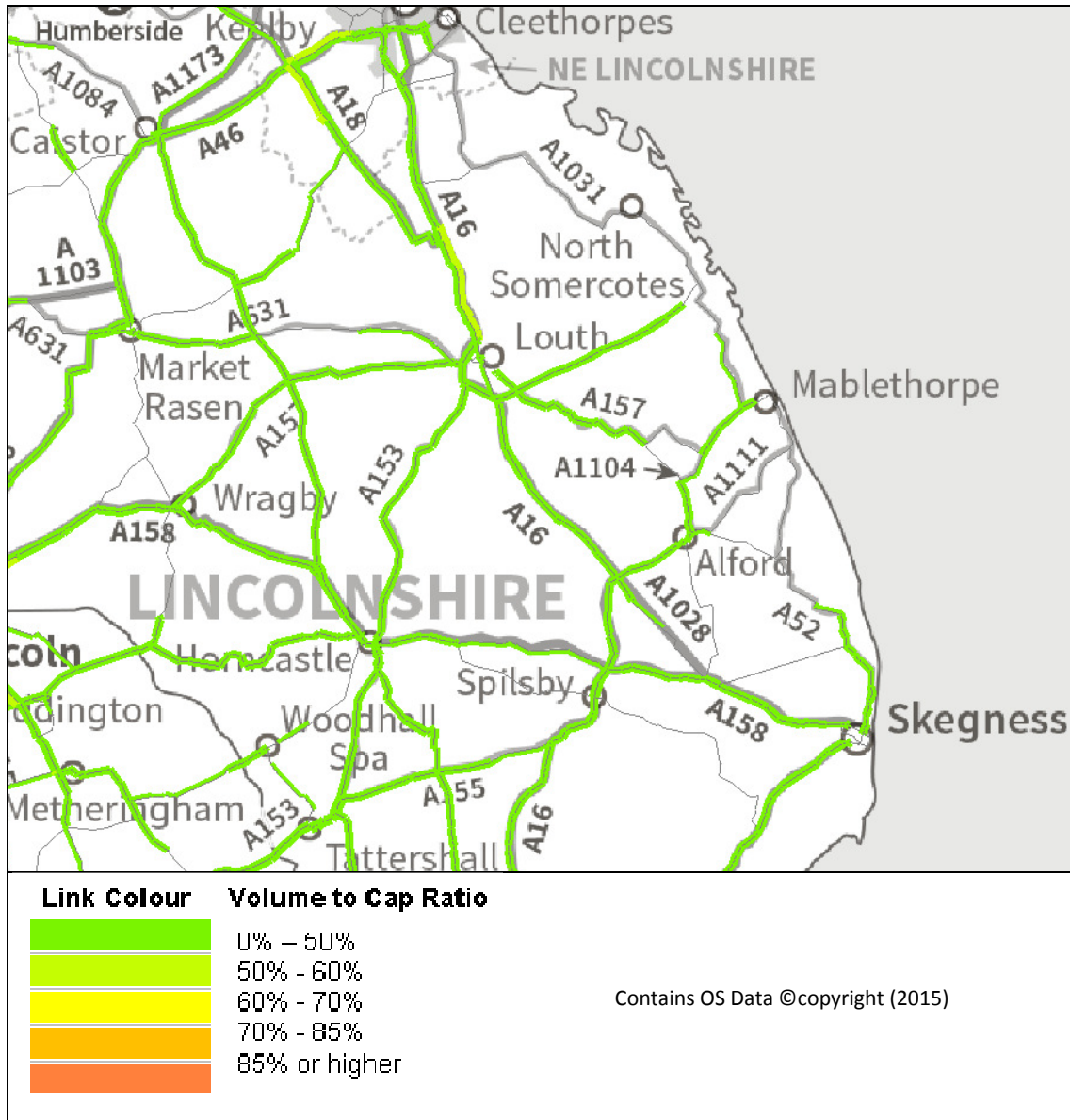


Figure 6-6 – Volume to Capacity Ratio 2036 AM Peak – East Lindsey

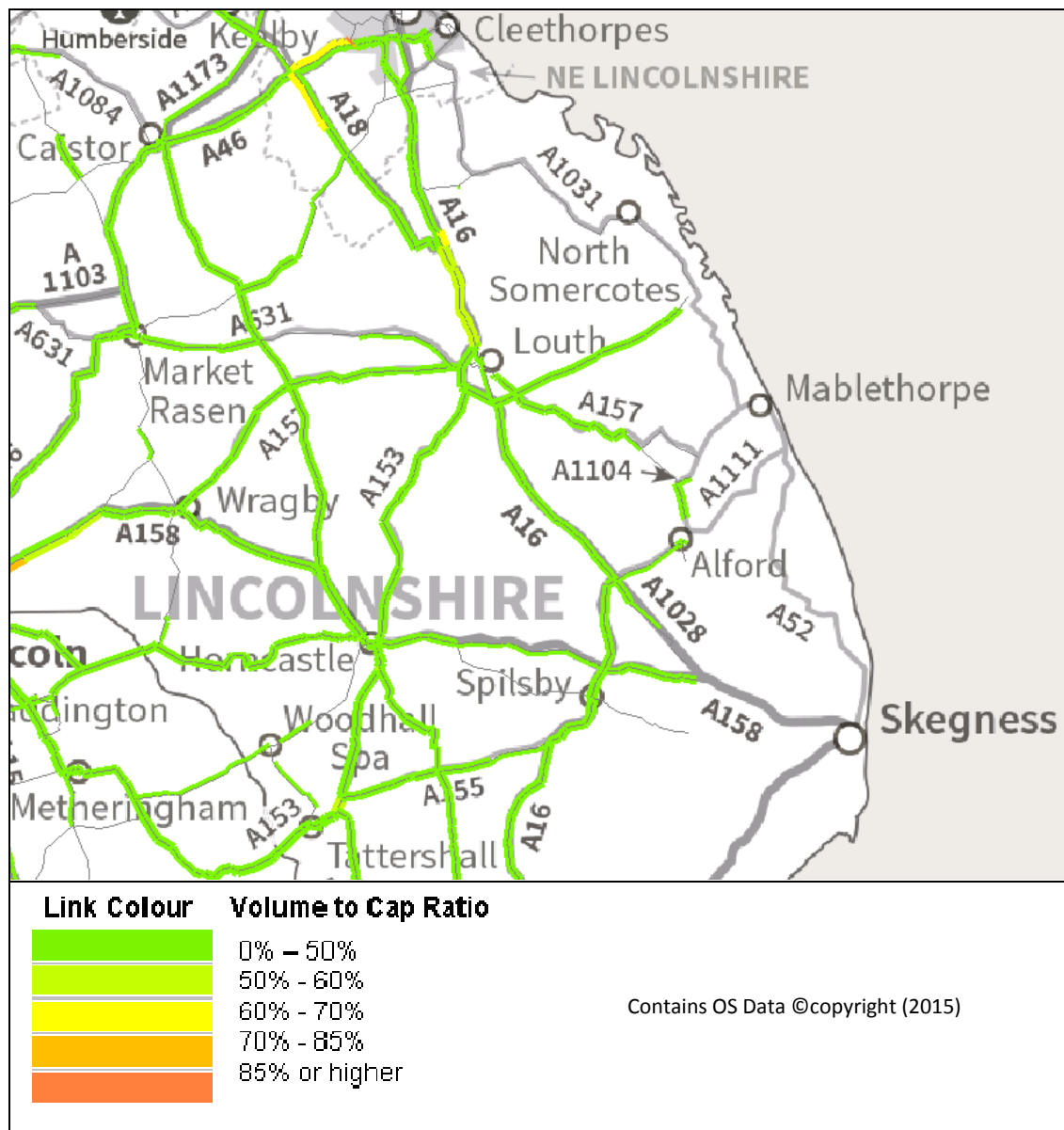


Figure 6-7 – Volume to Capacity Ratio 2014 PM Peak – East Lindsey

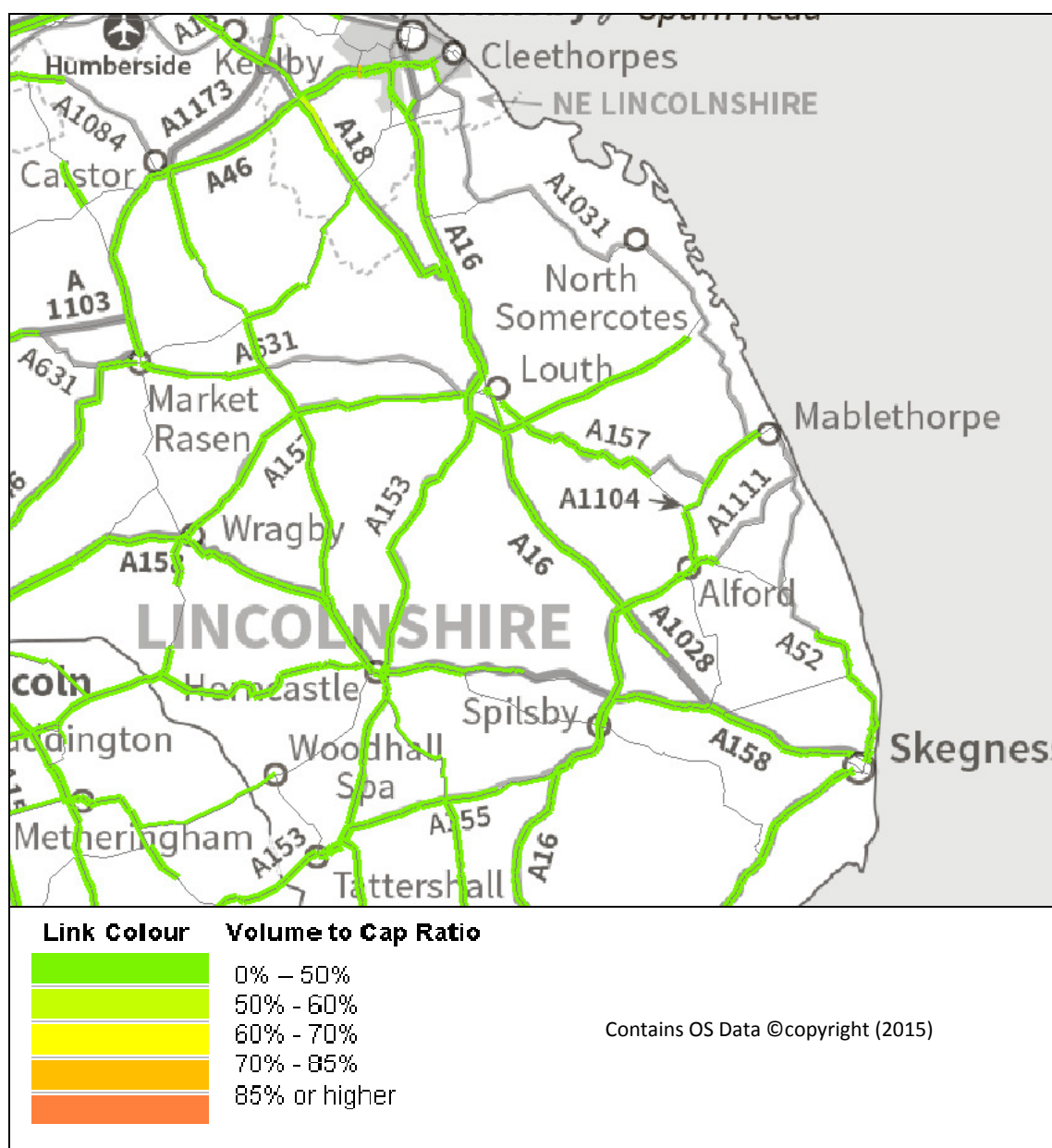
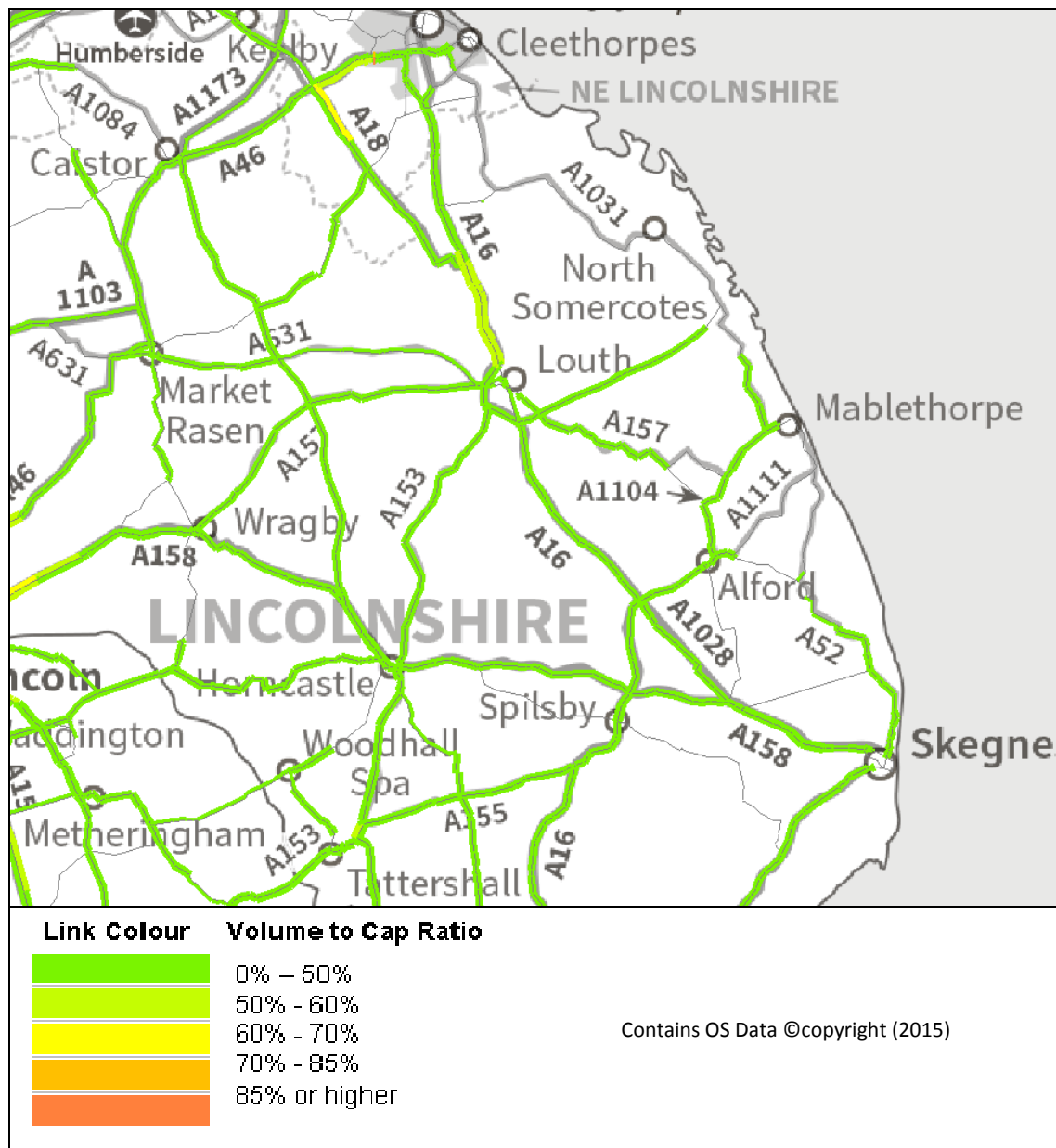


Figure 6-8 – Volume to Capacity Ratio 2036 PM Peak – East Lindsey



The figures above show that for most of the District there are few grounds for concern. Most links show a volume to capacity ratio of less than 50% even after the additional trips generated by 2036. The main exceptions to this are to the north of Louth. This area is shown in more detail in the figures below.

Figure 6-9 – Volume to Capacity Ratio 2036 AM Peak – Louth

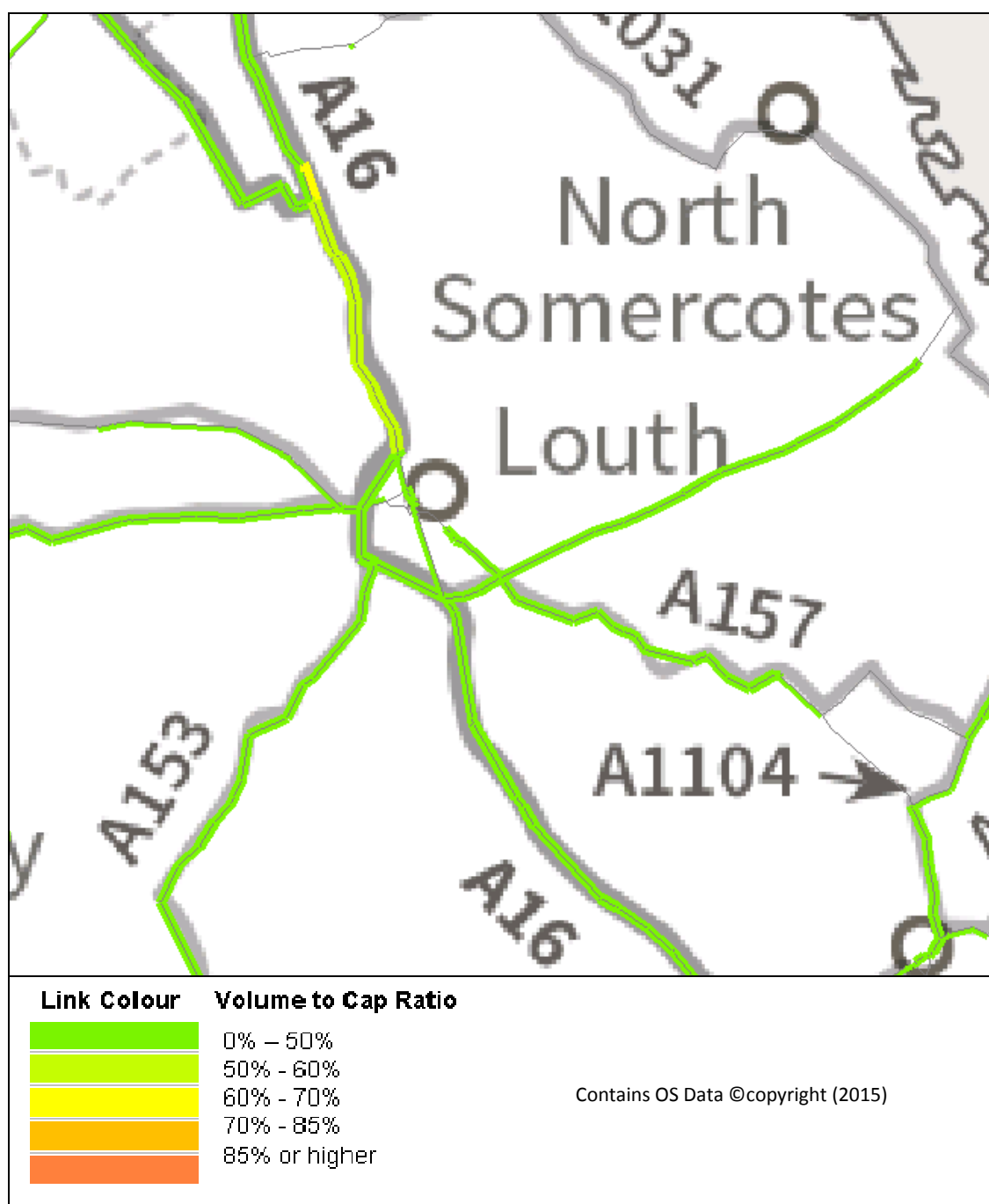
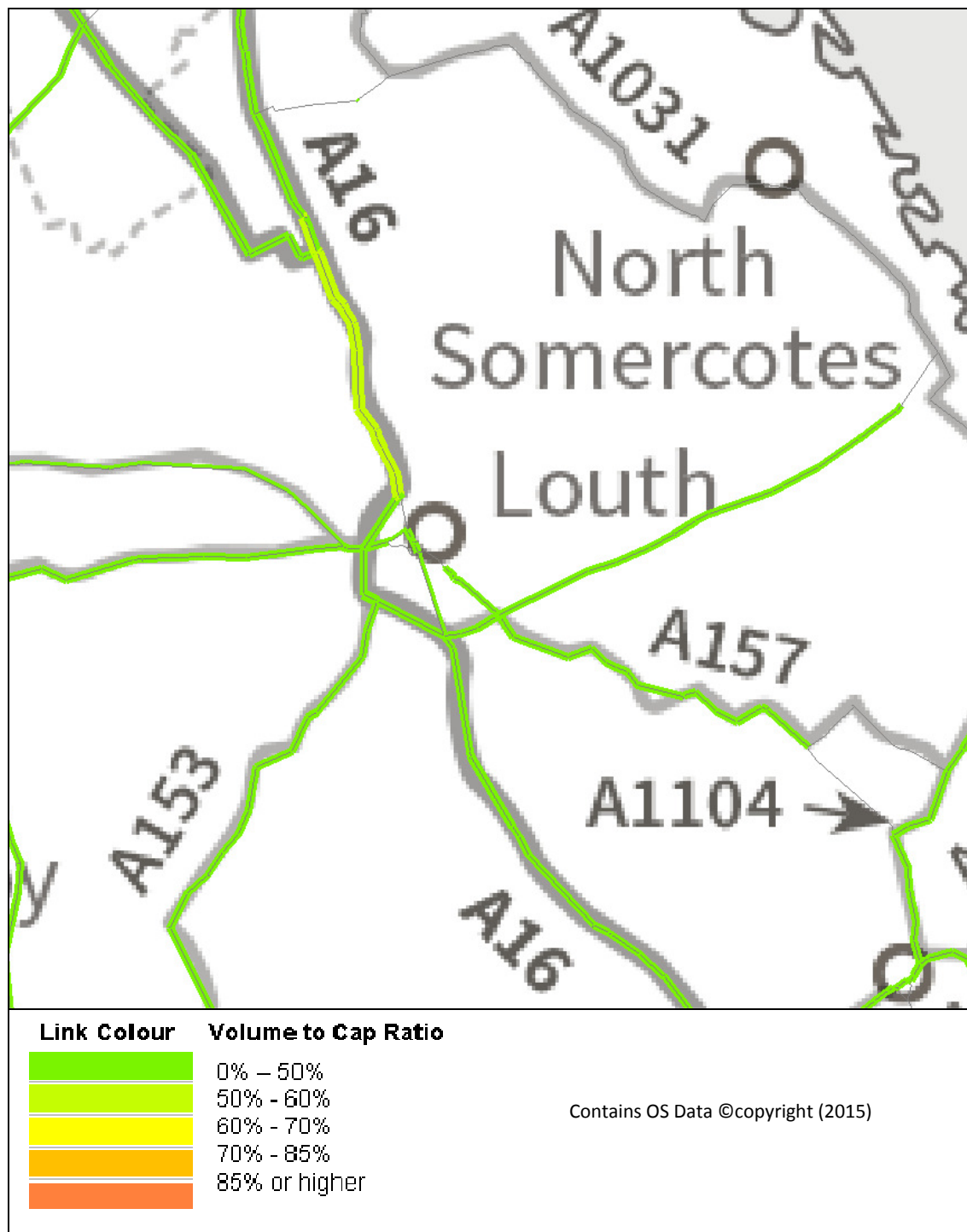


Figure 6-10 – Volume to Capacity Ratio 2036 PM Peak – Louth



It can be seen from the figures above that in the 2036 study year, the A16 north of Louth operates at between 50% and 60% volume to capacity, and at between 60% and 75% on the short southbound stretch north of the junction with the A18. There may therefore be a need to assess this area in more detail than the high level tool is able to, taking into account matters such as junctions.

Nevertheless, it can be concluded that even with the additional volume of traffic that will be generated by the potential growth of East Lindsey in the period to 2036, there are unlikely to be major link capacity issues in the District.

6.4 Conclusions

Detailed analysis of trip growth in East Lindsey resulting from worst case development assumptions both within and external to the District in the period to 2036 has highlighted the following:

- Most peak hour trips are expected to remain within East Lindsey.
- North/South links along the A16 connecting the District with North East Lincolnshire, North Lincolnshire and Doncaster to the north, and to Boston and the fens to the south expected to grow in importance.
- Links to Greater Lincoln Area also expected to grow in importance.
- There is limited congestion within the main urban areas of East Lindsey. However, Horncastle appears to experience some peak period congestion, due to junction capacity in the centre of the town, and projected growth in traffic may exacerbate this.
- Most links within the District expected to continue to operate comfortably within capacity even with additional traffic.
- One possible area for concern for link capacity is the A16 north of Louth, although even here it is predicted that the road will continue to operate within capacity.

The LLPT upper tier analysis investigates potential increases in demand on highway links (i.e. the sections of road between junctions) which provides a high level, strategic understanding of where increasing demand for journeys may generate capacity issues in future. The impact that junctions play in influencing highway capacity is very important and cannot be assessed using the LLPT upper tier analysis. Further more detailed analysis, taking account of either where known junction constraints already occur or where significant increases in demand for traffic are forecast, is therefore recommended.

6.5 Mitigation

On the basis of the analysis carried out on forecast traffic growth within East Lindsey, few issues have been identified so few mitigative measures are necessary. It may however be advisable to examine Horncastle and the A16 north of Louth in more detail.

7 Results – Central Lincolnshire

7.1 Introduction

In this Section, the outputs from the tool for Central Lincolnshire are presented for the 2014 and 2036 years, based upon the Core Scenario (See Section 11.2).

7.2 Plan Area and Status of Local Plan

The emerging Central Lincolnshire Local Plan will set out development policies and identify specific sites in the period to 2036 for the three authorities of West Lindsey, City of Lincoln and North Kesteven. The final draft is expected to be completed in early 2016, and adoption of the plan is expected in late 2016.

7.3 Results

7.3.1 Origins and Destinations

The table and figures below show origins and destinations for trips to and from Central Lincolnshire in the AM Peak hour, in 2014 and 2036.

Table 7-1 – Origins and Destinations for AM Peak Hour Trips – Central Lincolnshire

Local Plan Area	Settlement	2014		2036	
		Origin (Trips from C Lincs)	Destination (Trips to C Lincs)	Origin (Trips from C Lincs)	Destination (Trips to C Lincs)
Central Lincolnshire	Lincoln	10,613	12,150	14,085	15,587
	Sleaford	1,247	1,183	1,656	1,529
	Gainsborough	891	989	1,432	1,226
	Other Central Lincolnshire	6,087	4,506	7,062	5,589
	Total Central Lincolnshire	18,838	18,838	24,071	24,071
South Kesteven	Grantham	536	652	792	964
	Other South Kesteven	769	697	859	893
	Total South Kesteven	1,305	1,349	1,651	1,857
East Lindsey	Total East Lindsey	1,396	1,204	1,679	1,504
South East Lincolnshire	Boston	276	367	396	499
	Spalding	142	180	207	257
	Other South East Lincs.	418	339	494	407
	Total South East Lincs.	836	887	1,097	1,163
External	Doncaster	452	535	501	699
	Scunthorpe	408	520	528	619

Local Plan Area	Settlement	2014		2036	
		Origin (Trips from C Lincs)	Destination (Trips to C Lincs_	Origin (Trips from C Lincs)	Destination (Trips to C Lincs)
	Newark	402	467	506	704
	Grimsby / Cleethorpes	350	442	367	523
	Nottingham	123	295	182	447
	Other External	2,536	2,775	2,974	3,871
	Total External	4,272	5,033	5,057	6,862
Total Outside Central Lincolnshire		7,809	8,473	9,484	11,385
Total		26,647	27,311	33,555	35,456
<p>For the purposes of clarity, note that 'origin' refers to the origin of trips whose destination is in Central Lincolnshire; and that 'destination' refers to the destination of those trips whose origin is in Central Lincolnshire.</p> <p>Note that the Total figures exclude those trips which are wholly within Central Lincolnshire.</p>					

Figure 7-1 – Journey Origins to Central Lincolnshire, AM Peak

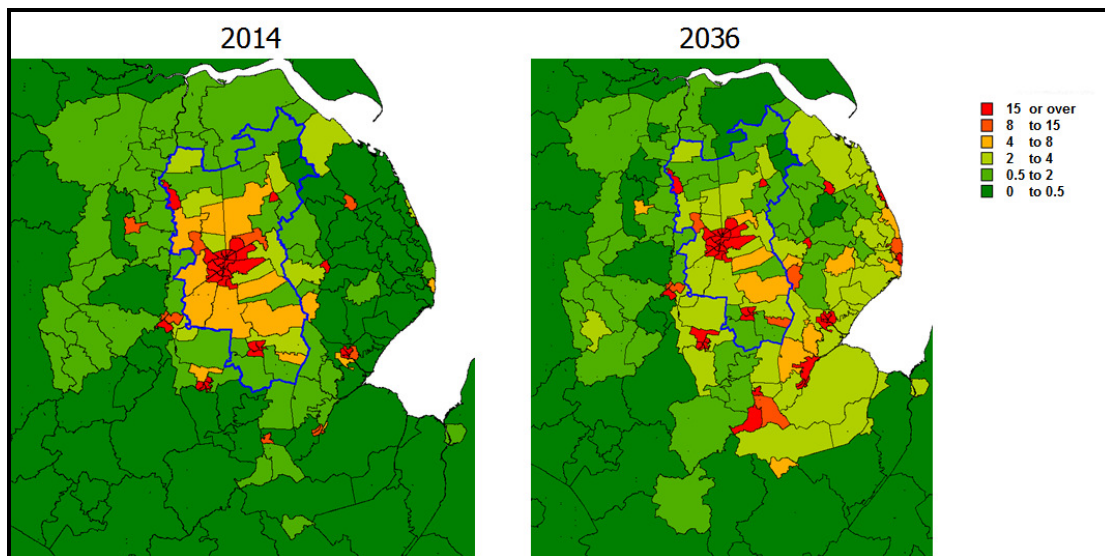
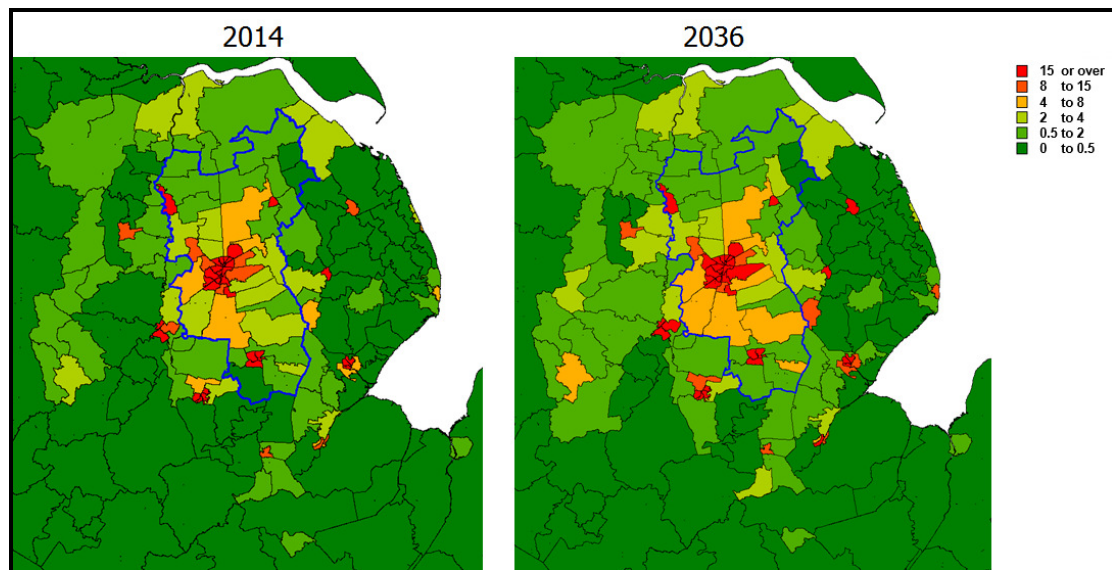


Figure 7-2 – Journey Destinations from Central Lincolnshire, AM Peak



The table and figures above show that most peak hour inter-zonal trips generated within Central Lincolnshire are internal to the Local Plan Area. Such trips account for around 69% of AM peak hour trips to destinations in Central Lincolnshire in the AM Peak, and around 71% of AM peak hour trips starting in Central Lincolnshire. The total for outgoing peak hour trips is around 9% greater than the total for incoming peak hour trips, indicating that Central Lincolnshire is a net generator of peak hour journeys. Lincoln is by far the most significant origin and destination of peak hour trips, and is the origin for over half of all peak hour trips starting in Central Lincolnshire, and around two thirds of peak hour trips ending in Central Lincolnshire. Sleaford and Gainsborough are the next most significant centres.

By 2036, taking into account the growth forecast, this situation is expected to be exacerbated, with outgoing journeys in the AM peak exceeding incoming journeys by around 20%. Other patterns remain broadly consistent, although the overall volumes of trips are around 28% greater.

Outside of Central Lincolnshire, the most significant origin of AM Peak hour trips to Central Lincolnshire in 2014 is Grantham, followed by Doncaster, Scunthorpe and Newark. Grimsby / Cleethorpes and Boston are also significant. More broadly, a clear hinterland can be seen, encompassing Nottinghamshire, Doncaster, North Lincolnshire and North East Lincolnshire and the adjacent fringes of the other districts within Lincolnshire. These origins are likely to grow in importance in the period to 2036; with Scunthorpe, Boston and Nottingham growing in importance.

Destinations of trips from Central Lincolnshire within the AM Peak show a similar pattern. In 2014, internally, the most significant destination is Greater Lincoln, followed by Sleaford, Gainsborough and Market Rasen, while externally, Grantham, Doncaster and Scunthorpe are the most significant destinations, followed by Newark, Grimsby, Boston and Nottingham. Again, a clear hinterland is evident, including Nottinghamshire (in particular the more urban areas in the west), Doncaster, North

Lincolnshire, North East Lincolnshire and the adjacent fringes of other districts within Lincolnshire. This pattern remains the same in 2036, with Boston, Grantham and Nottingham all set to grow in importance as destinations.

This increase in trips is likely to be have significance for several routes through Central Lincolnshire, particularly around Lincoln itself. The likely impacts are discussed in more detail below.

7.3.2 Current Highway Network Speeds

The figure below shows current speeds on links in Central Lincolnshire in the AM Peak, based on information sourced from Trafficmaster.

Figure 7-3 – Current Link Speeds – Central Lincolnshire



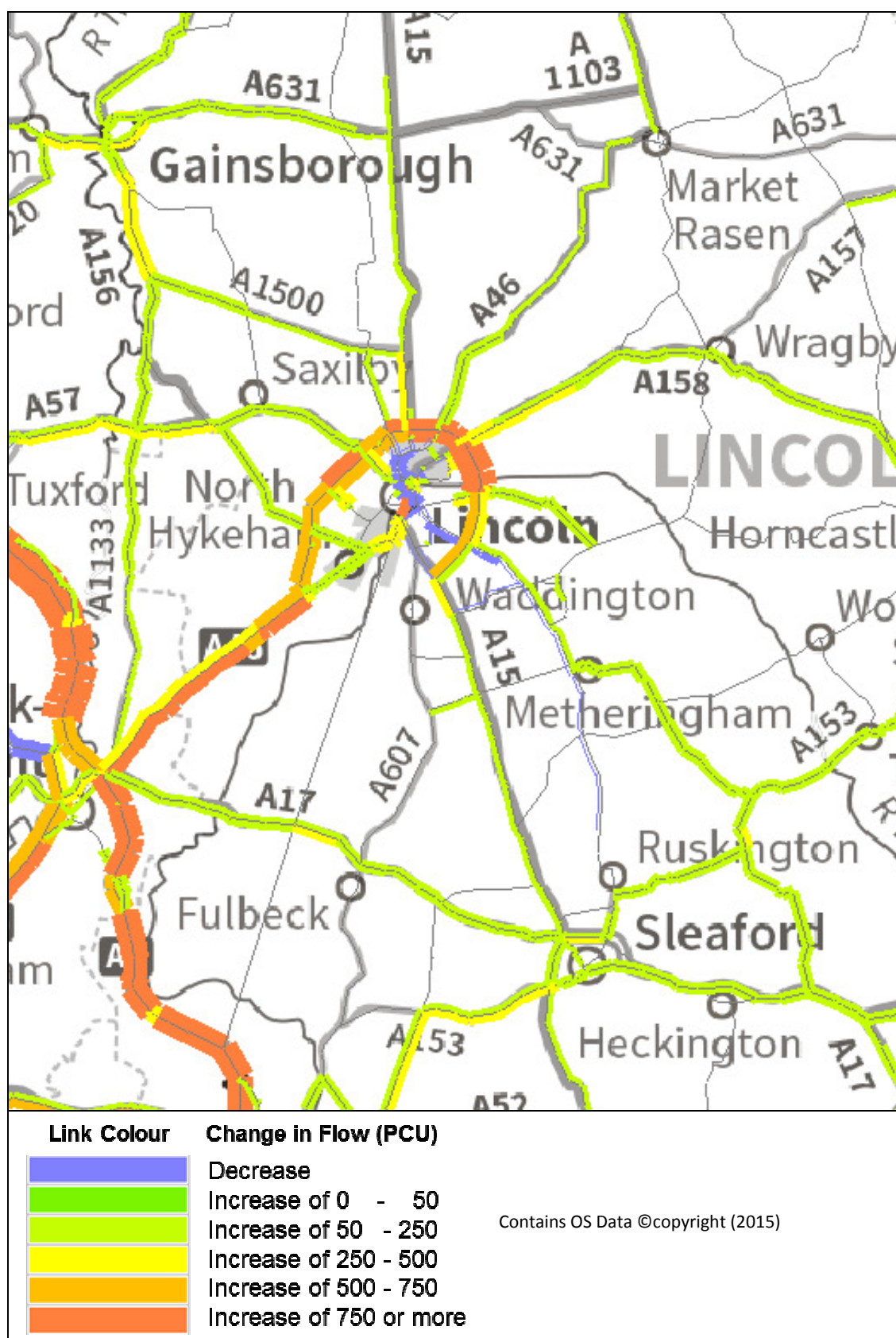
Looking at the urban areas first, where speeds less than 10mph are assumed to suggest congested conditions, Lincoln appears to experience congestion on a number of the links into the city centre and surrounding suburbs. In addition, Sleaford experiences congestion within the town centre but Market Rasen and Gainsborough appear to experience lower levels of congestion.

Outside of the main urban areas, the Western and Northern Relief Roads of Lincoln, which are derestricted (speed limits of 60mph for single carriageway and 70mph for dual-carriageway), experience average speeds of less than 30mph on a number of links indicating congested conditions. There are a number of other links which experience low speeds but many of these appear to be as roads pass through villages.

7.3.3 *Flow Differences*

The figure below shows flow differences between 2014 and 2036 across Central Lincolnshire in the AM peak hour.

Figure 7-4 – Flow Difference 2014 – 2036 – AM Peak – Central Lincolnshire



The figure above shows that there are a number of links across Central Lincolnshire on which flow differences between 2014 and 2036 are expected to be high. In particular, Lincoln's Northern and Western Relief Roads and the A46 between Lincoln and the A1 are forecast to have increased flows in excess of 500 PCUs per hour in the AM Peak, with some sections having increased flow differences in excess of 750 PCUs. There are also flow differences in excess of 250 PCUs on the A158 east of Lincoln, the A156 south of Gainsborough, and the A153 west of Sleaford.

Notably, there are several roads within the Lincoln urban area which show decreases in flows between 2014 and 2036 which is as a result of the implementation of the Lincoln Eastern Bypass.

Additionally, although it lies outside the district, the significant flow differences on the A1 and A46 around Newark should be noted. These could potentially have a significant impact on traffic entering and leaving the County.

The above information combined with the data on current traffic speeds indicates in particular that Lincoln's Western and Northern Relief Roads are a concern in terms of future operation.

7.3.4 *Comparison of Demand to Capacity*

The figures below show the volume to capacity ratios on the A and B roads at peak times across Central Lincolnshire, both in the base year of 2014 and the study year of 2036. This shows how congested these links are: the higher the volume to capacity ratio, the greater the likelihood of congestion. In general, volume to capacity ratios of over 85% show that there is likely to be congestion due to insufficient link capacity.

Figure 7-5 – Volume to Capacity Ratio 2014 AM Peak – Central Lincolnshire

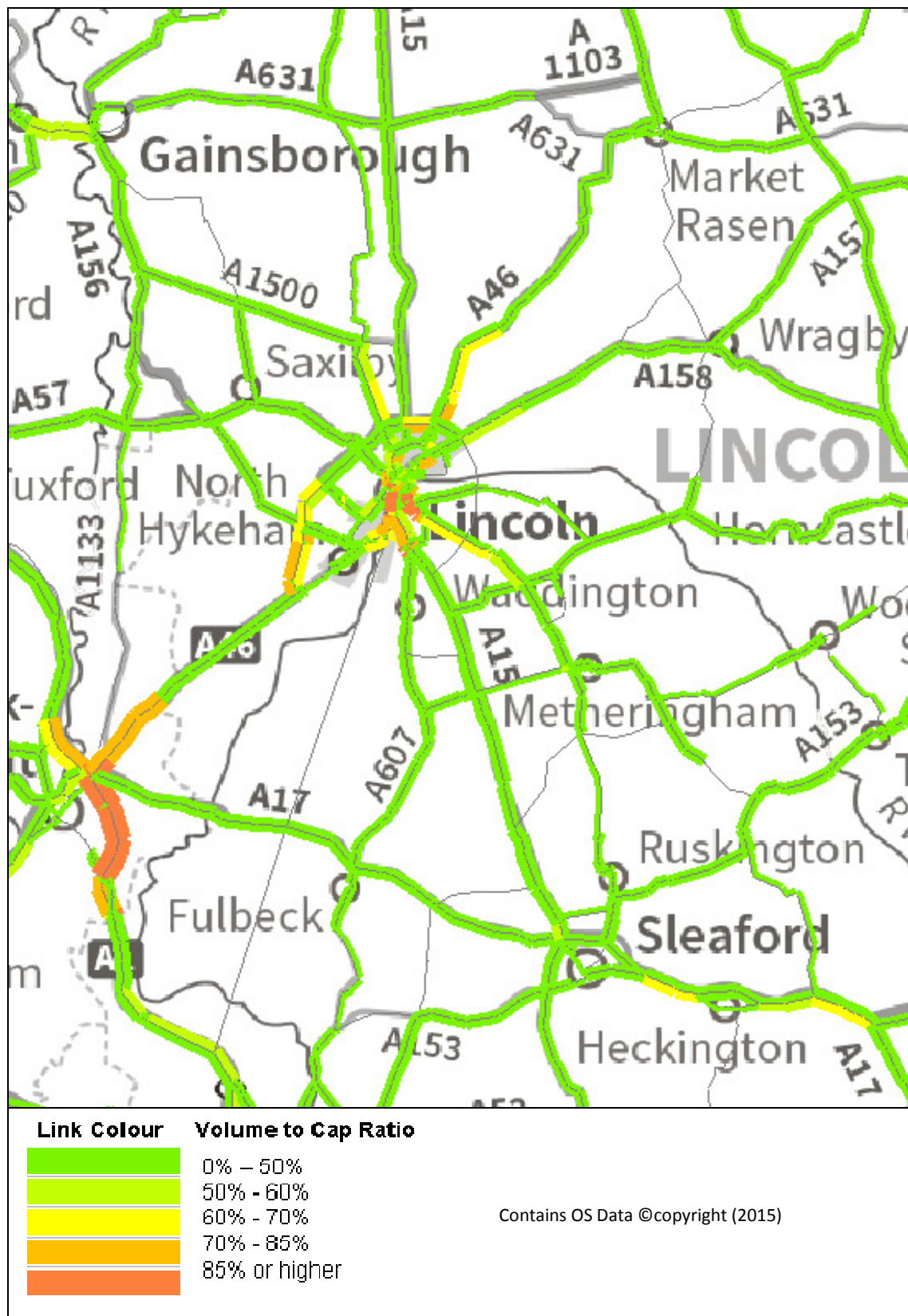


Figure 7-6 – Volume to Capacity Ratio 2036 AM Peak – Central Lincolnshire



Figure 7-7 – Volume to Capacity Ratio 2014 PM Peak – Central Lincolnshire

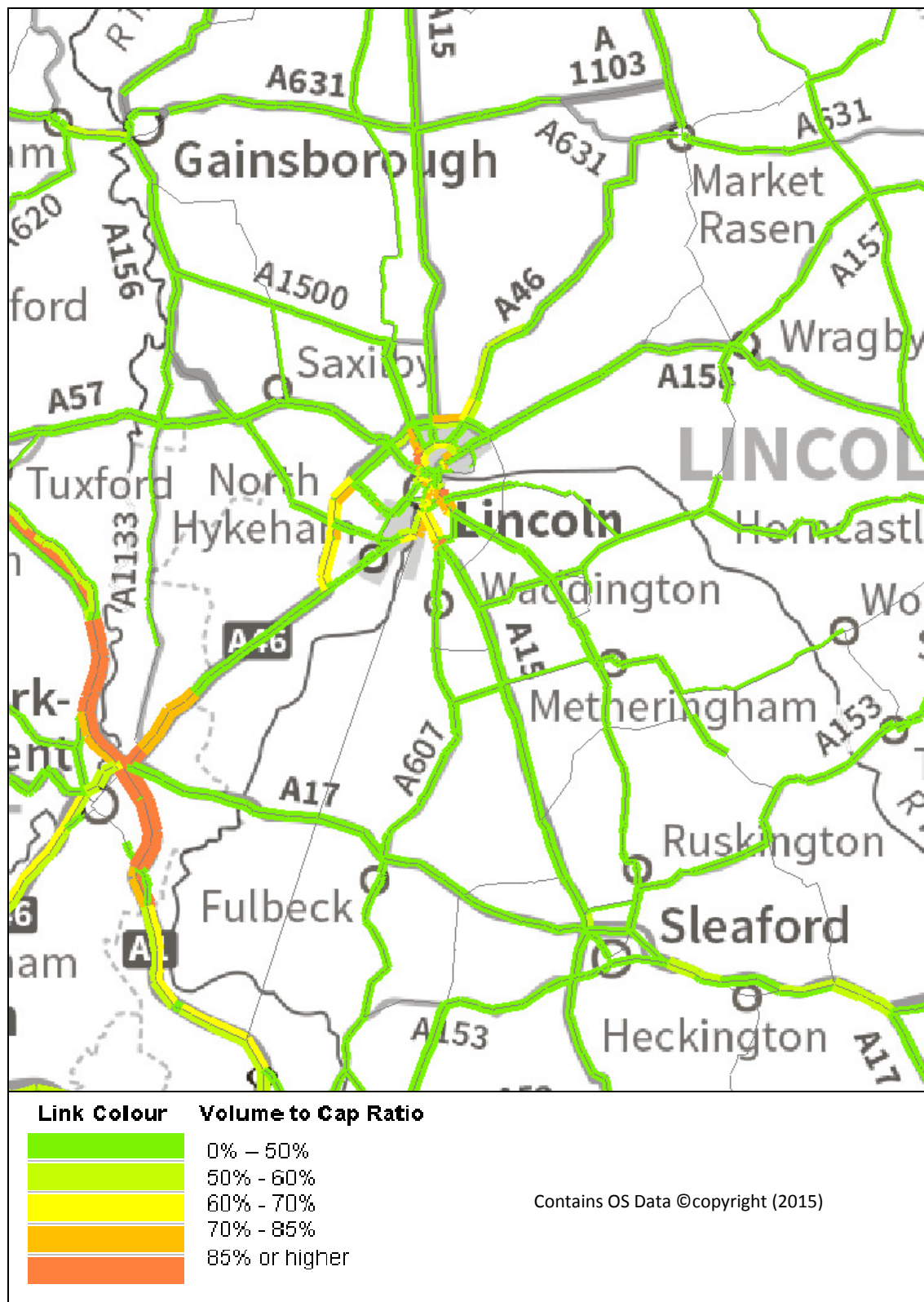
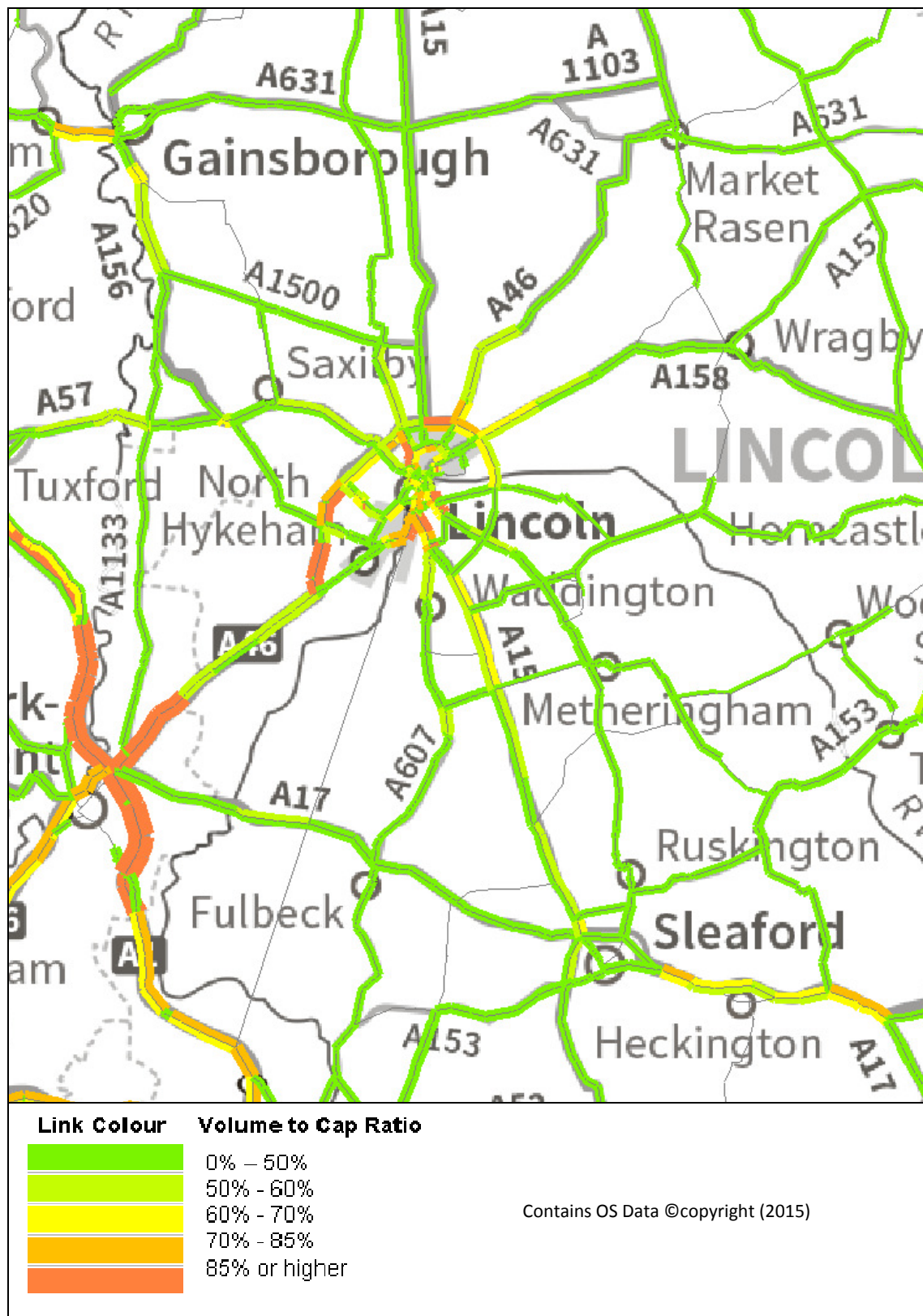


Figure 7-8 – Volume to Capacity Ratio 2036 PM Peak – Central Lincolnshire



The area around Lincoln is shown in more detail in the figures below.

Figure 7-9 – Volume to Capacity Ratio 2014 AM Peak – Lincoln

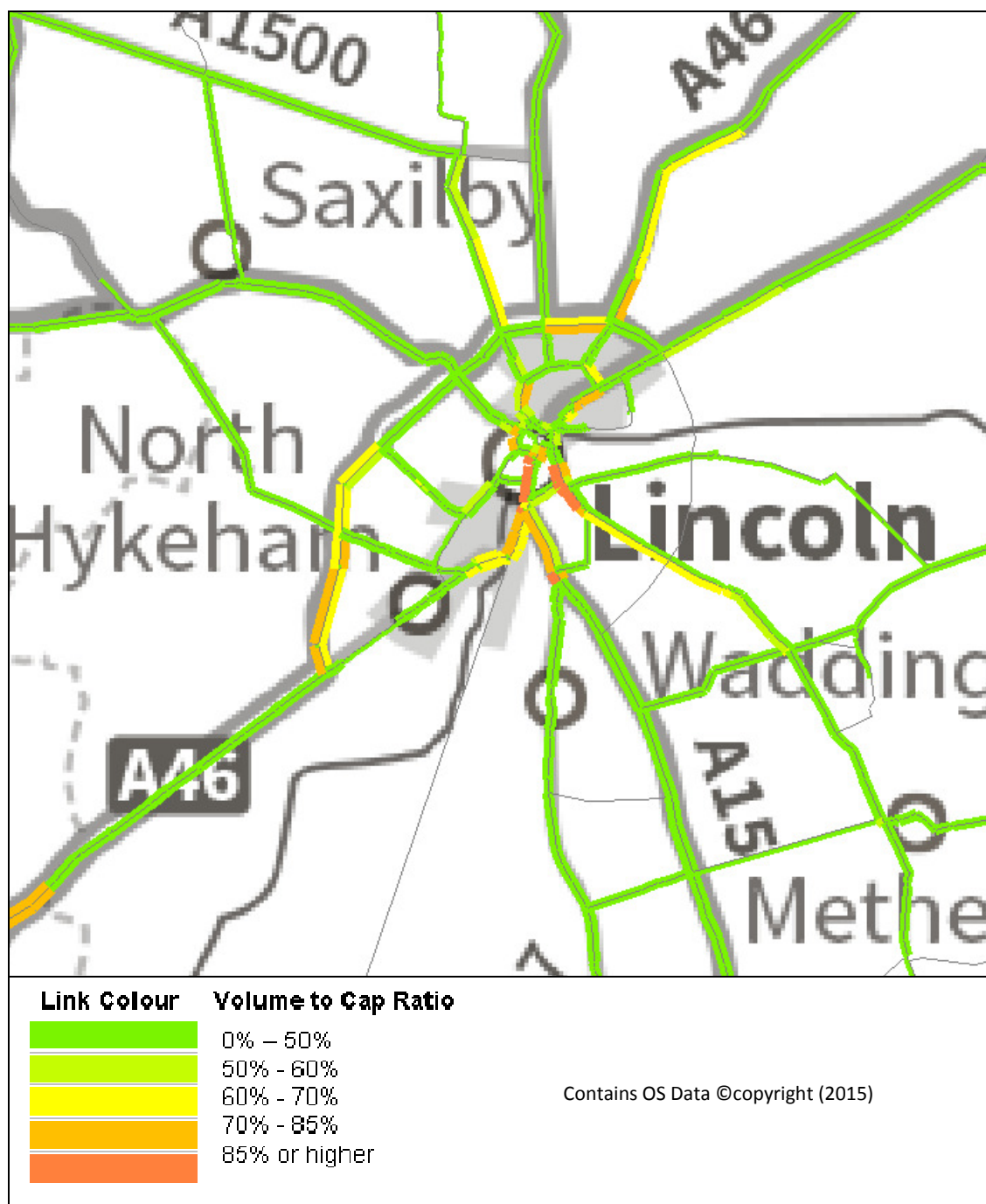


Figure 7-10 – Volume to Capacity Ratio 2036 AM Peak – Lincoln

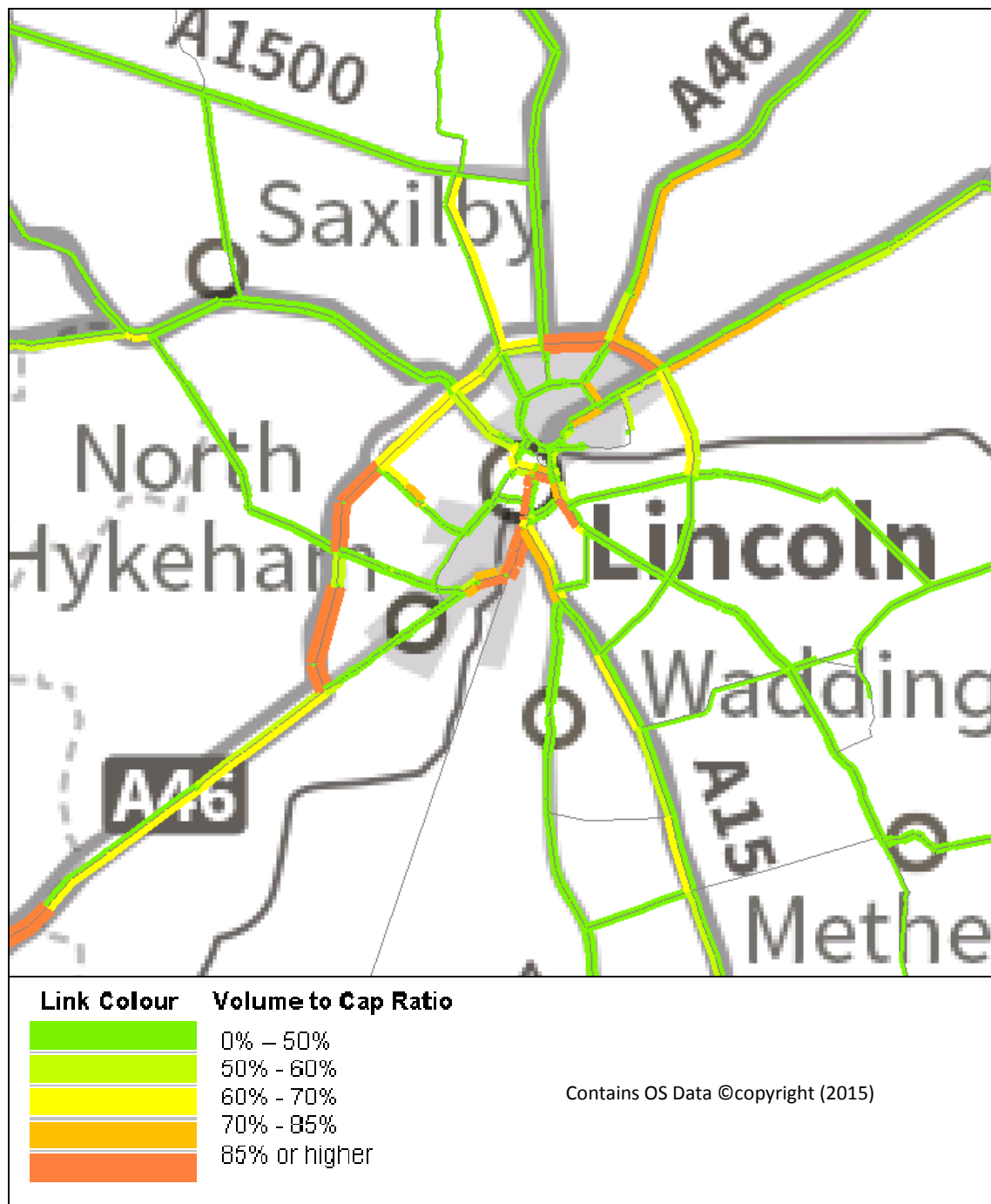


Figure 7-11 – Volume to Capacity Ratio 2014 PM Peak – Lincoln

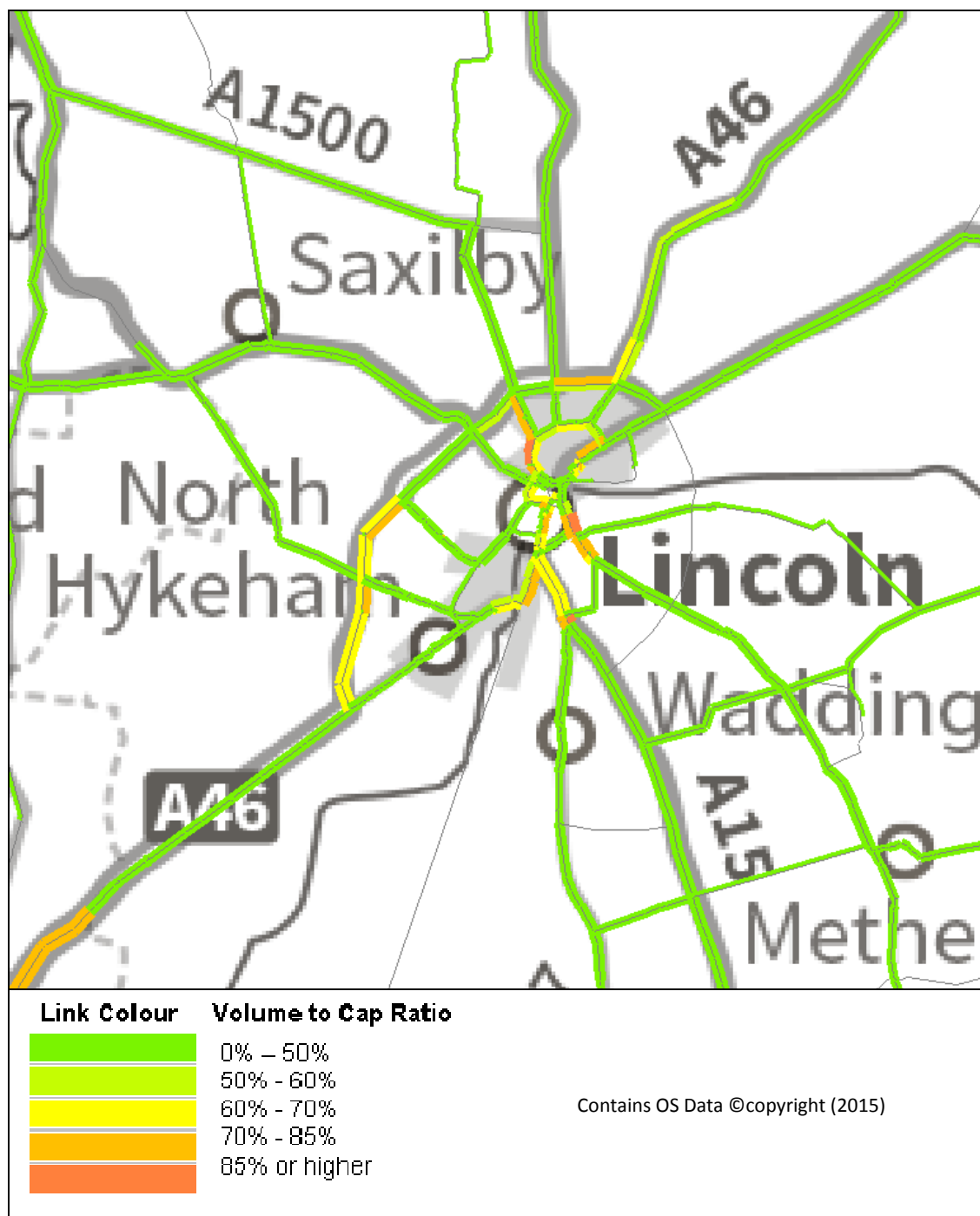


Figure 7-12 – Volume to Capacity Ratio 2036 PM Peak – Lincoln



The eight figures above show that there are several areas within Central Lincolnshire where analysis of volume to capacity ratios indicate areas for concern. In particular:

- Lincoln's Western and Northern Relief Roads, both of which show some stretches where volume to capacity ratios are above 85%;

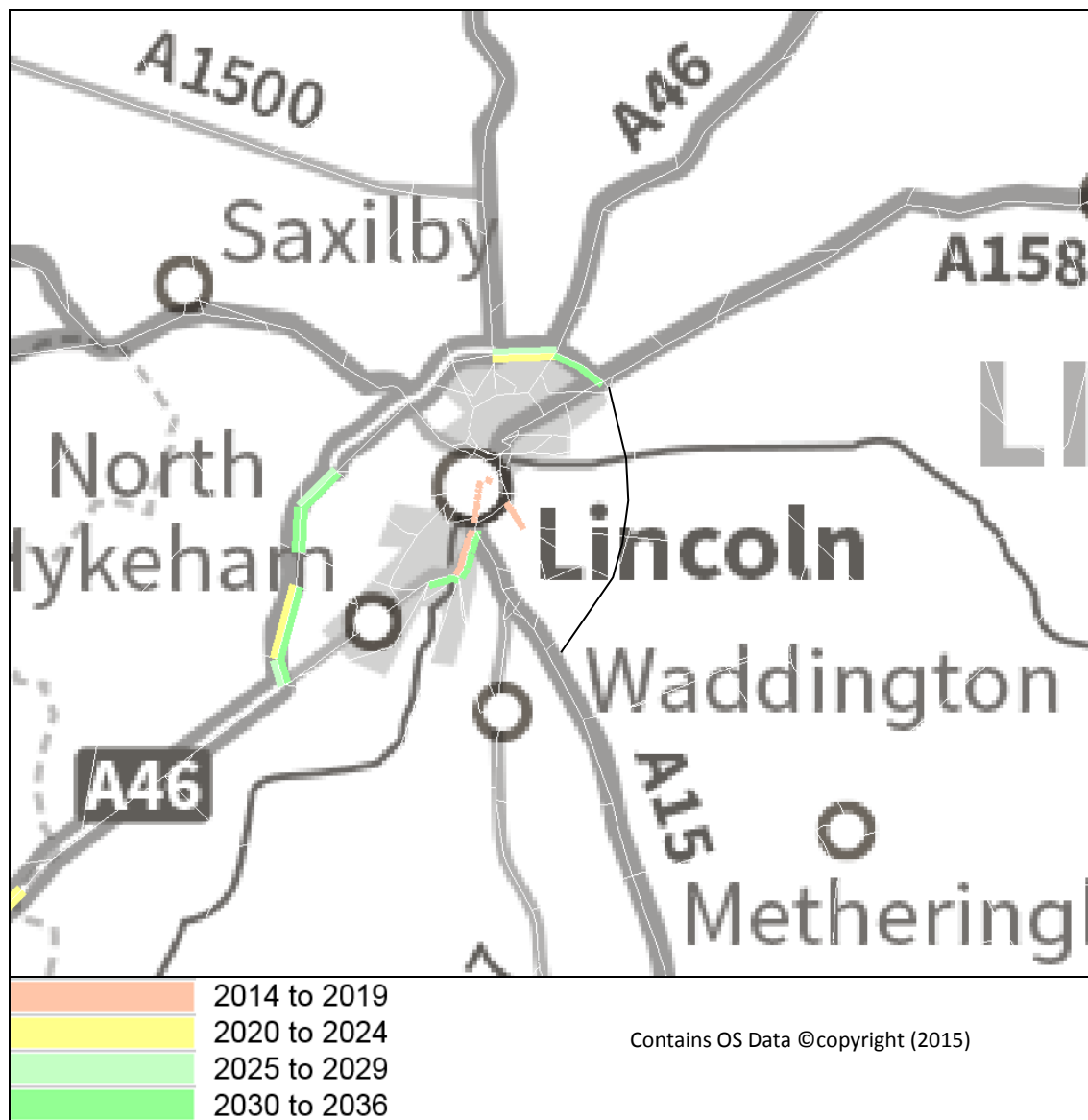
- Some of the arterial routes into Lincoln, in particular the A1434/A15 and B1188 from the south in both peaks and the B1398 to the north-west both of which show volume to capacity ratios above 85%;
- The A631 across the Trent west of Gainsborough, which shows volume to capacity ratios above 60% in both peaks in the study year, and of over 70% eastbound in the AM Peak; and
- The A17 as it approaches Sleaford from the east, which shows a volume to capacity ratio of between 70% and 85% in the AM peak in the study year.

It can also be seen from these figures that forecast volume to capacity ratios are a particular cause for concern on the A1 along much of its length within Lincolnshire and Nottinghamshire, in particular past Newark, where volume to capacity ratios are in excess of 85% at both peaks in the study year. Similarly, volume to capacity ratios are also high on the A46 as it approaches the A1 at Newark.

7.3.5 *Threshold Analysis*

The following figure shows the timescales during which links in the Lincoln area are projected to experience traffic demand in excess of 85% of capacity, the threshold at which traffic flow begins to breakdown and congestion starts to occur. Some of the links within the urban area of Lincoln may reach the threshold at or before 2019 while a number of single carriageway links on the Western and Northern Bypasses are projected to reach the threshold by 2025, 2029 or 2036.

Figure 7-13 – Link Capacity Threshold Analysis



7.4 Conclusions

Detailed analysis of trip growth in Central Lincolnshire resulting from worst case development assumptions both within and external to the Local Plan area in the period to 2036 has highlighted the following points:

- Most peak hour trips expected to remain with Central Lincolnshire.
- Growth of trip volumes associated with the Greater Lincoln area.
- Significant capacity issues on Lincoln's Western and Northern Relief Roads.
- Capacity issues on arterial routes into Lincoln, especially on the A1434/A15 and B1188 to the south and B1398 to the north-west

- Other possible capacity issues on the approaches to Gainsborough and Sleaford.
- Potential impacts on trips via the A1 near Newark resulting from increased volumes.

As stated previously, the LLPT upper tier analysis investigates potential increases in demand on highway links (i.e. the sections of road between junctions) which provides a high level, strategic understanding of where increasing demand for journeys may generate capacity issues in future. The impact that junctions play in influencing highway capacity is very important and cannot be assessed using the LLPT upper tier analysis. Therefore, further, more detailed analysis, taking account of either where known junction constraints already occur or where significant increases in demand for traffic are forecast, is recommended.

7.5 Mitigation

The upper tier tool has identified a number of significant issues in Central Lincolnshire, mainly around the Greater Lincoln area; these would be worse without Lincoln Eastern Bypass which is included in the 2036 testing. These issues need to be assessed in more detail with Lower Tier Modelling in order to fully understand the issues involved and identify possible mitigative measures. It will be necessary to monitor emerging plans for development of the various SUEs to ensure all details are reflected as accurately as possible.

8 Results – South East Lincolnshire

8.1 Introduction

In this Section, the outputs from the tool for South East Lincolnshire are presented for the 2014 and 2036 years, based upon the Core Scenario (See Section 11.2).

8.2 Plan Area and Status of Local Plan

The emerging South East Lincolnshire Local Plan will set out plans and policies for the Borough of Boston and the District of South Holland in the period to 2036.

8.3 Results

8.3.1 Origins and Destinations

The table and figures below show origins and destinations for inter-zonal trips to and from South East Lincolnshire in the AM Peak hour, in 2014 and 2036.

Table 8-1 – Origins and Destinations for AM Peak Hour Trips – S. East Lincolnshire

Local Plan Area	Settlement	2014		2036	
		Origin (Trips from SE Lincs)	Destination (Trips to SE Lincs)	Origin (Trips from SE Lincs)	Destination (Trips to SE Lincs)
South East Lincolnshire	Boston	2,455	2,782	3,223	3,537
	Spalding	1,947	2,406	2,615	3,179
	Other South East Lincs.	4,595	3,810	5,722	4,844
	Total South East Lincs.	8,997	8,997	11,560	11,560
South Kesteven	Market Deeping	354	327	411	425
	Bourne	247	237	288	341
	Grantham	124	155	183	215
	Stamford	120	163	141	221
	Other South Kesteven	365	291	418	373
	Total South Kesteven	1,211	1,174	1,441	1,575
Central Lincolnshire	Sleaford	402	315	557	441
	Lincoln	160	250	228	318
	Other Central Lincolnshire	325	271	377	338
	Total Central Lincolnshire	887	836	1,163	1,097
East Lindsey	Total East Lindsey	1,094	879	1,302	1,105
External	Peterborough	460	945	473	1,231
	Other External	1,524	1,966	1,527	2,470

Local Plan Area	Settlement	2014		2036	
		Origin (Trips from SE Lincs)	Destination (Trips to SE Lincs)	Origin (Trips from SE Lincs)	Destination (Trips to SE Lincs)
	Total External	1,984	2,911	2,001	3,701
Total Outside South East Lincolnshire		5,176	5,800	5,907	7,478
Total		14,173	14,798	17,467	19,037

For the purposes of clarity, note that 'origin' refers to the origin of trips whose destination is in South East Lincolnshire; and that 'destination' refers to the destination of those trips whose origin is in South East Lincolnshire.

Figure 8-1 – Journey Origins to South East Lincolnshire, AM Peak

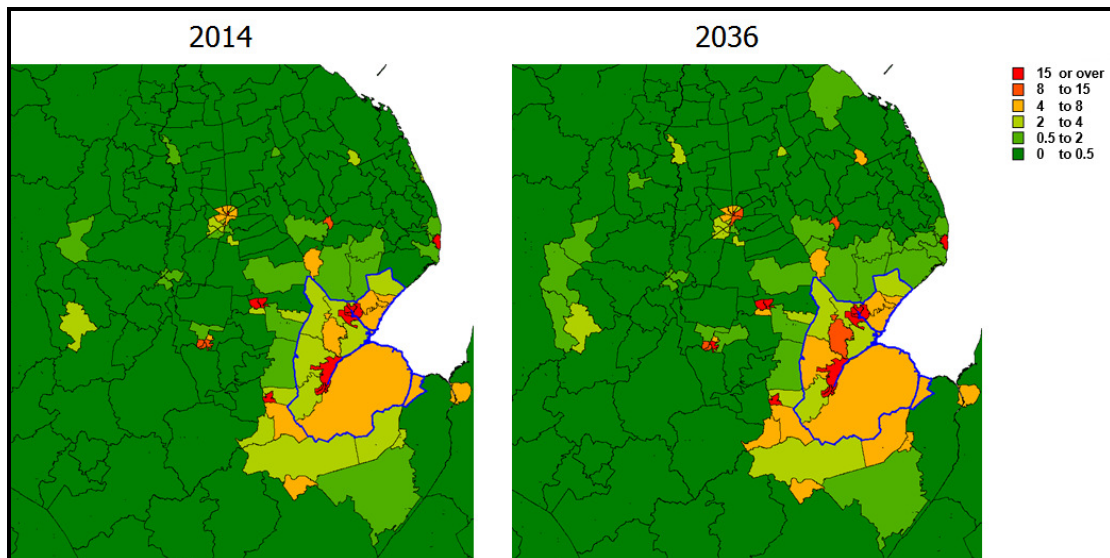
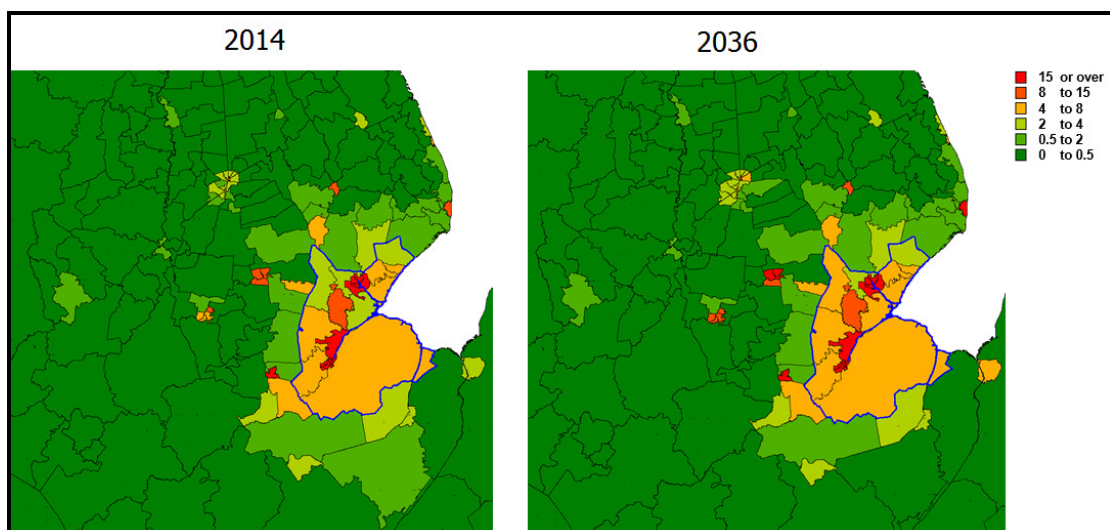


Figure 8-2 – Journey Destinations from South East Lincolnshire, AM Peak



The table and figures above show the majority peak hour inter-zonal trips generated within South East Lincolnshire are internal to the Local Plan Area. Such trips account for around 63% of AM peak hour trips to destinations in South East Lincolnshire in the AM Peak, and around 61% of AM peak hour trips starting in South East Lincolnshire. The total outgoing AM peak hour trips is around 12% greater than the total incoming AM peak hour trips, indicating that South East Lincolnshire is a net generator of peak hour journeys. Boston is by some way the most important source of journeys within South East Lincolnshire, as well as the most important destination for journeys followed in both cases by Spalding.

In the study year of 2036, the Local Plan Area is forecast to become slightly more self-contained, with internal trips accounting for around 66% of AM peak hour trips to destinations in South East Lincolnshire in the AM Peak, and around 61% of AM peak hour trips starting in South East Lincolnshire. The Local Plan Area continues to be a net generator of journeys, with the difference between outgoing and incoming trips increasing to around 27%.

Outside of South East Lincolnshire, the main sources of peak hour trips to the Local Plan area are the immediately surrounding areas: the southern fringes of East Lindsey, South Kesteven, in particular Sleaford and the eastern fringes of the District; Peterborough, Fenland and West Norfolk. This pattern remains broadly consistent in the period to 2036, with an intensification of vehicle trip generation from existing areas.

Destinations of trips from South East Lincolnshire within the AM Peak show a similar pattern. Peterborough is the most significant destination, with other areas adjacent to the Local Plan area such as Fenland and West Norfolk also acting as important destinations. Within South East Lincolnshire, the most significant destinations are Boston and Spalding. This pattern remains the same in 2036.

This increase in trips is likely to have significance for several routes through South East Lincolnshire, particularly the A16 and A17. The likely impacts are discussed in more detail below.

8.3.2 *Current Highway Network Speeds*

The figure below shows current speeds on links in South East Lincolnshire in the AM Peak generated by data from Trafficmaster.

Figure 8-3 – Current Link Speeds – South East Lincolnshire



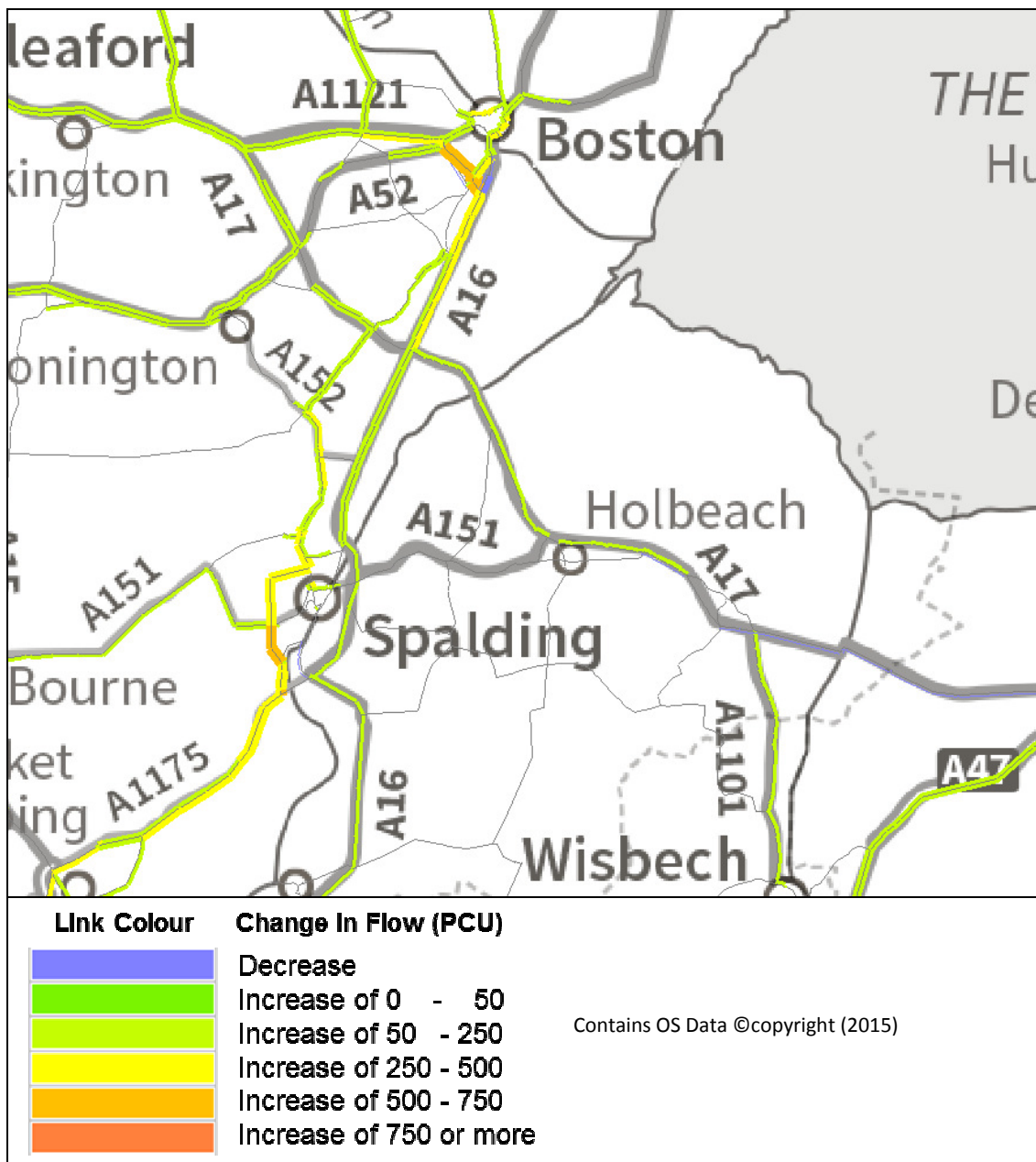
In terms of the urban areas, the analysis shows that a significant proportion of routes within Boston experience peak hour speeds of less than 10mph, indicating a significant amount of congestion. Spalding and Holbeach experience lower levels of

congestion but there are a number of inter-urban links with congestion including the A17 and the A16/A17 Sutterton junction,

8.3.3 Flow Differences

The figure below shows flow differences between 2014 and 2036 across South East Lincolnshire in the AM peak hour.

Figure 8-4 – Flow Difference 2014 – 2036 – AM Peak – South East Lincolnshire



The most significant differences shown on the figure above are on the new links of the Spalding Western Relief Road (SWRR) and the Boston Distributor Road (BDR). These roads are starting from a base flow of zero, so it is not unexpected to see large forecast flow differences. Aside from these, there are no links with forecast

increases in excess of 500 PCUs per hour. There are several links with increases forecast in excess of 250 PCUs per hour, notably the A16 south of Boston, the A1175 south of Spalding, the A1121 west of Boston and the B1356/A152 north of Spalding where it ties in with the proposed SWRR.

There are also some links where flows are forecast to decrease: the A16 immediately south of Boston, as a result of the BDR, and some roads in Spalding, as a result of the SWRR. It is notable that these decreases are on links where road speeds are currently slowest.

8.3.4 *Comparison of Demand to Capacity*

The figures below show the volume to capacity ratios on the A and B roads at peak times across South East Lincolnshire, both in the base year of 2014 and the study year of 2036. This shows how congested these links are: the higher the volume to capacity ratio, the greater the likelihood of congestion. In general, volume to capacity ratios of over 85% show that there is likely to be congestion due to insufficient capacity.

Figure 8-5 – Volume to Capacity Ratio 2014 AM Peak – South East Lincolnshire

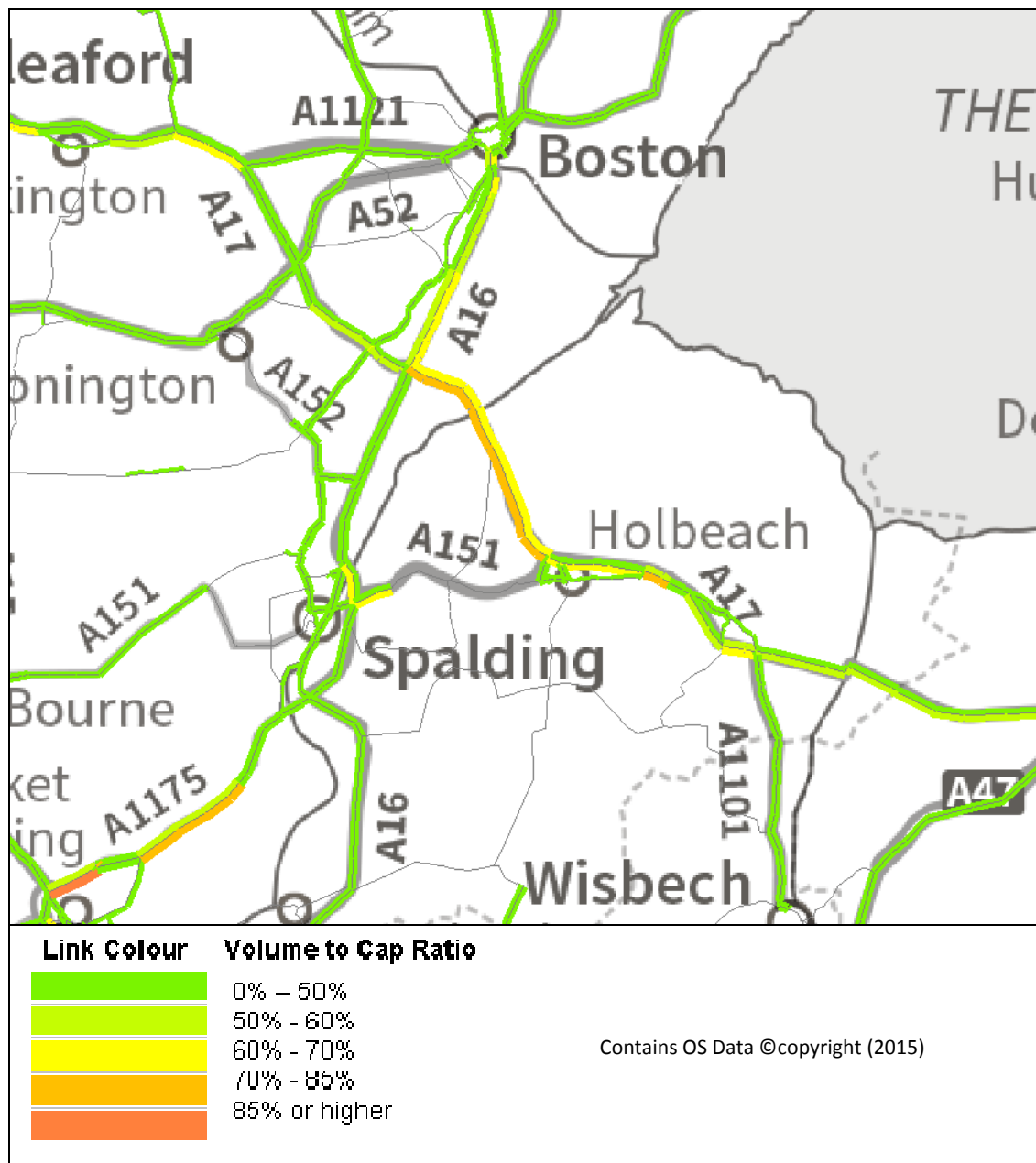


Figure 8-6 – Volume to Capacity Ratio 2036 AM Peak – South East Lincolnshire

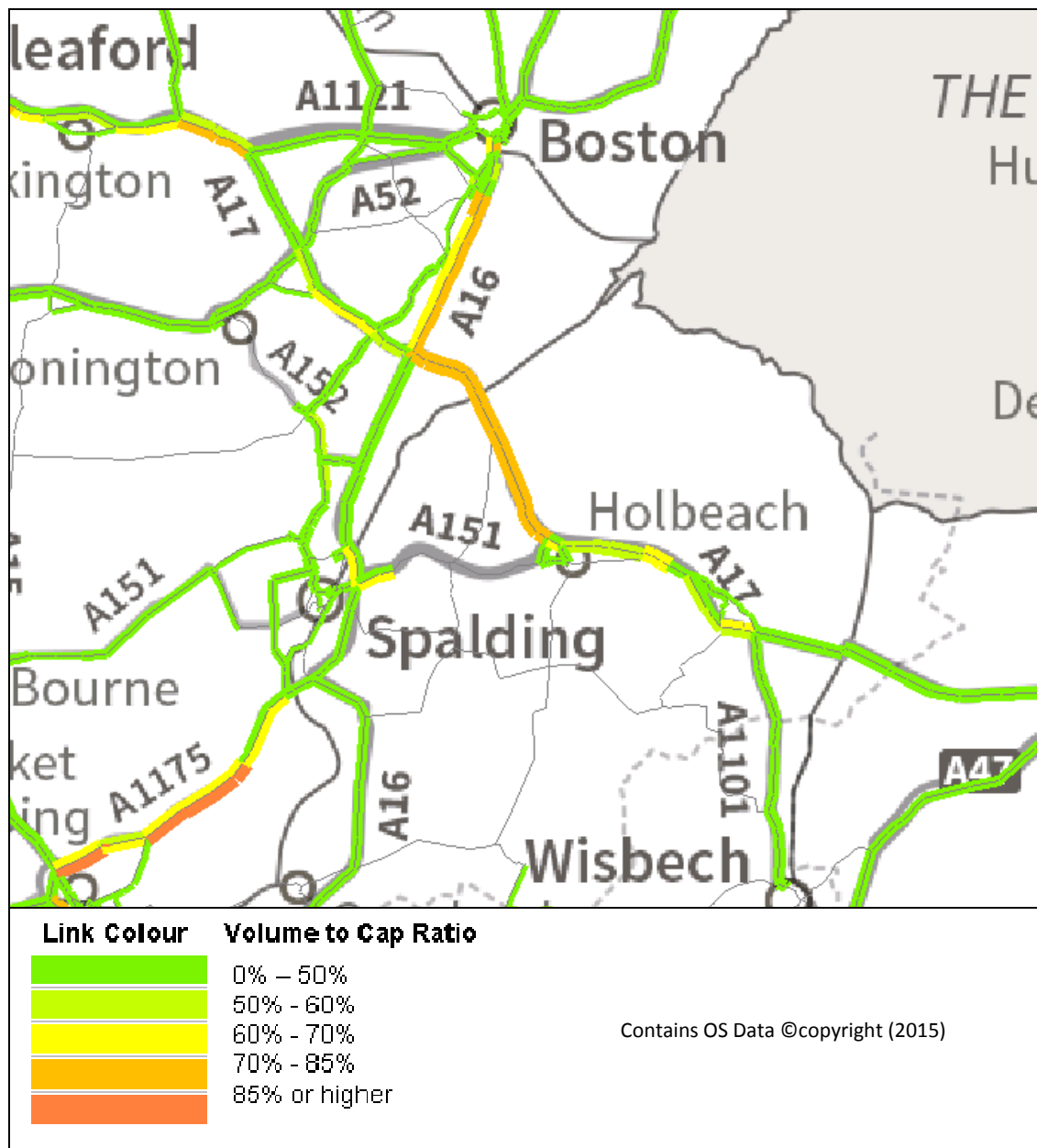


Figure 8-7 – Volume to Capacity Ratio 2014 PM Peak – South East Lincolnshire



Figure 8-8 – Volume to Capacity Ratio 2036 PM Peak – South East Lincolnshire



The figures below show the towns of Boston and Spalding in more detail.

Figure 8-9 – Volume to Capacity Ratio 2014 AM Peak – Boston

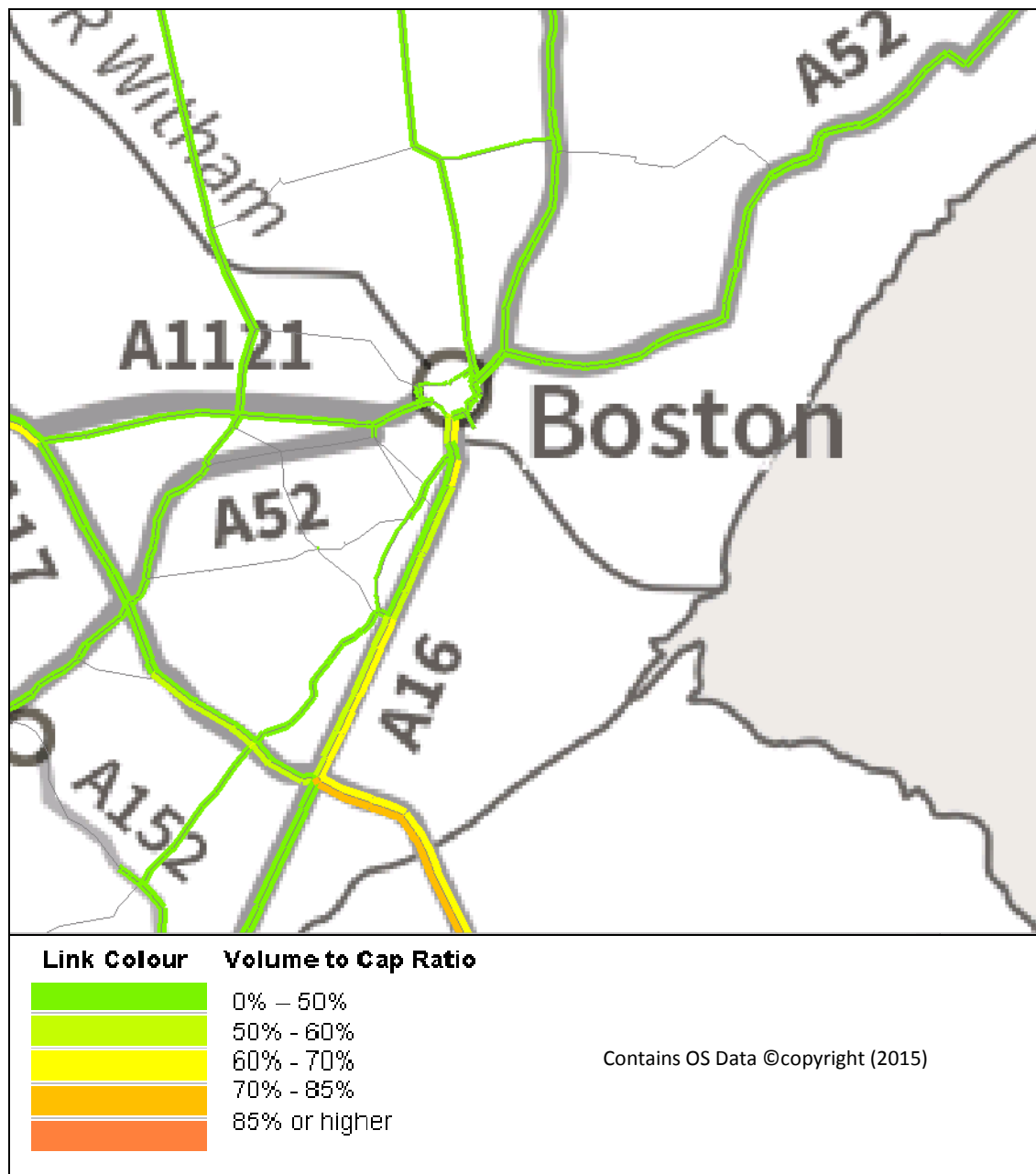


Figure 8-10 – Volume to Capacity Ratio 2036 AM Peak – Boston

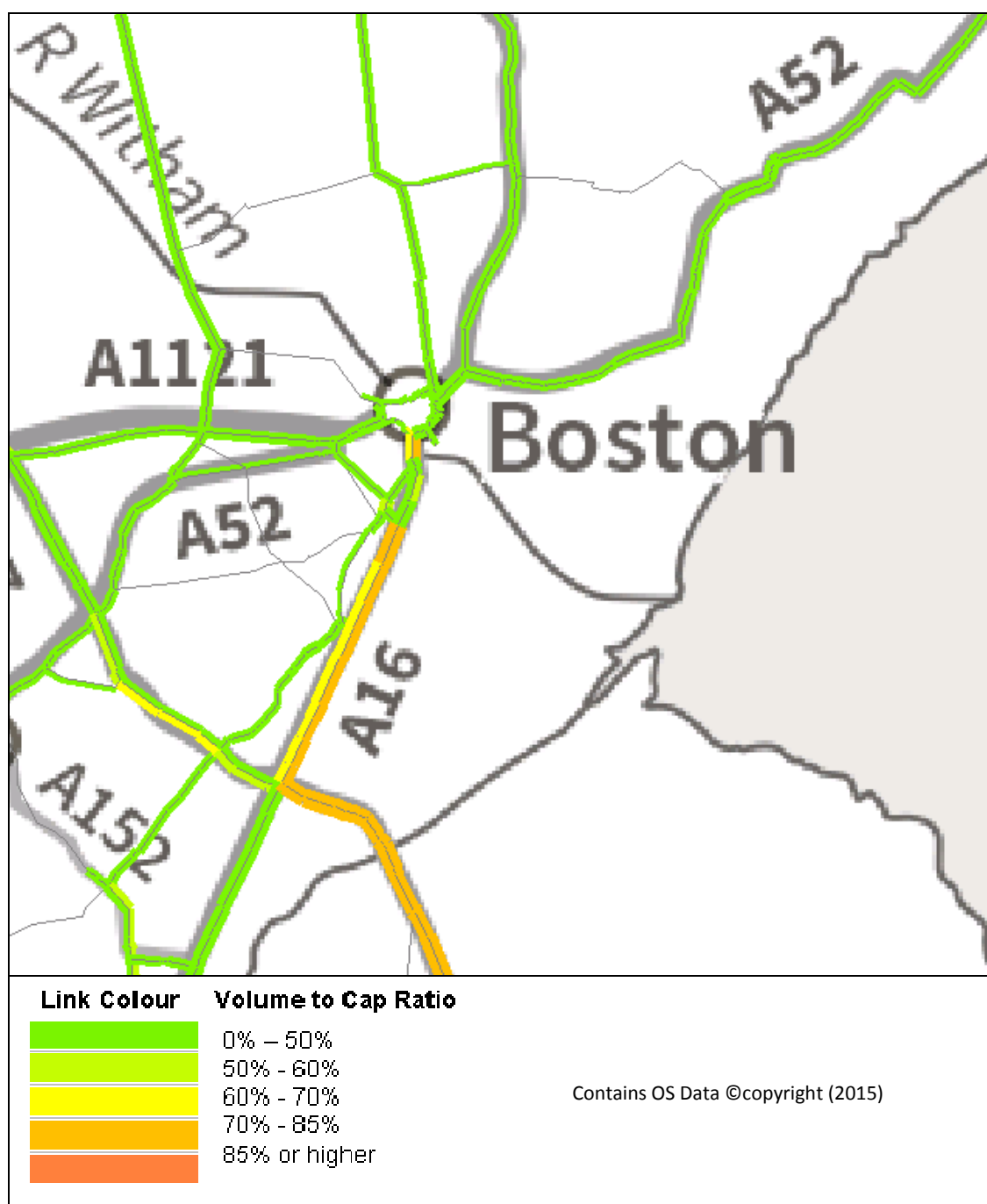


Figure 8-11 – Volume to Capacity Ratio 2014 PM Peak – Boston

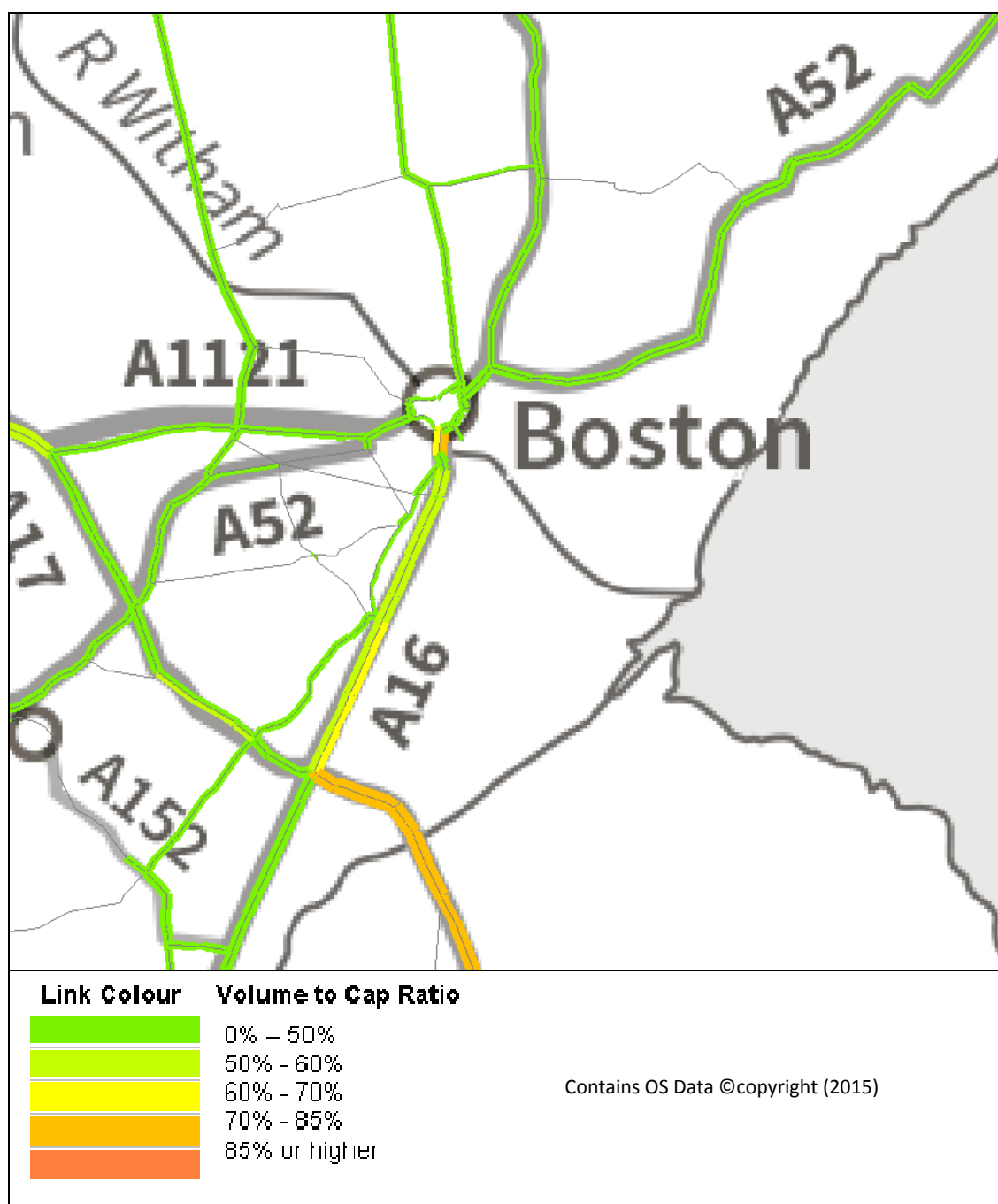


Figure 8-12 – Volume to Capacity Ratio 2036 PM Peak – Boston

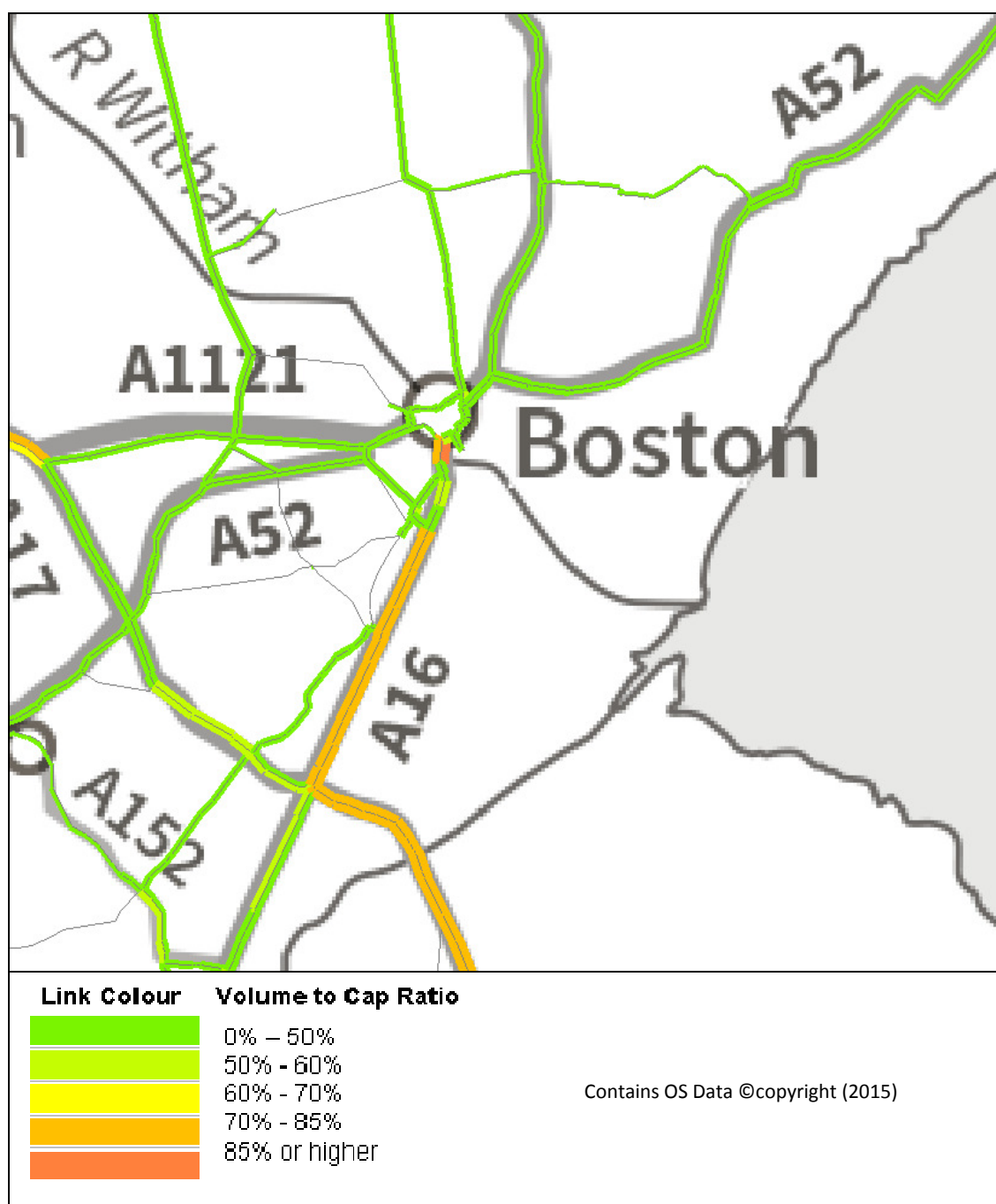


Figure 8-13 – Volume to Capacity Ratio 2014 AM Peak – Spalding

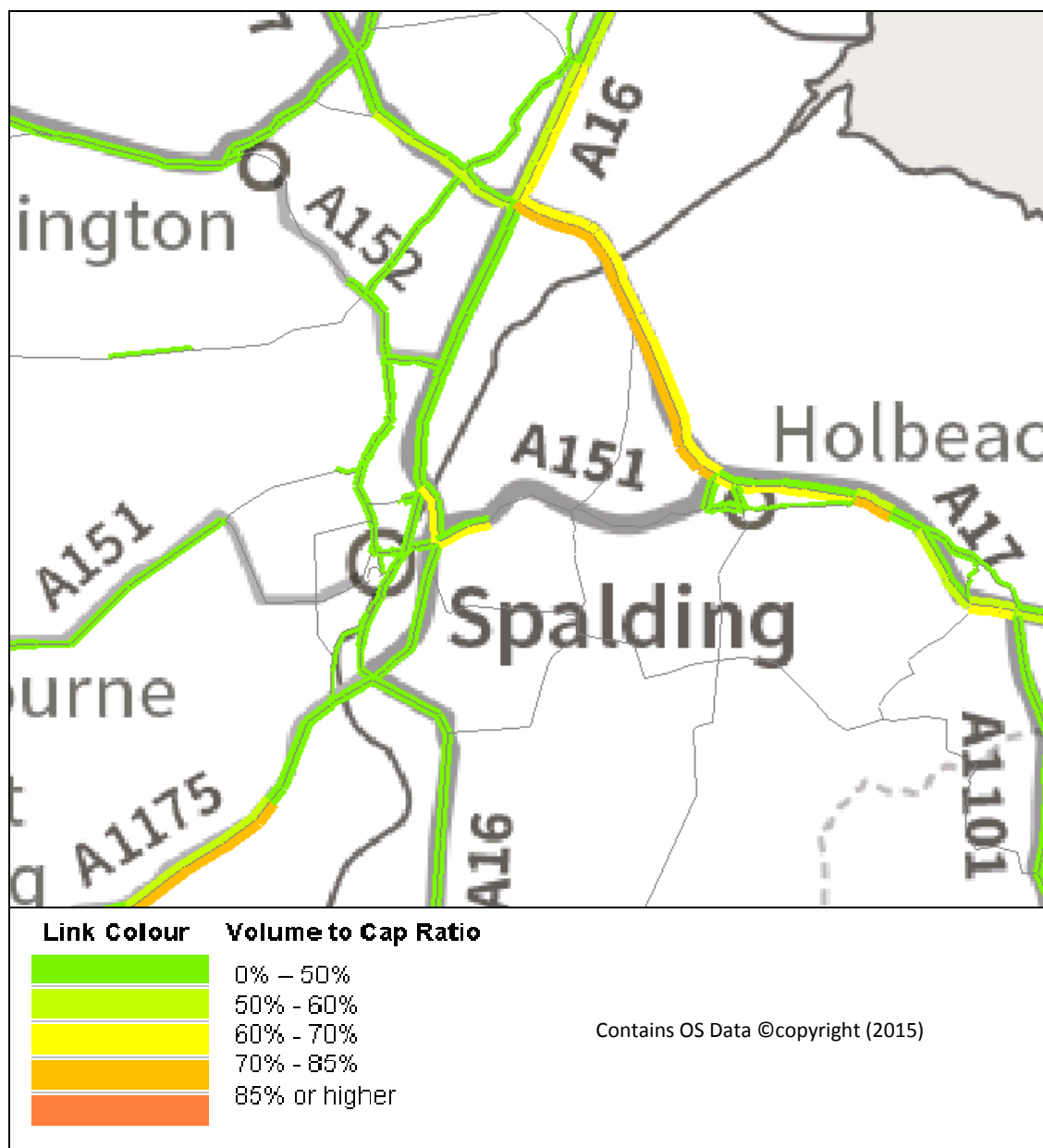


Figure 8-14 – Volume to Capacity Ratio 2036 AM Peak – Spalding

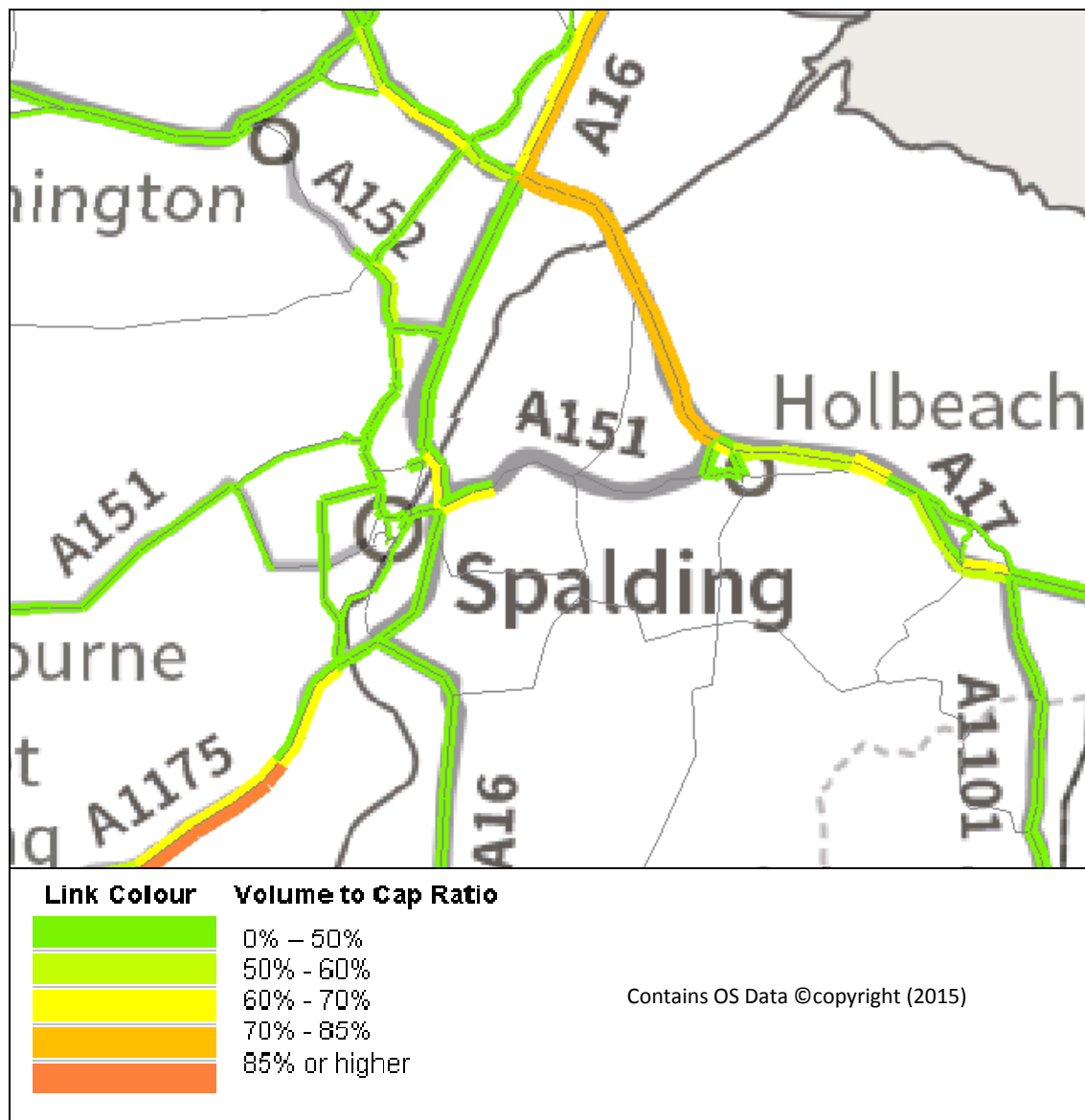


Figure 8-15 – Volume to Capacity Ratio 2014 PM Peak – Spalding

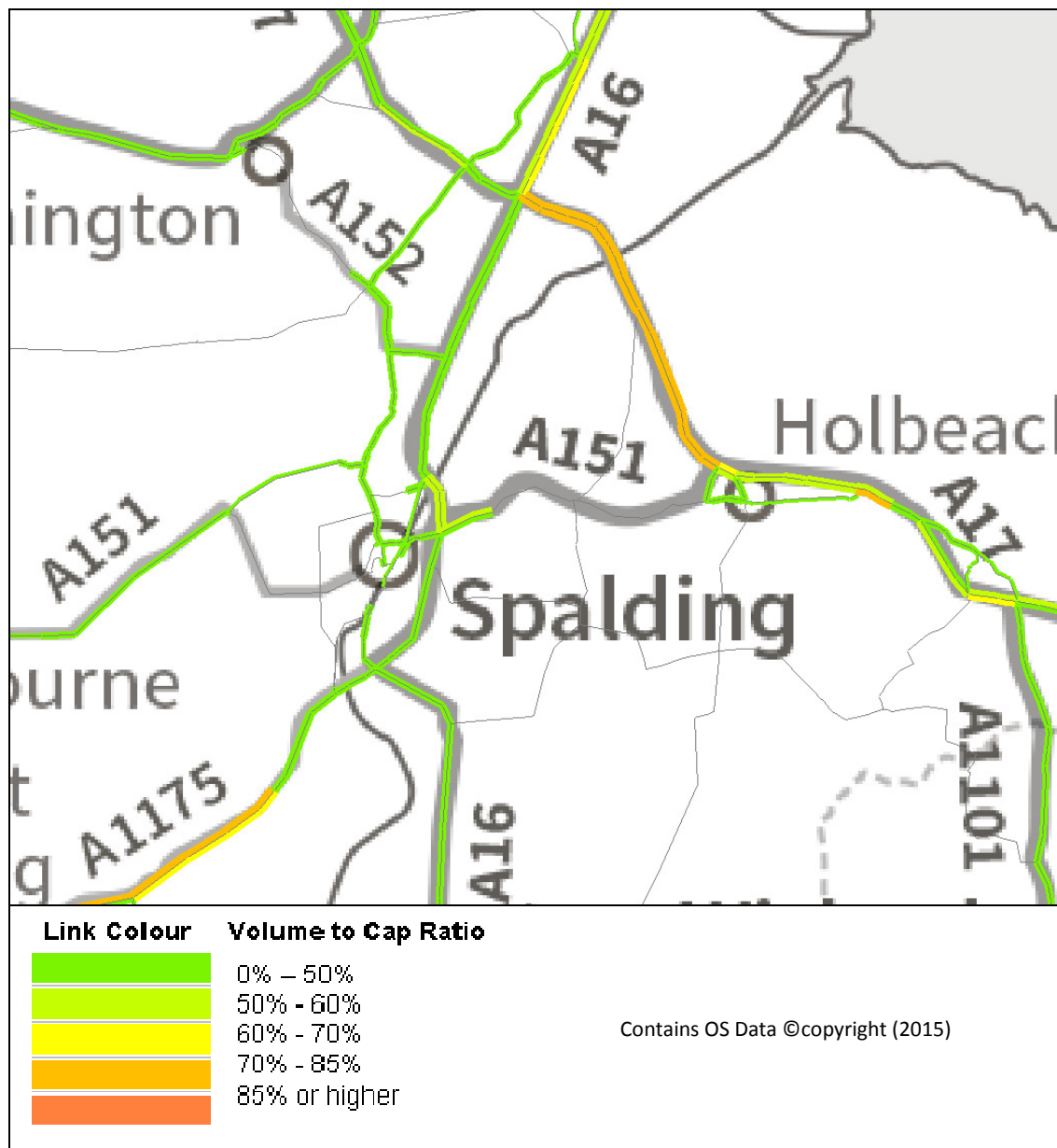
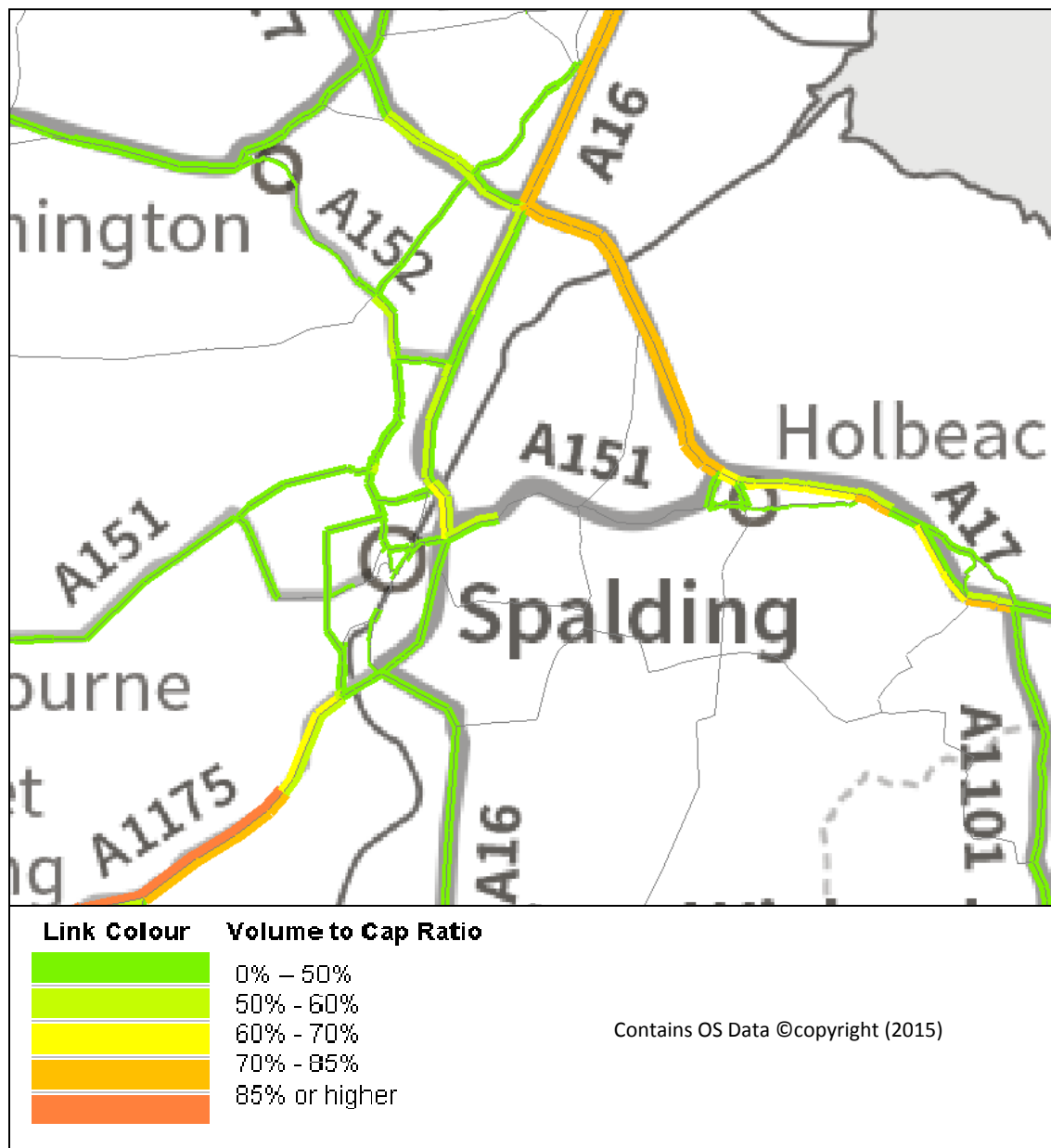


Figure 8-16 – Volume to Capacity Ratio 2036 PM Peak – Spalding



The figures above show that there are several areas within South East Lincolnshire where analysis of volume to capacity ratios indicate areas for concern. In particular:

- The A1175 west of Deeping St. Nicholas, which shows volume to capacity ratios of over 85% eastbound in the AM peak and westbound in the PM peak in the study year;
- The A16 through the centre of Boston and also past Wyberton, both of which show volume to capacity ratios of over 85% in the southbound direction in the PM peak in the study year;
- The A16 between Sutterton Roundabout and Wyberton, where in the study year of 2036 there is a volume to capacity ratio of between 70% and 85% in the northbound direction in the PM peak and in the southbound direction in both peaks;
- The A17 between Sutterton Roundabout and the A151, where in the study year there is a volume to capacity ratio of between 70% and 85% in both peaks in both directions; and
- The A17 west of Swineshead Bridge, which shows a volume to capacity ratio of between 70% and 85% in the westbound direction in the AM peak in the study year.

As stated previously, the LLPT upper tier analysis investigates potential increases in demand on highway links (i.e. the sections of road between junctions) which provides a high level, strategic understanding of where increasing demand for journeys may generate capacity issues in future. The impact that junctions play in influencing highway capacity is very important and cannot be assessed using the LLPT upper tier analysis. Therefore, further, more detailed analysis, taking account of either where known junction constraints already occur or where significant increases in demand for traffic are forecast, is recommended.

8.4 Conclusions

Detailed analysis of inter-zonal trip growth in South East Lincolnshire resulting from worst case development assumptions both within and external to the Local Plan area in the period to 2036 has highlighted the following:

- The majority of peak hour trips expected to remain with South East Lincolnshire.
- General growth of trip volumes associated with existing destinations, and a growth associated with destinations to the south such as Peterborough.
- Significant capacity issues through and south of Boston, including on the A16, and on the A1175 west of Deeping St. Nicholas. It should be noted that

only the southern extent of Boston Distributor Road (through the Quadrant 1 and Quadrant 2 sites) has been included in the testing.

- Capacity issues on the A16 and A17 north and west of Sutterton Roundabout.
- Capacity issues on the A17 west of Swineshead Bridge.

8.5 Mitigation

In order to mitigate the issues identified above, further work may be required. In particular, a detailed assessment of options for potential mitigation around Boston should be undertaken. More detailed assessment of the A16 and A17 may also be needed, particularly as the routes cross at Sutterton Roundabout. Further investigation of issues on the A1175 may also be necessary.

9 Results – South Kesteven

9.1 Introduction

In this Section, the outputs from the tool for South Kesteven are presented for the 2014 and 2036 years, based upon the Core Scenario (See Section 11.2).

9.2 Plan Area and Status of Local Plan

The emerging South Kesteven Local Plan will set out the Council's plans for growth and development in South Kesteven in the period to 2036. Adoption of the new plan is expected in 2017.

9.3 Results

9.3.1 Origins and Destinations

The table and figures below show origins and destinations for inter-zonal trips to and from South Kesteven in the AM Peak hour, in 2014 and 2036.

Table 9-1 – Origins and Destinations for AM Peak Hour Trips – South Kesteven

Local Plan Area	Settlement	2014		2036	
		Origin (Trips from S Kesteven)	Destination (Trips to S Kesteven)	Origin (Trips from S Kesteven)	Destination (Trips to S Kesteven)
South Kesteven	Grantham	2,422	2,595	3,239	3,310
	Stamford	899	1,094	1,006	1,283
	Market Deeping	661	564	797	663
	Bourne	613	555	557	537
	Other South Kesteven	1,087	1,595	2,074	1,879
	Total South Kesteven	6,402	6,402	7,673	7,673
Central Lincolnshire	Lincoln	320	440	451	533
	Sleaford	584	490	889	680
	Other Central Lincolnshire	445	375	516	438
	Total Central Lincolnshire	1,349	1,305	1,857	1,441
South East Lincolnshire	Boston	120	152	173	189
	Spalding	555	646	823	825
	Other South East Lincs.	499	412	579	427
	Total South East Lincs.	1,174	1,211	1,575	1,441
East Lindsey	Total East Lindsey	207	185	246	228
External	Peterborough	888	1,637	926	1,971
	Newark	257	329	323	445

Local Plan Area	Settlement	2014		2036	
		Origin (Trips from S Kesteven)	Destination (Trips to S Kesteven)	Origin (Trips from S Kesteven)	Destination (Trips to S Kesteven)
	Nottingham	118	301	160	426
	Other External	1,443	2,486	1,613	3,113
	Total External	2,806	4,108	3,108	5,159
Total Outside South Kesteven		5,536	6,809	6,786	8,403
Total		11,937	13,212	14,458	16,152

For the purposes of clarity, note that 'origin' refers to the origin of trips whose destination is in South Kesteven; and that 'destination' refers to the destination of those trips whose origin is in South Kesteven.

Figure 9-1 – Journey Origins to South Kesteven, AM Peak

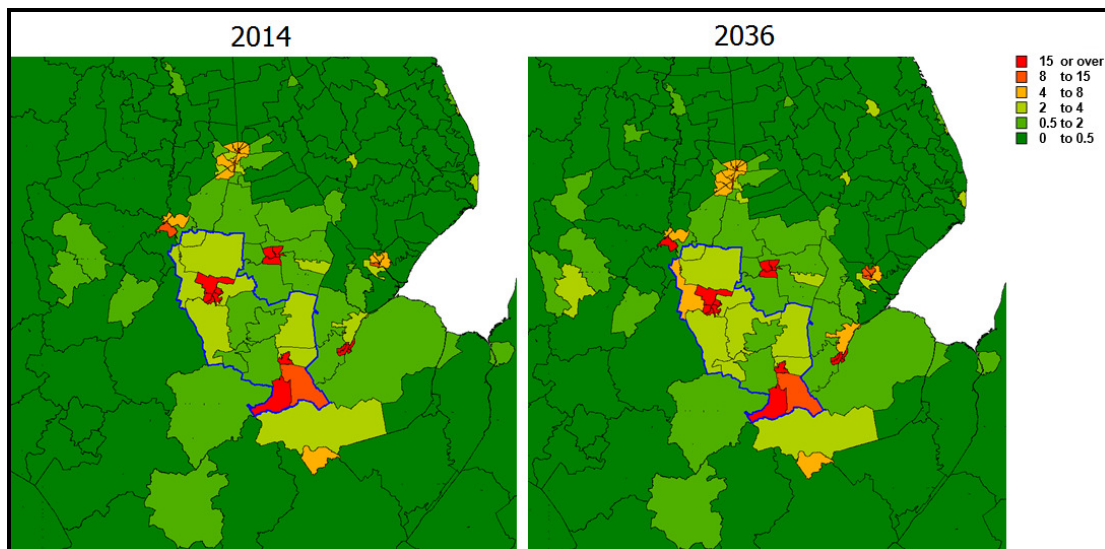
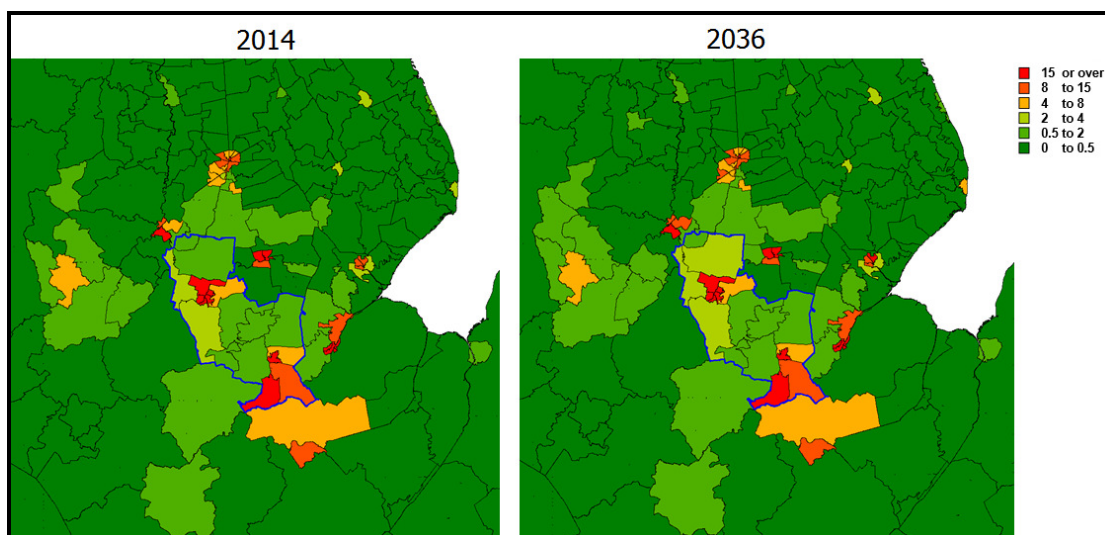


Figure 9-2 – Journey Destinations from South Kesteven, AM Peak



The table and figures above show that the proportion of peak hour inter-zonal trips in South Kesteven which are internal to the District is lower than any of the other plan areas in Lincolnshire. Such trips account for around 54% of AM peak hour trips to destinations in South Kesteven in the AM Peak, and around 48% of AM peak hour trips starting in South Kesteven. The total outgoing AM peak hour trips is around 23% greater than the total incoming AM peak hour trips, indicating that South Kesteven is a net generator of peak hour journeys. In the study year of 2036, these patterns are expected to be broadly similar.

Grantham is the main sources of peak hour trips to the Local Plan area, with other towns in South Kesteven – Stamford, Market Deeping and Bourne – also acting as significant sources of trips. Outside of the District, the main sources of trips are the immediately surrounding areas: Peterborough, South Holland, Newark, Lincoln, and Sleaford and North Kesteven. This pattern remains broadly consistent in the period to 2036, with an intensification of vehicle trip generation from existing areas.

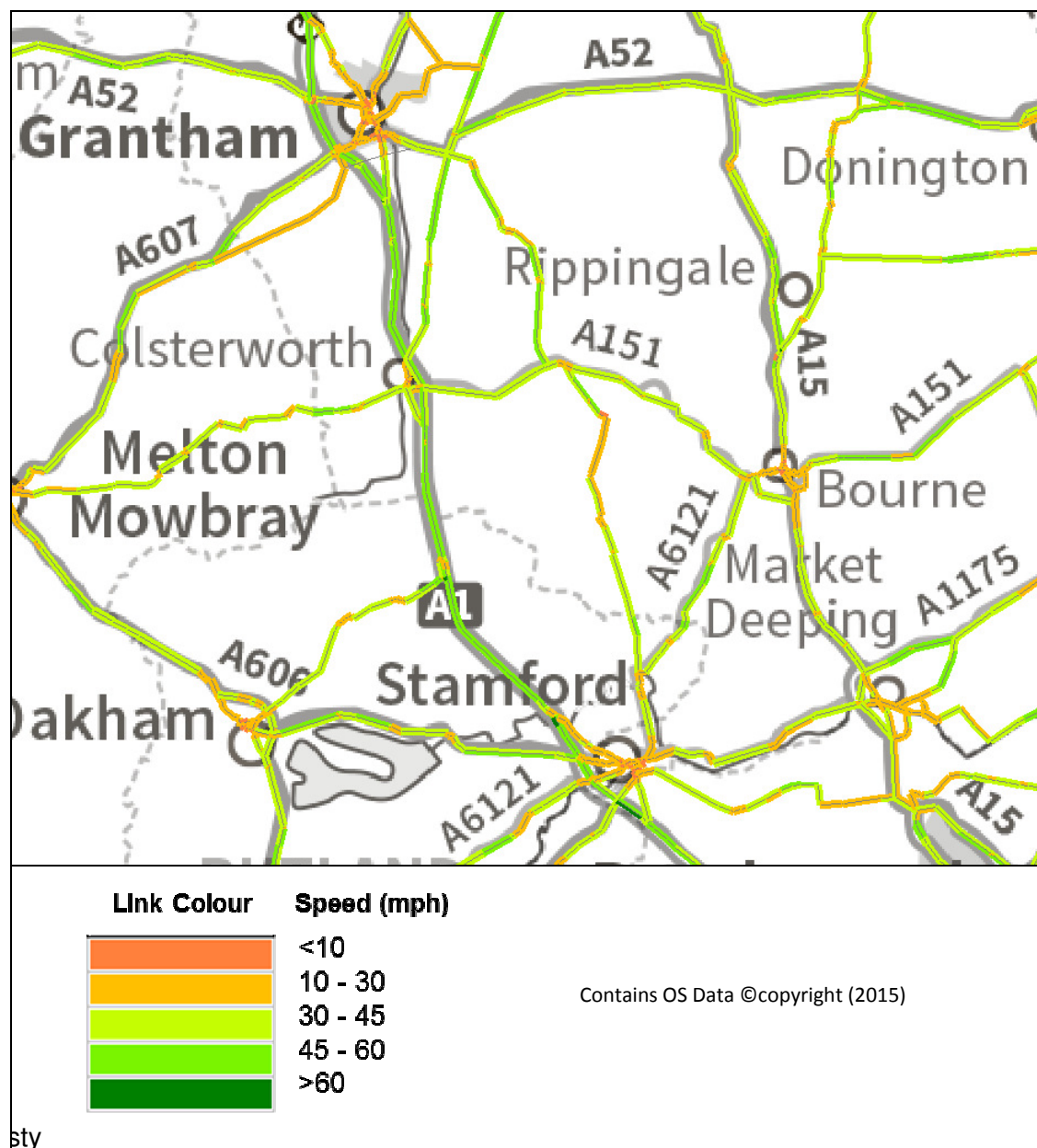
Destinations of trips from South Kesteven within the AM Peak show a similar pattern. Grantham is the single most important destination, and the other main towns within the District are also important. Outside of the District, Peterborough is one of the most significant destinations, and there are also strong connections with Lincoln, Spalding, Sleaford, Newark and Nottingham. Again, this pattern remains the same in 2036.

This increase in trips is likely to have significance for several routes through South East Lincolnshire, particularly the A16 and A17. The likely impacts are discussed in more detail below.

9.3.2 *Current Highway Network Speeds*

The figure below shows current speeds on links in South Kesteven in the AM Peak taken from information supplied by Trafficmaster.

Figure 9-3 – Current Link Speeds – South Kesteven

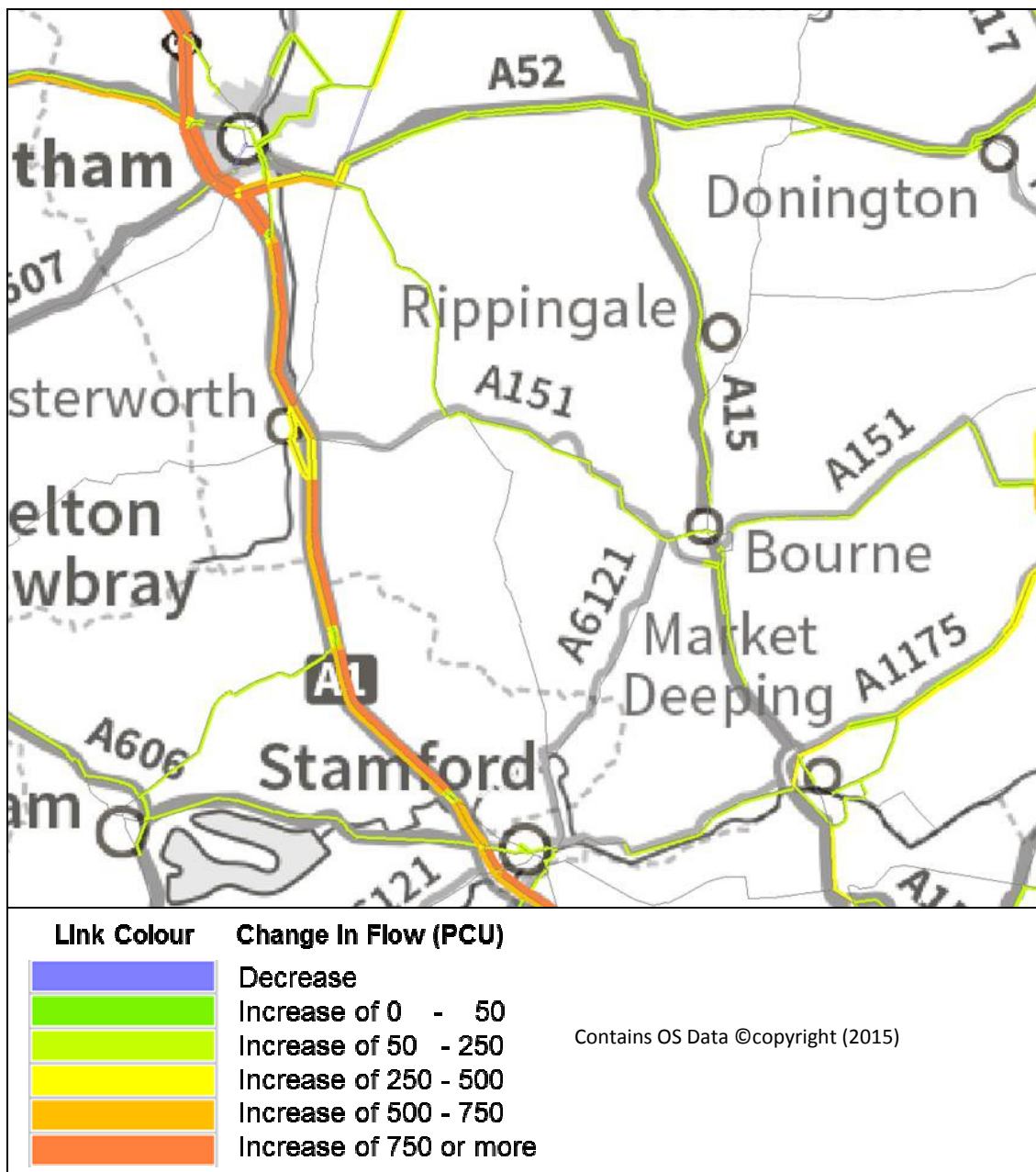


The above figure shows that the urban areas of both Grantham and Stamford experience a significant amount of congestion, indicated by links with average speeds of less than 10mph, with fewer issues in Bourne and Market Deeping.

9.3.3 Flow Differences

The figure below shows flow differences between 2014 and 2036 across South Kesteven in the AM peak hour.

Figure 9-4 – Flow Difference 2014 – 2036 – AM Peak – South Kesteven



The most significant differences shown on the figure above are on the A1 between Grantham and Stamford, with increases of over 750 PCUs per hour. There are significant increases on the A52 near Grantham on either side of the A1. The A607 to the east of Grantham and the A1175 east of Market Deeping also see increases of over 250 PCUs per hour. On most other links in the district, increases are much more modest.

9.3.4 Comparison of Demand to Capacity

The figures below show the volume to capacity ratios on the A and B roads at peak times across South Kesteven, both in the base year of 2014 and the study year of 2036. This shows how congested these links are: the higher the volume to capacity

ratio, the greater the likelihood of congestion. In general, volume to capacity ratios of over 85% show that there is likely to be congestion due to insufficient capacity.

Figure 9-5 – Volume to Capacity Ratio 2014 AM Peak – South Kesteven

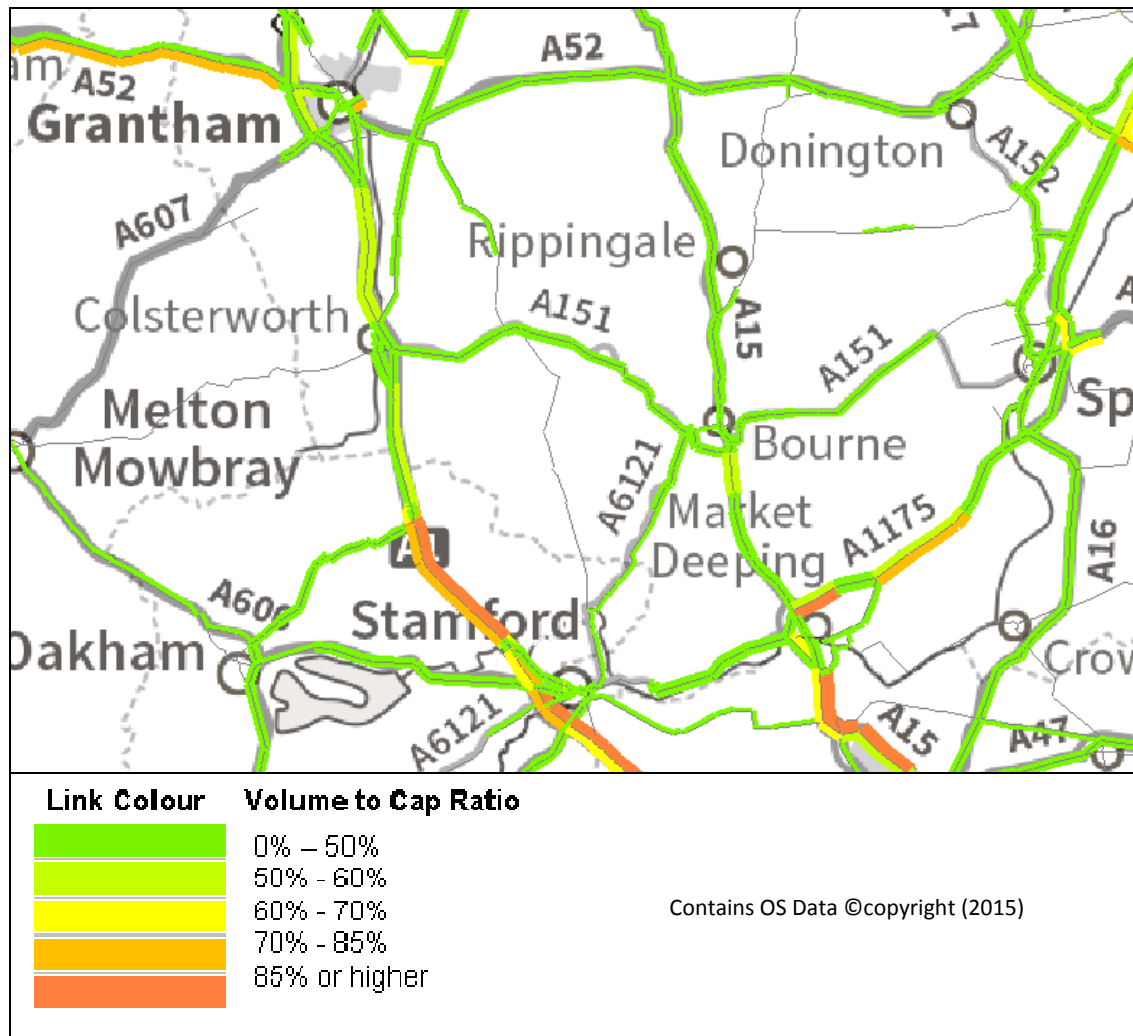


Figure 9-6 – Volume to Capacity Ratio 2036 AM Peak – South Kesteven

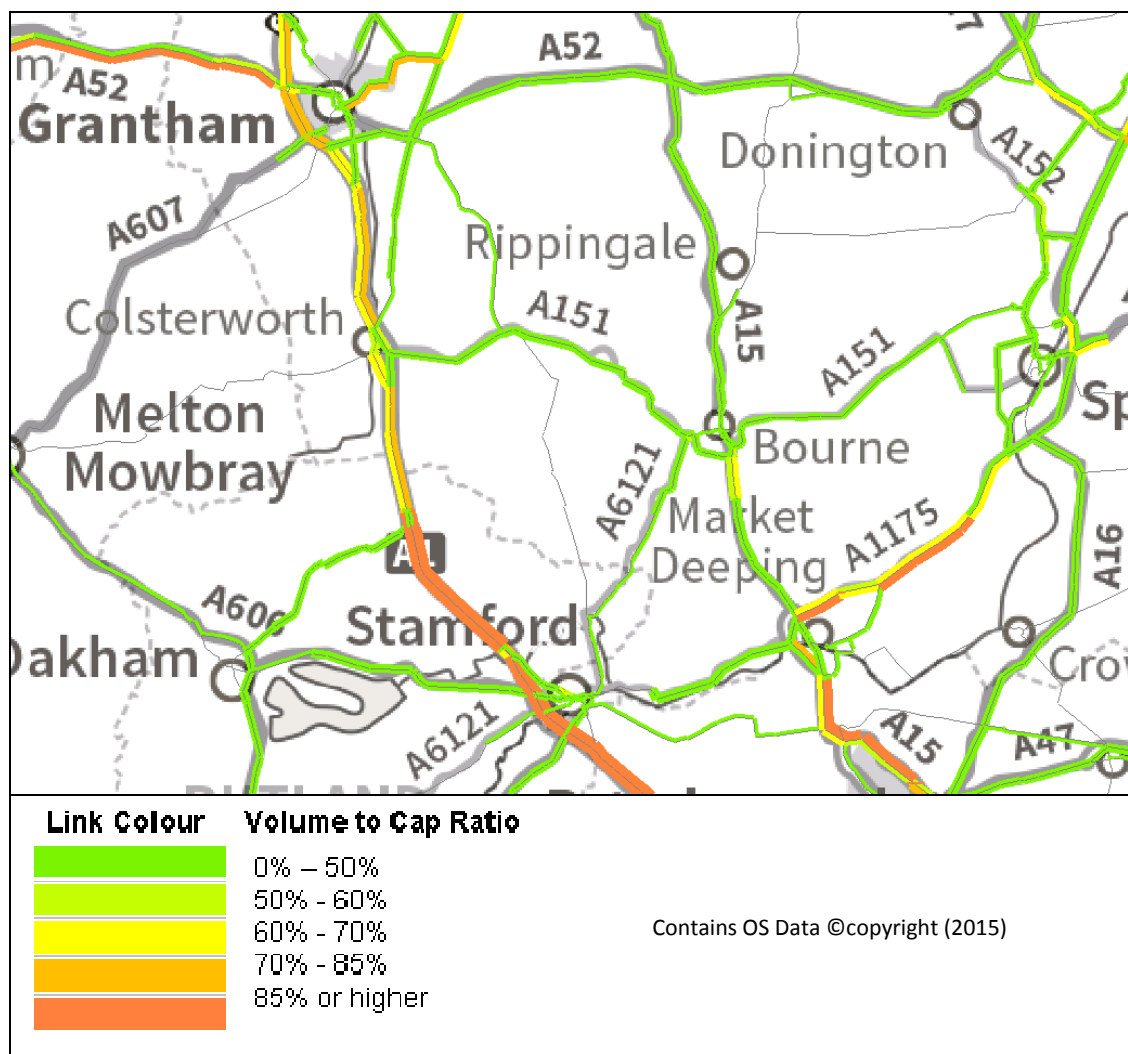


Figure 9-7 – Volume to Capacity Ratio 2014 PM Peak – South Kesteven

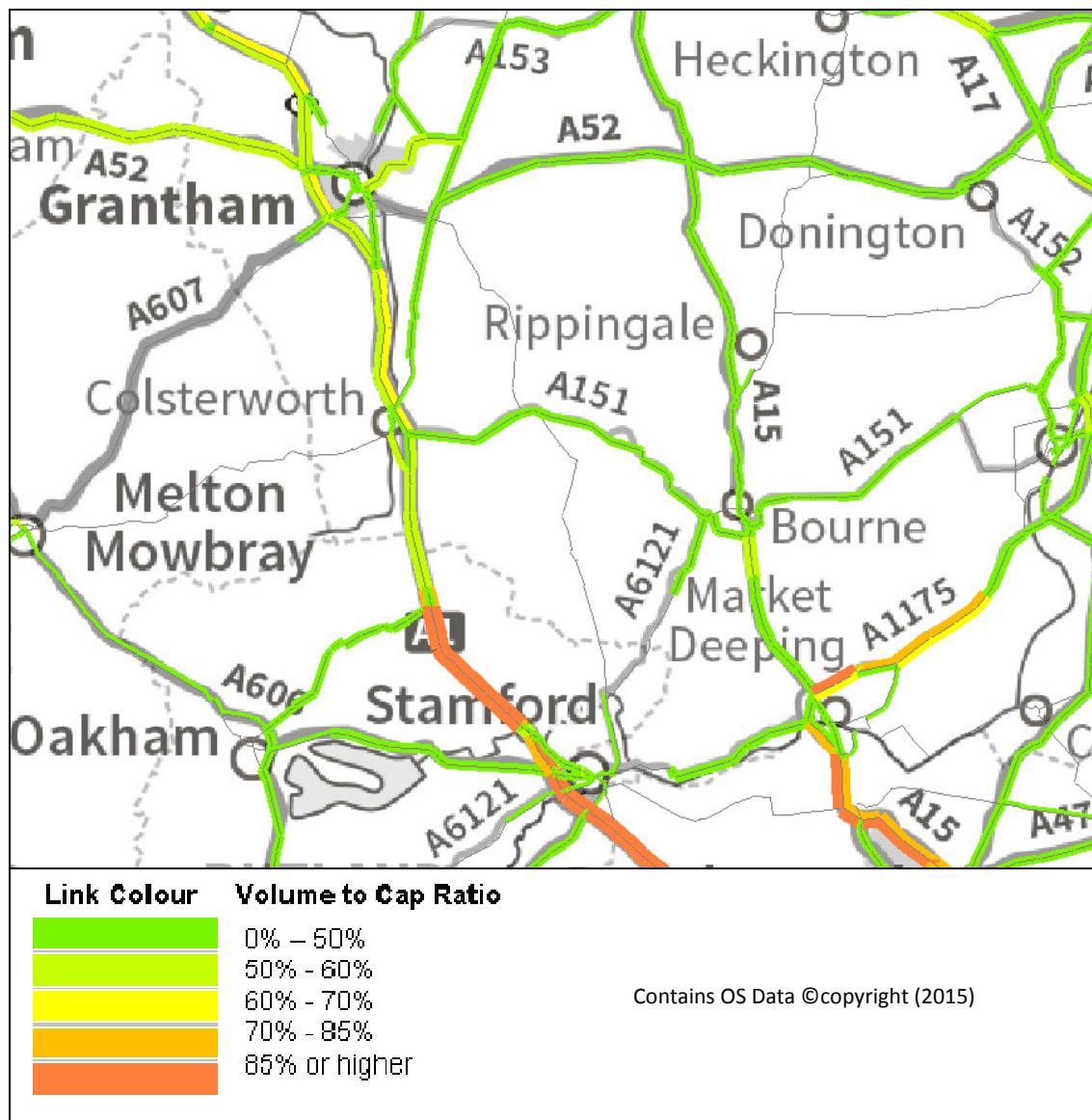
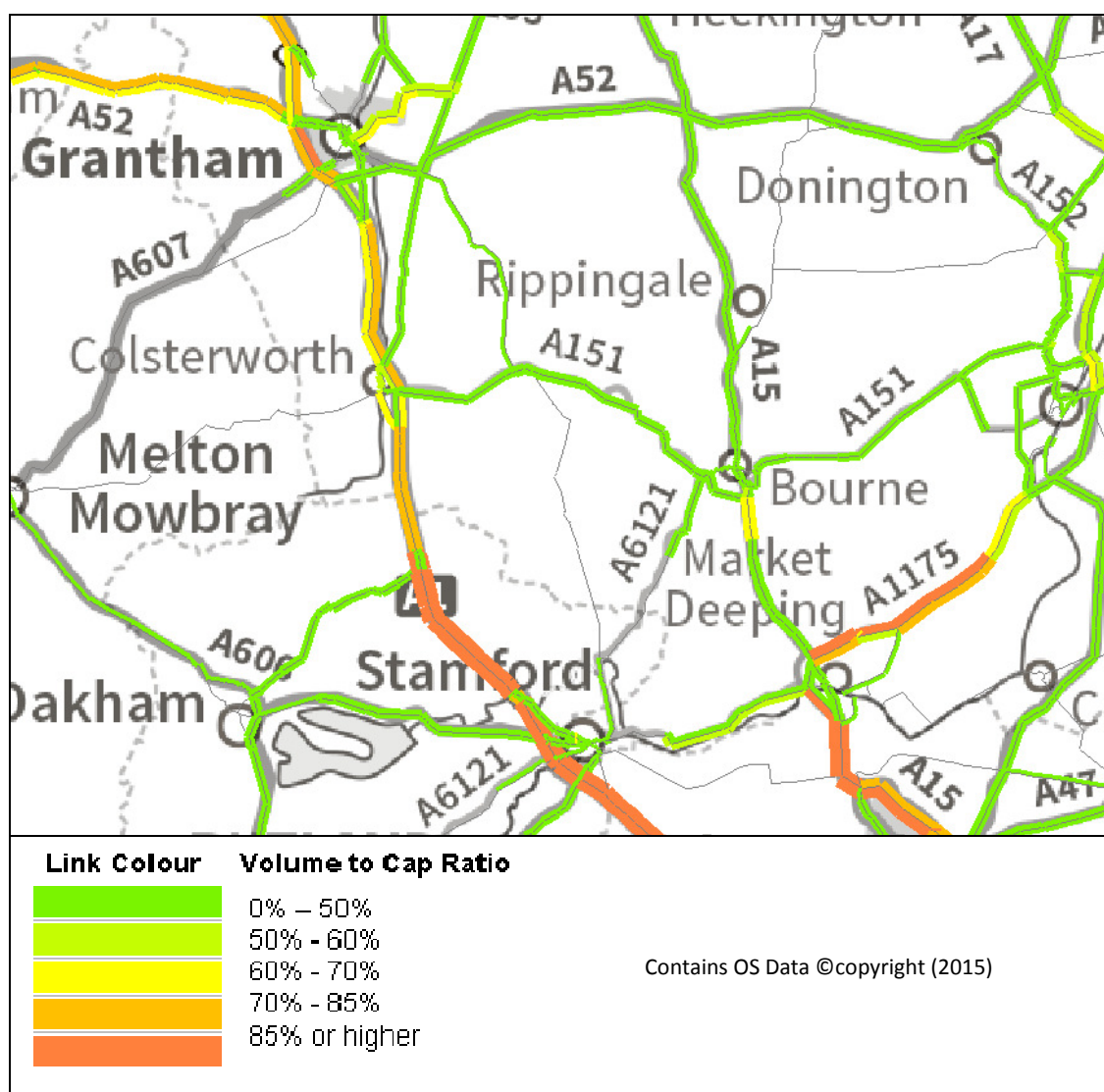


Figure 9-8 – Volume to Capacity Ratio 2036 PM Peak – South Kesteven



The figures below show the towns of Grantham and Stamford in more detail.

Figure 9-9 – Volume to Capacity Ratio 2014 AM Peak – Grantham

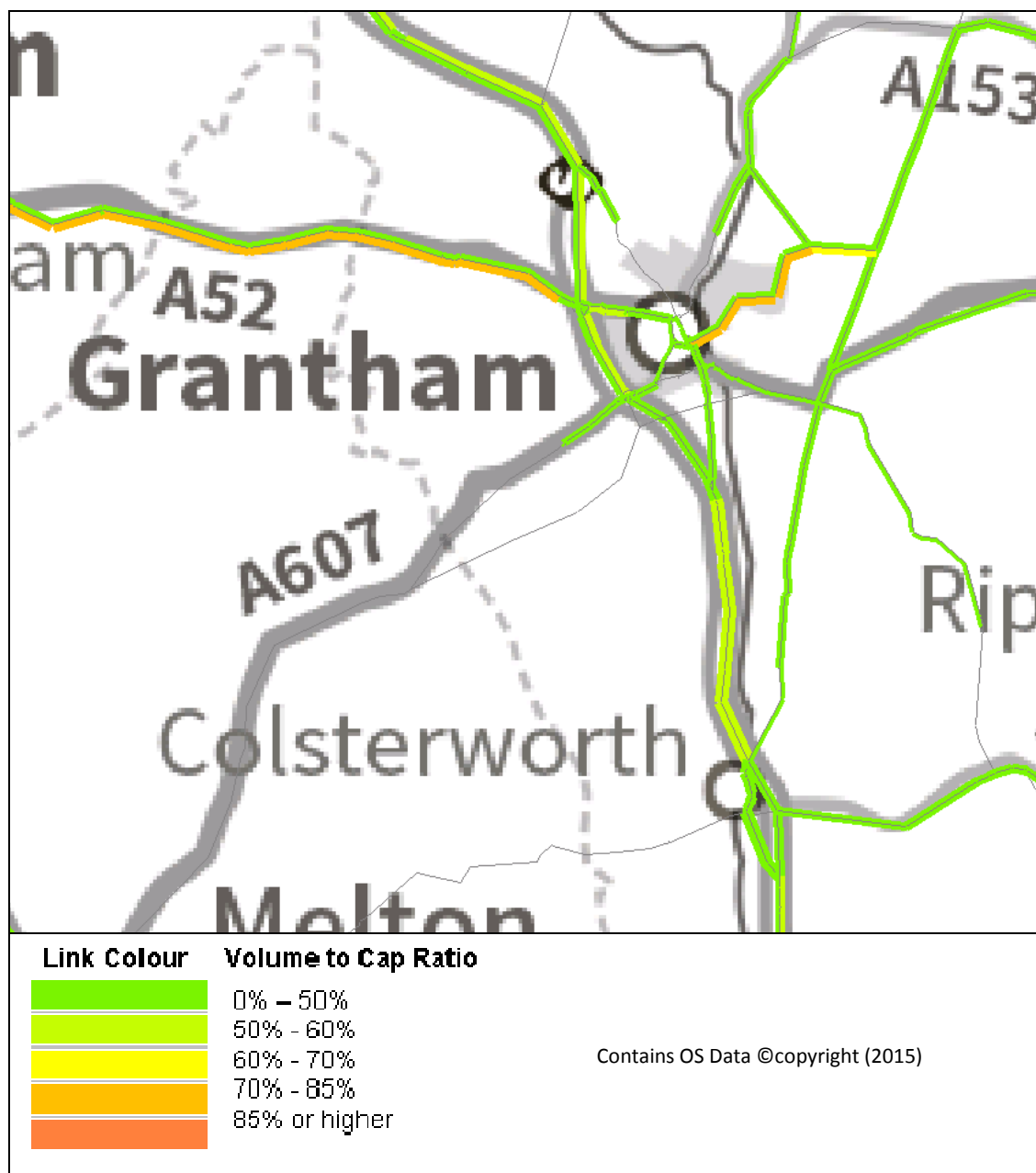


Figure 9-10 – Volume to Capacity Ratio 2036 AM Peak – Grantham

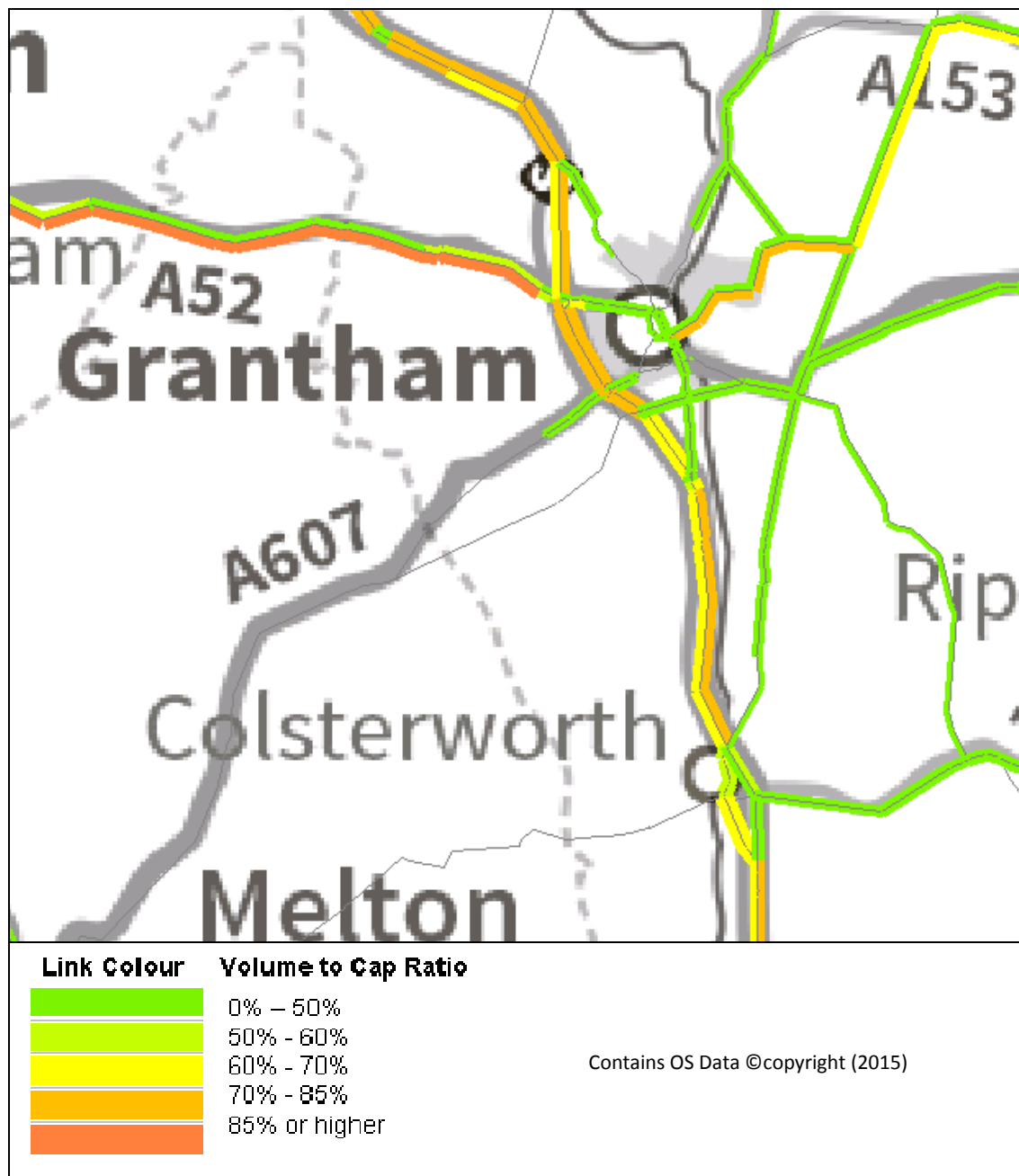


Figure 9-11 – Volume to Capacity Ratio 2014 PM Peak – Grantham

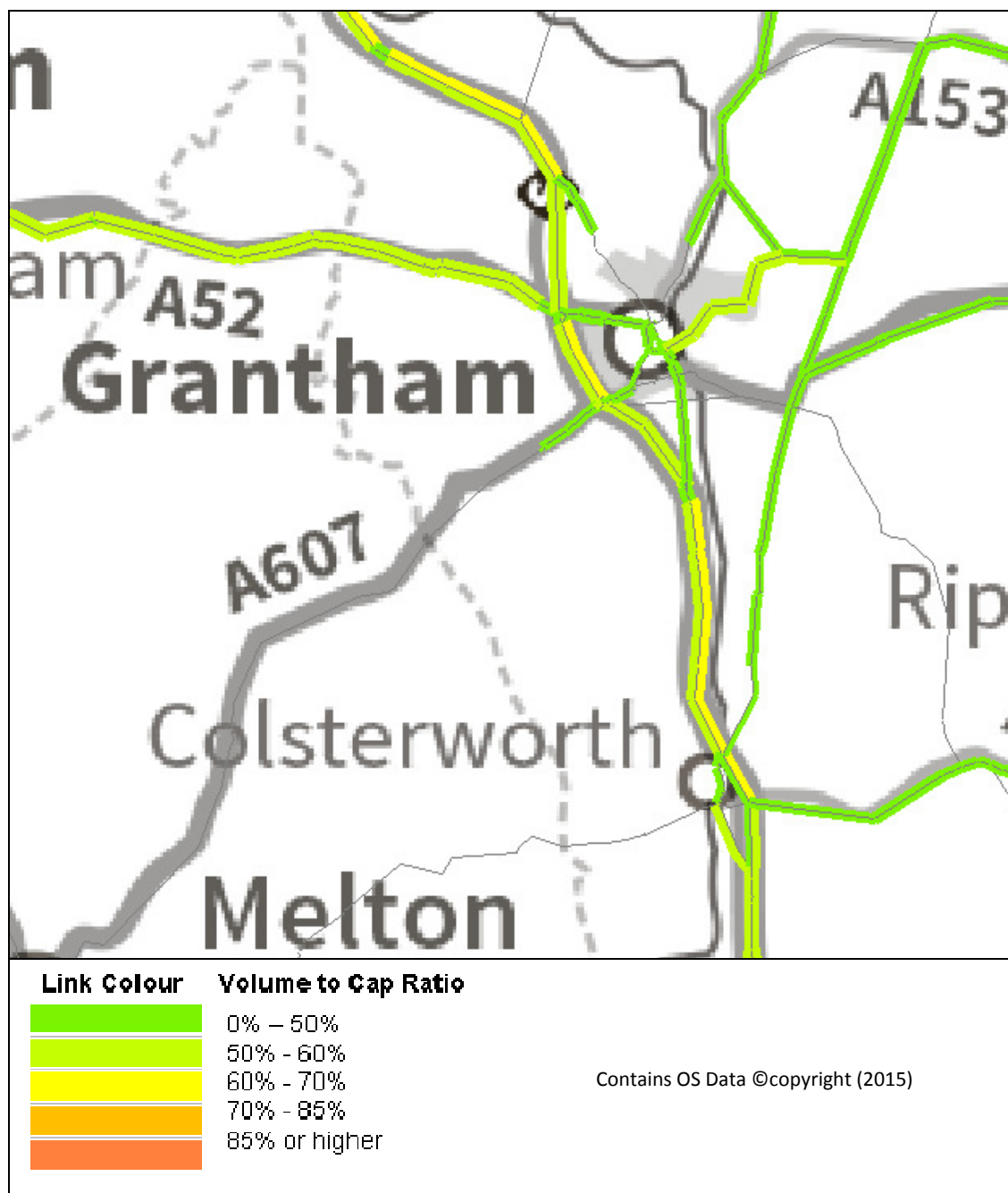


Figure 9-12 – Volume to Capacity Ratio 2036 PM Peak – Grantham

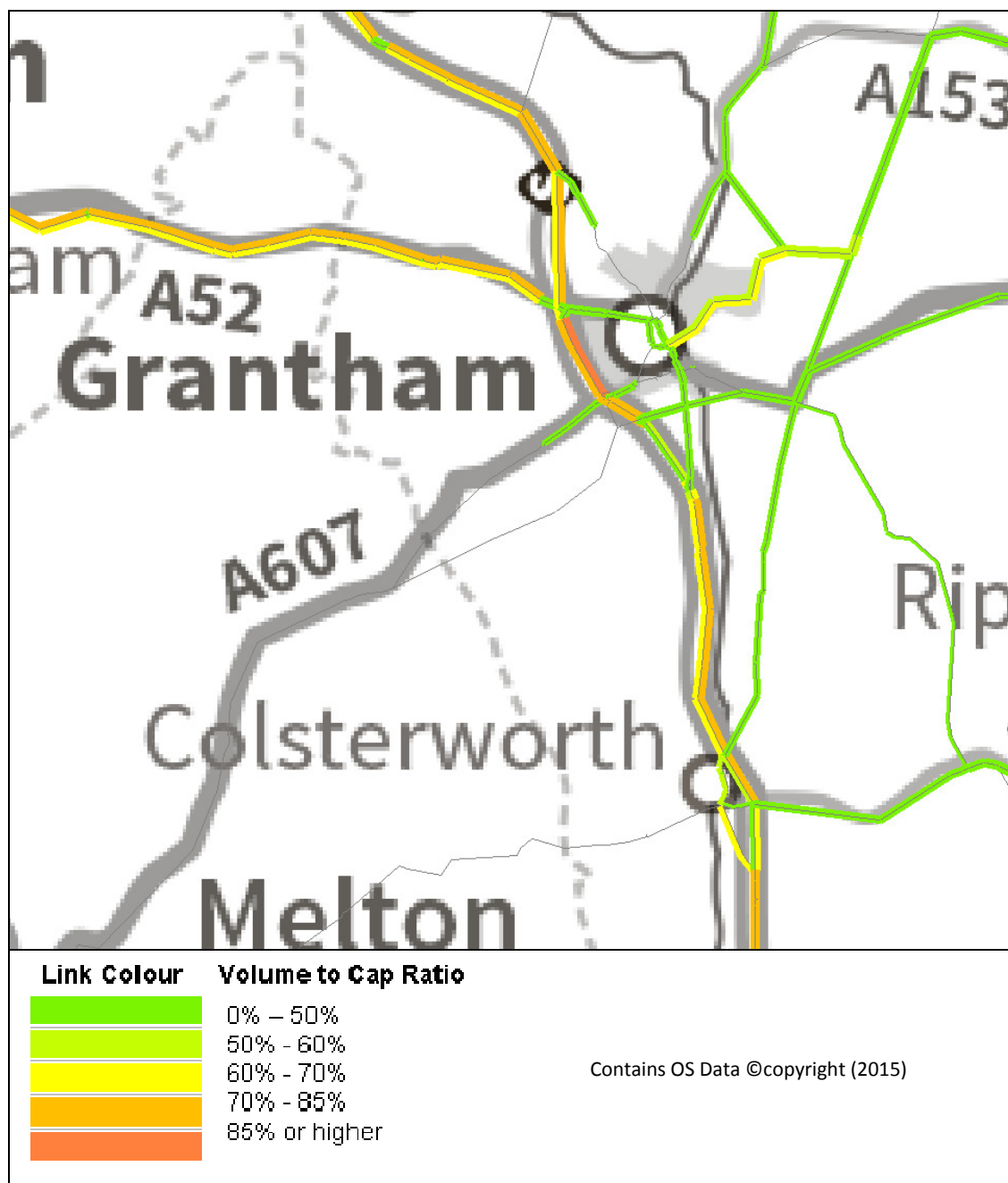


Figure 9-13 – Volume to Capacity Ratio 2014 AM Peak – Stamford

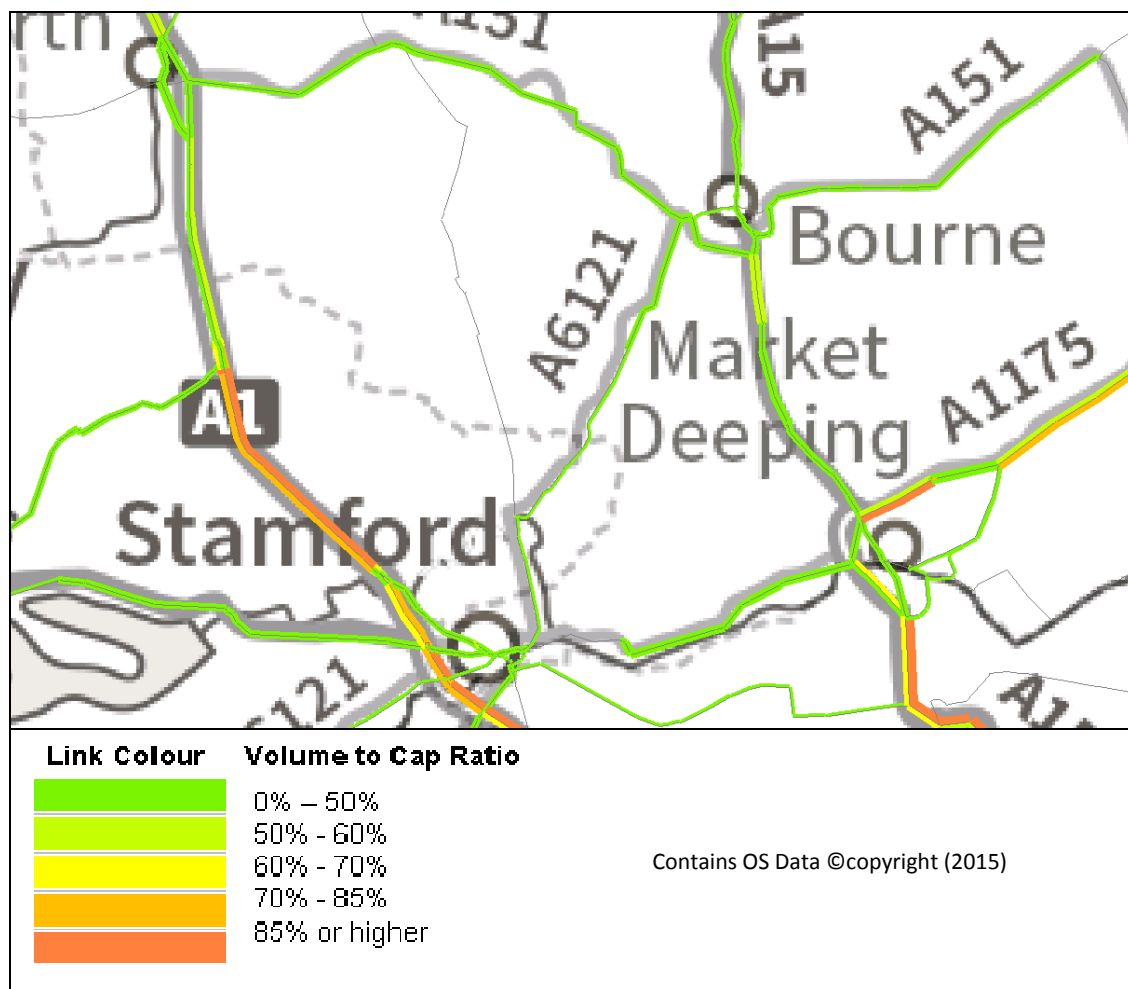


Figure 9-14 – Volume to Capacity Ratio 2036 AM Peak – Stamford

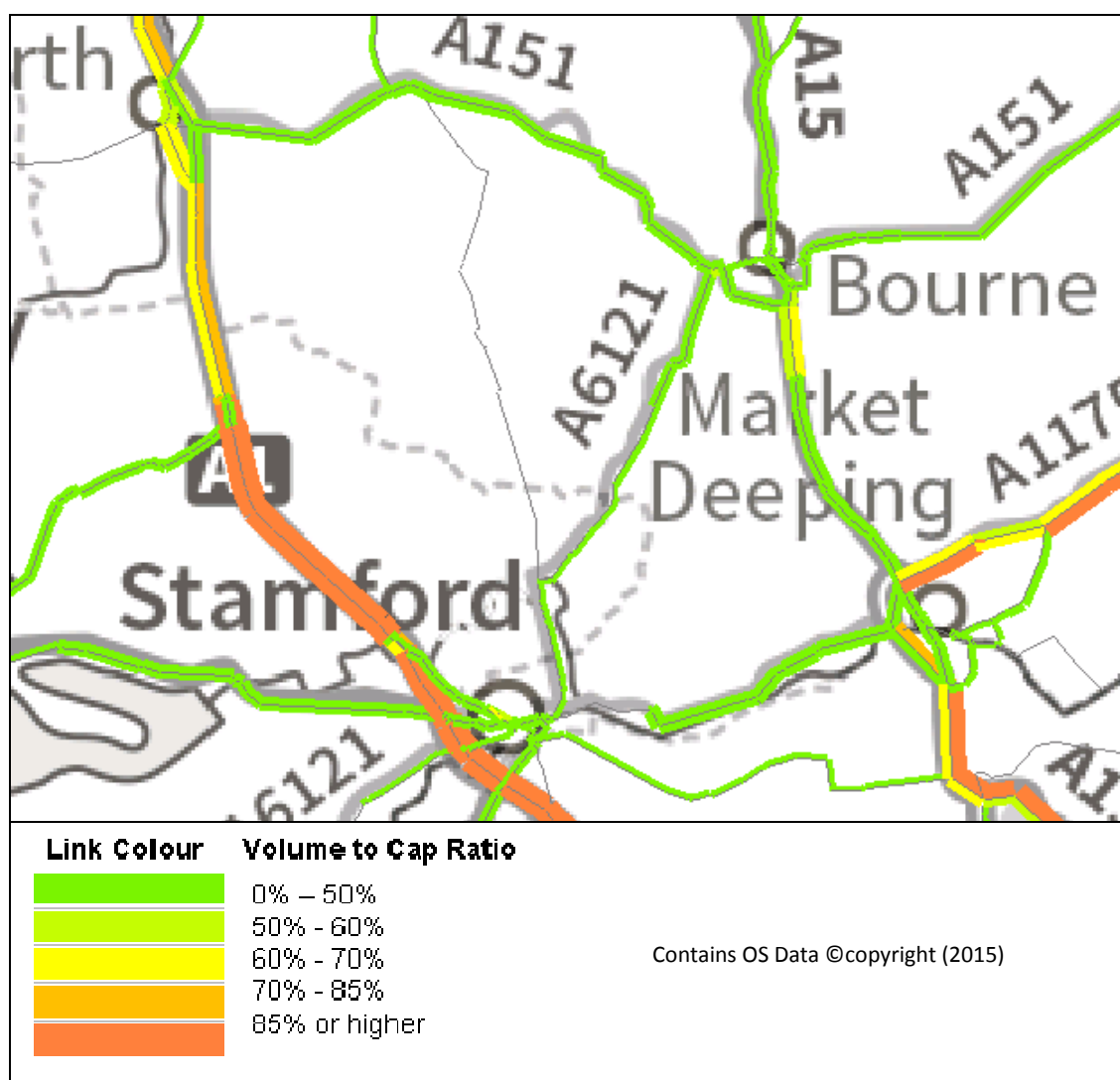


Figure 9-15 – Volume to Capacity Ratio 2014 PM Peak – Stamford

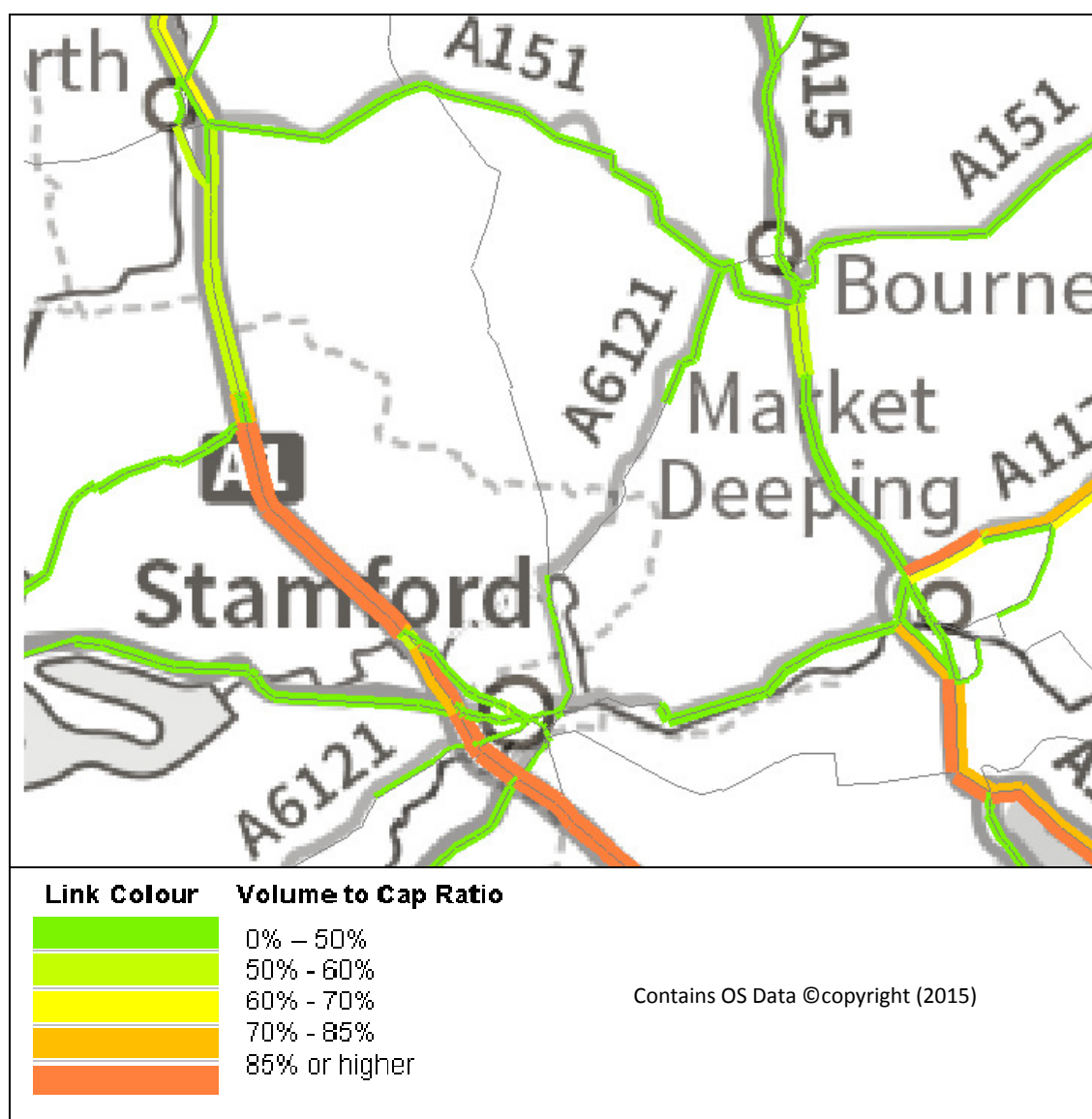
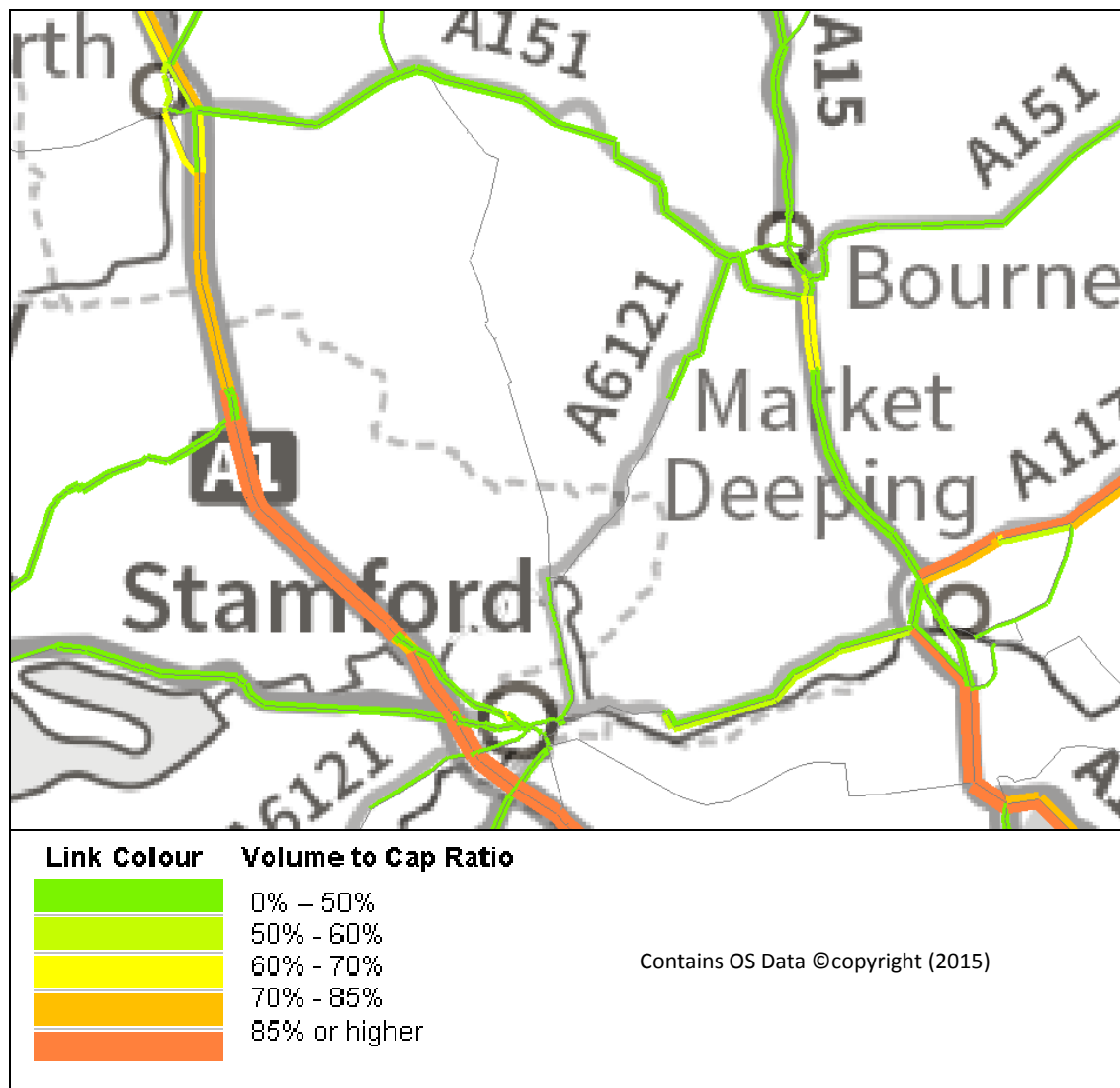


Figure 9-16 – Volume to Capacity Ratio 2036 PM Peak – Stamford



The figures above show that there are several areas within South Kesteven where analysis of volume to capacity ratios indicate areas for concern. In particular:

- The A1175 between Market Deeping and Deeping St. Nicholas, which shows volume to capacity ratios of over 85% eastbound in the AM peak and westbound in the PM peak in the study year;
- The A52 west of the A1 near Grantham, which shows volume to capacity ratios of over 85% westbound in the AM peak in the study year; and
- The Harrowby Lane / Alma Park Road route into Grantham from Londonthorpe, which shows volume to capacity ratios of over 70% in the AM peak in the study year.

In addition, it is also worth noting various locations just outside the boundaries of the District where volume to capacity ratios in the study year are over 85%, in particular the A1 near Stamford (in Rutland and Peterborough) and the A15 south of Market Deeping (in Peterborough).

9.4 Conclusions

Detailed analysis of inter-zonal trip growth in South Kesteven resulting from worst case development assumptions both within and external to the Local Plan area in the period to 2036 has highlighted the following:

- South Kesteven is a net generator of peak hour journeys.
- Grantham is the most significant town in terms of vehicle trip generation; outside the District, Peterborough is a significant source and destination of trips.
- Grantham and Stamford currently experience peak period congestion. Grantham Southern Relief Road has been included in the testing and will mitigate some of the increases in traffic but congestion is still forecast.
- Significant capacity issues on the A1175 between Market Deeping and Deeping St. Nicholas.
- Capacity issues on stretches of the A1 near Stamford and A15 near Market Deeping just outside the county boundaries.

As stated previously, the LLPT upper tier analysis investigates potential increases in demand on highway links (i.e. the sections of road between junctions) which provides a high level, strategic understanding of where increasing demand for journeys may generate capacity issues in future. The impact that junctions play in influencing highway capacity is very important and cannot be assessed using the LLPT upper tier analysis. Therefore, further, more detailed analysis, taking account of either where known junction constraints already occur or where significant increases in demand for traffic are forecast, is recommended.

9.5 Mitigation

In order to mitigate the issues identified above, further work may be required. In particular, a detailed assessment of growth around Market Deeping may be needed to help understand why the LLPT is identifying potential issues in this area when additional infrastructure delivered in the area should have released capacity on the A1175. It may also be worth considering the towns of Grantham and Stamford in more detail. Grantham Southern Relief Road will mitigate some of the predicted growth in traffic but issues are forecast.

10 Summary

10.1 Key Findings

Based on the worst case growth scenarios, the main findings from the analysis undertaken on the outputs from the LLPT can be summarised as follows:

10.1.1 East Lindsey

- There is limited congestion within the main urban areas of East Lindsey. However, Horncastle appears to experience some peak period congestion and projected growth in traffic may exacerbate this.
- Most links within the District are expected to continue to operate comfortably within capacity even with additional traffic.
- One possible area for concern for link capacity is the A16 north of Louth, although even here it is predicted that the road will continue to operate within capacity.

10.1.2 Central Lincolnshire

- Significant capacity issues on Lincoln's Western and Northern Relief Roads.
- Capacity issues on arterial routes into Lincoln, especially on the A1434/A15 and B1188 to the south and B1398 to the north east.
- Other possible capacity issues on the approaches to Gainsborough and Sleaford.
- Potential impacts on trips via the A1 near Newark resulting from increased volumes.

10.1.3 South East Lincolnshire

- Significant capacity issues through and south of Boston, including on the A16, and on the A1175 west of Deeping St. Nicholas.
- Capacity issues on the A16 and A17 north and west of Sutterton Roundabout.
- Capacity issues on the A17 west of Swineshead Bridge.

10.1.4 South Kesteven

- Grantham and Stamford currently experience peak period congestion
- Significant capacity issues on the A1175 between Market Deeping and Deeping St. Nicholas.
- Capacity issues on stretches of the A1 near Stamford and A15 near Market Deeping just outside the county boundaries.

11 Next Steps

11.1 Lower Tier Modelling

Following the completion of the first stage of the LLPT Project (creating the Upper Tier Tool (the LLPT), using the Tool to assess future development impacts and analysing the findings), the second stage of the project can now commence.

The second stage of the commission will involve assessing, in more detail, the predicted highway impacts of the combined quantum of development planned in Lincolnshire across the four Local Plan areas up to 2036. The current commission includes for this more detailed assessment to be undertaken in the area covered by the Greater Lincoln Traffic Model.

This more detailed assessment will be undertaken using one or more of the existing 'Lower Tier' traffic models that have been developed and used by Lincolnshire County Council over the past few years.

The following areas are covered by existing Lower Tier traffic models:

- Boston;
- East Coast;
- Gainsborough;
- Grantham;
- Lincoln;
- Sleaford;
- Spalding; and,
- Stamford.

The lower tier modelling will have a number of steps including:

- Applying the worst case traffic growth assumptions and distributions developed through the Upper Tier Tool to the Lower Tier Models.
- Assessing in detail the impact of that growth on the local road network (including both links and junctions through the use of lower tier traffic models) and where impacts are required to be mitigated.
- Identifying locations of potential schemes to mitigate impacts.
- Testing potential schemes using the Lower Tier Models.

- High level appraisal of potential schemes using model outputs.

The lower tier modelling work will continue to be at a level above the planning application and development control process and, therefore, individual planning applications and their associated Transport Assessments/Statement will need to be assessed on an individual basis.

11.2 Core Scenario

A 'core scenario' has been mentioned a number of times earlier in this report. This scenario has been the basis upon which all the second iteration testing has been undertaken and will remain the 'core scenario' until a major change in any of the local plans is made.

Essentially, the core scenario comprises the currently agreed assumptions for land use allocations for each of the Local Plans; these assumptions were agreed following the second LLPT stakeholder workshop in May 2015 and are summarised in Section 4 of this report. It is intended that the core scenario will continue to be used for work undertaken using LLPT or the lower tier modelling. The use of the scenario will enable any local modelling for one of the four Local Plans to be undertaken using 'static' land use assumptions for the other three. Sensitivity testing may be necessary in specific local areas, where local plan teams want to assess the impact of differing levels of development and the use of the core scenario will enable the wider development assumptions, outside of individual local plans areas, to remain consistent.

It is expected that when any of the four local plans is adopted, the land use assumptions in the core scenario will be updated to reflect the adopted allocations. Furthermore, where appropriate, it is expected that the core scenario will also be updated to reflect the delivery of the local plans and could be updated using outputs from the local plan monitoring process and feed into the associated reporting process.

We have used our reasonable endeavours to provide information that is correct and accurate and have discussed above the reasonable conclusions that can be reached on the basis of the information available. Having issued the range of conclusions it is for the client to decide how to proceed with this project.