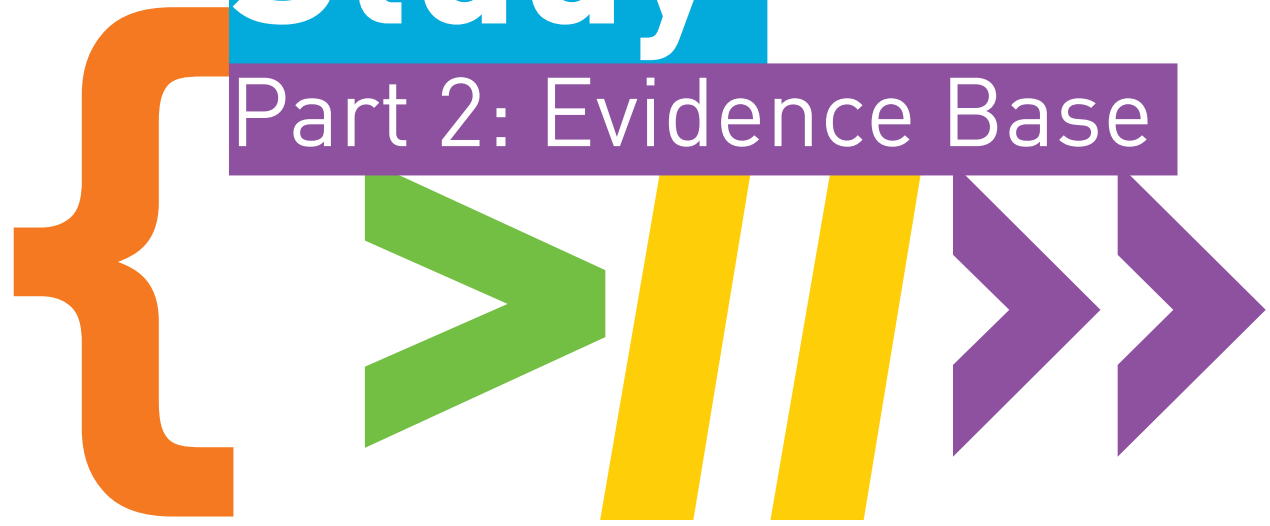


GRANTHAM URBAN DESIGN FRAMEWORK

Grantham Movement Study

Part 2: Evidence Base



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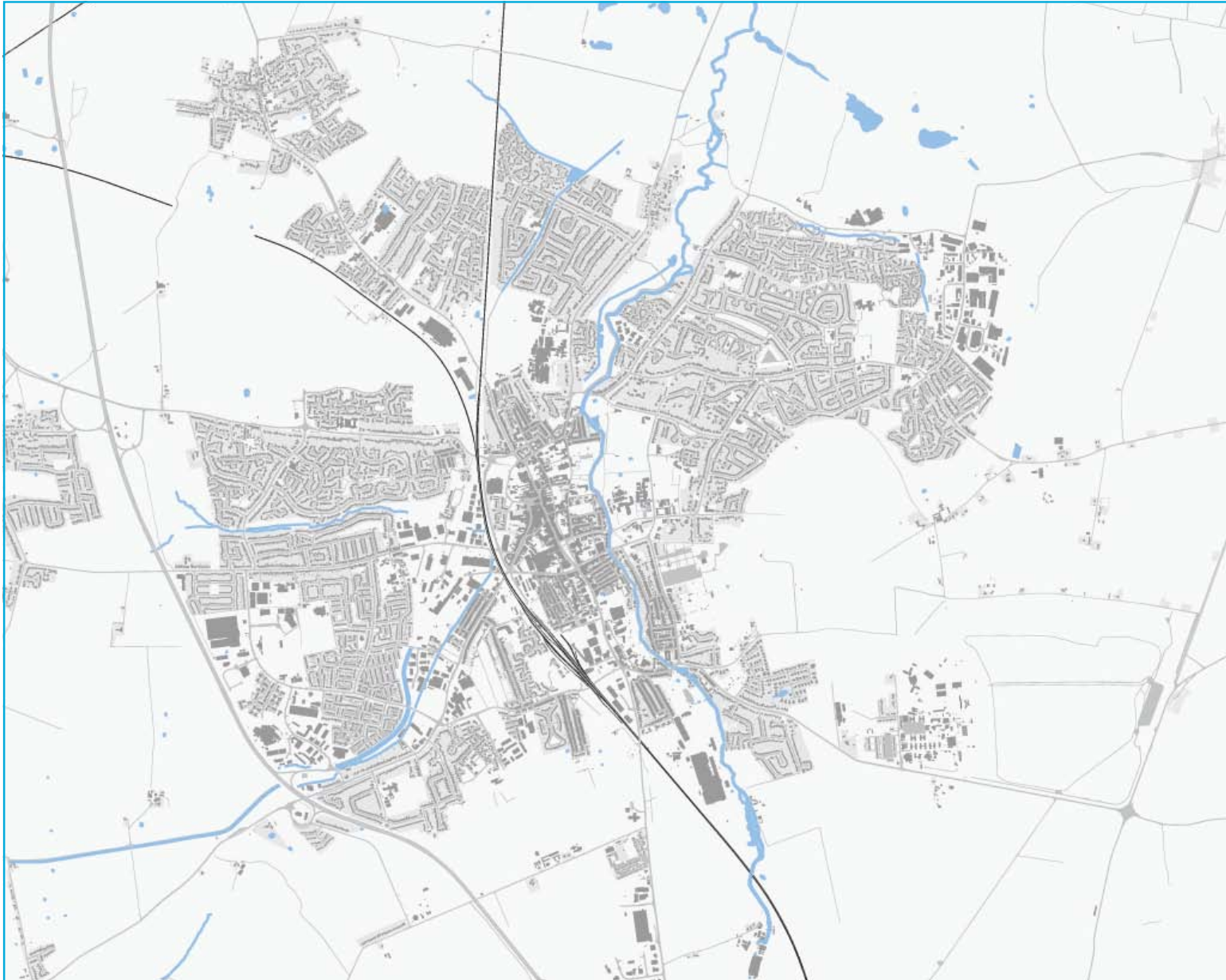
01 INTRODUCTION

INTRODUCTION

Urban Initiatives were commissioned by South Kesteven District Council to prepare a 'Movement Strategy' for the market town of Grantham as an integral component of the Grantham Urban Design Framework (GUDF). The commission builds on the Grantham Transport Strategy produced in 2007 by Lincolnshire County Council. It does so by focusing on the specific design interventions required to meet, influence and manage the additional movement demands to be generated by the planned growth of the town.

The strategy is split into two parts - Part 1: 'Movement Strategy' and Part 2: 'Evidence Base'. The Strategy documents our approach to movement, the process and method for the study, and a range of strategies for the town and specific areas. A detailed list of projects, priorities and timeframes is also provided.

The focus of this part of the study is the Evidence Base including all of the desktop analysis and site work, as well as a suite of analysis for each mode of transport. A detailed assessment has also been undertaken to determine existing and future travel demands generated by planned growth across the town. The culmination of this work is a comprehensive evidence base upon which the Movement Strategy is based.



Grantham project study area

PROCESS AND METHOD

The Movement Strategy has been underpinned by a number of processes to assist in collaborative working and in gaining consensus, recognising that the delivery of the projects and initiatives identified are the responsibility of the local authorities and Government Agencies. The study began by identifying four high level propositions for the town aimed at getting stakeholders thinking progressively about the future of Grantham from the outset. These propositions are presented below.

EVIDENCE BASE

The Strategy has been developed through an analysis of regional and local movement pressures impacting upon the town for all modes of transport. This 'Evidence Base' includes a comprehensive and systematic review of policy and growth pressures, and the current provision of traffic, freight, public transport, cycling and walking networks in Grantham. Each mode of transport is researched in terms of baseline transport conditions, current transport proposals, and documents any specific analysis undertaken as part of this study.

Also included in this report is a detailed assessment of existing and future travel demands generated by planned growth across the town. A spreadsheet model has been used as the tool for this assessment, based upon data outputs and assumptions underpinning the Lincolnshire County Council SATURN model.

DESIGN-LED PROCESS

The Movement Strategy has been delivered through an 'enquiry by design' process where the bulk of the baseline, options and strategy thinking was undertaken by and with the direct participation of a range of stakeholders and interested parties throughout the course of the project. A 'hands on'

Grantham Design Team - an array of planning, transport, and design interests - met at critical study stages of baseline, options and strategy. Workshops included briefing presentations, break out design sessions and interactive, cross-discipline discussions.

The four propositions were an important starting point in this regard. These were presented to the Design Team who subsequently undertook a Placecheck of the existing town to help stimulate debate on key issues, to understand information sources, and to begin the process of identifying ideas.

Following the Placecheck two 'enquiry by design' events were held: an options workshop and a strategy workshop. The options workshop focused on three parts of Grantham, the Northern area, the town centre and surround, and the southern area. Network and infrastructure options were identified, (including the proposed new relief and link roads) discussed and assessed through an intensive design enquiry process.

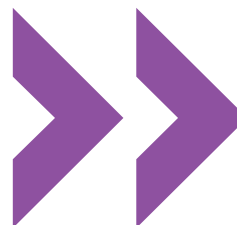
The strategy workshop then focused on issues that required a further level of design testing. These were focused largely on the town centre given that unlocking wider development across the town will be largely dependent upon resolving pressure here.

A wider stakeholder team was also set up as a public sounding board for options and design solutions as they emerged throughout the process. This team met at the Options and Strategy stages of the study.



Expand

Influencing development proposals to improve connectivity and access by all modes, and to make trip patterns to, from and within the town genuinely sustainable....



Zoom

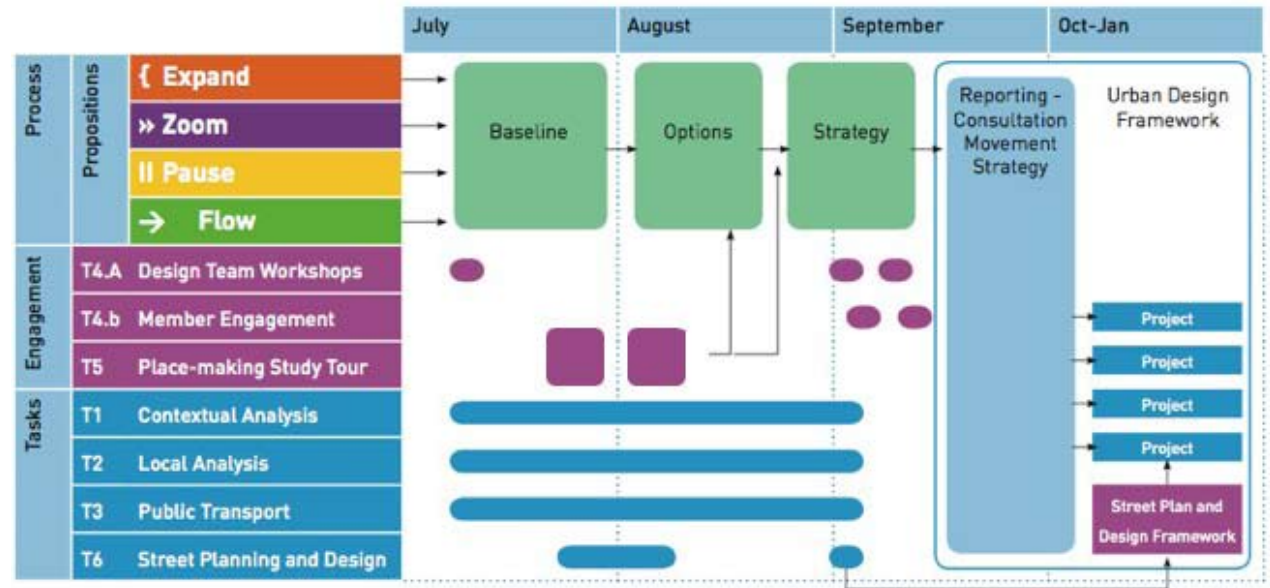
Maximising the generation of public transport demand, and driving a step change in the level of service and quality offered....

THE STRATEGY

The Strategy document has been developed following completion of the evidence base and enquiry by design process. It is this part of the strategy that will be taken forward into an Urban Design Framework.

The Strategy builds on the Grantham Transport Strategy produced by Lincolnshire County Council in 2007. It does so by focusing on the specific design interventions required to meet, influence or manage the additional movement demands to be generated by the planned growth of town.

The Strategy describes the approach to movement and design principles for the town of Grantham. It then puts forward town wide strategies for each mode of transport, and an overall composite strategy. Area based strategies are then outlined, setting out guidelines for how differing and often competing modal demands are to be reconciled as part of new development proposals and the town generally.



Pause

Making walking – and cycling – modes of choice for many more, striking the best balance of movement and place to deliver GREAT STREETS and spaces where people will love to be....



Flow

Using the River Witham, the Canal, parks and other open spaces to add a new, attractive and sustainable dimension to Grantham's street network

THE PLACE MAKING STUDY TOUR

The Design Team also participated in a 'Place-Making Study Tour' of best practice UK examples of regeneration schemes, urban extensions, transport initiatives, and public realm improvements. The purpose of the Tour was to equip the Design Team with the sense of the possible and to build capacity to make more informed decisions on the future of Grantham.

The Tour took place on two separate days and included visits to:

- Darlington's town centre regeneration project including the 'Pedestrian Heart'
- Example of an urban extension in Upton, Northampton
- **Accordia, Cambridge** - a residential-led regeneration scheme with exemplary street network and public realm design;
- Public realm improvements in the historic market town of Bury St Edmunds that respected and contributed to historic form and townscape



Darlington Pedestrian Heart improvements have transformed the quality and image of the town, provided world class spaces for promenading and civic activity, as well as greatly reduced retail spillage to neighbouring towns.



A new street based bus hub was delivered for local bus services as part of the Pedestrian Heart Scheme.



Upton, Northampton is renowned for the integration of a natural planting scheme into the layout and design of streets.



High quality architecture and the integration of a natural scheme throughout give the Accordia its own sense of place and identity.



Historic street improvements have transformed the quality of busy urban streets in Bury-St-Edmonds



Upton, Northampton has also delivered high quality public realm improvements and new open spaces as part of the medium density housing offer



Accordia, Cambridge has an excellent network of well designed streets and spaces.



More shared surface public realm improvements and the use of high specification materials that directly relate to the towns own townscape character has greatly improved the quality and connectivity of key town centre spaces in Bury-St-Edmonds.

02 POLICY CONTEXT AND GROWTH CHALLENGES

INTRODUCTION

This section sets out the planning context for Grantham. The policy framework for the area has been analysed in terms of the main implications for the Grantham Movement study and covers the strategic planning context, urban extensions and transport objectives.

NATIONAL PLANNING CONTEXT

Over the last decade, a raft of national policy guidance has advocated the need to pursue more sustainable transport outcomes for UK towns and cities to reduce transport impacts on the environment and improve peoples quality of life. Most notable are the White Paper on Transport 2001, The Department for Transport's Planning Policy Guidance 13: Transport, and the more recent Eddington and Stern Reviews of transport in the context of UK economy and climate change respectively. The relevant statutory policy of direct relevance to this study is summarised below:

- **Planning Policy Statement 1:** Delivering Sustainable Development seeks equal social progress, the protection of the environment, prudent use of natural resources and the maintenance of high and stable levels of economic growth and employment. New development should avoid having an adverse impact and where this is unavoidable, propose possible mitigation measures.
- **Planning Policy Statement 3:** Housing, sets out the governments objectives for: high quality housing, developed to take into account need and demand, accommodate a mix of market and affordable units and to be developed in suitable locations which offer a good range of community facilities and access to jobs and key services.

- **Planning Policy Guidance 13:** Transport, aspires to reducing the need to travel, and promotes the use of sustainable travel choices for people and freight. It gives attention to the need to make jobs, shops, and services accessible by walking, cycling and public transport, supported by mixed use development. People are given priority over traffic movement and this should be reflected in the planning and design of streets.

The Department for Transport's 'Delivering a Sustainable Transport System' (DfT, 2008) is the most recent non-statutory policy guidance on sustainable transport, and is linked into a funded programme of national and regional studies looking at how a more sustainable transport system can be achieved for particular areas and corridors over the next 10 years and beyond.

The DfT's 'Building Sustainable Transport Into New Developments (April 2008) provides further guidance on the 'sustainable transport' response to the national challenge of delivering an additional three million homes in the UK by 2020; and relates directly to the governments policy to deliver growth in nominated growth points and eco-towns. In contrast to traditional approaches, this document – supported by the Town and Country Planning Association Eco-Town worksheets - sets out how transport needs to be considered within the framework of wider settlement planning decisions, with the ethos of green travel embedded in the layout, design and management of new development both within and beyond the area in question.

This work is supported by recent research funded by the Commission for Integrated Transport (2009) that has shown a clear relationship between land use mix, density and settlement size with travel distance

and mode share, with lower distance and a higher proportion of travel by more sustainable modes as population size and density increases. Delivering smarter and more efficient forms of urbanism is clearly the starting point for delivering more sustainable transport outcomes.

The Statutory Manual for Streets (2007) provides policy and design guidance for the design of residential streets. The recently released Manual for Streets Two provides further guidance on street layout and design for other types of streets. Although this second edition is non-statutory and does not replace the Design Manual for Roads and Bridges, it has been developed by leading professionals in the field of transport planning, engineering and road safety in response to the inability of the DMRB to deal with contemporary street design issues for urban streets. It is also supported by a sound evidence base is considered best practice.



The Town and Country Planning Association eco-town transport pyramid illustrates how the location and design of development should be considered first to maximise the delivery of more sustainable patterns of trip making.

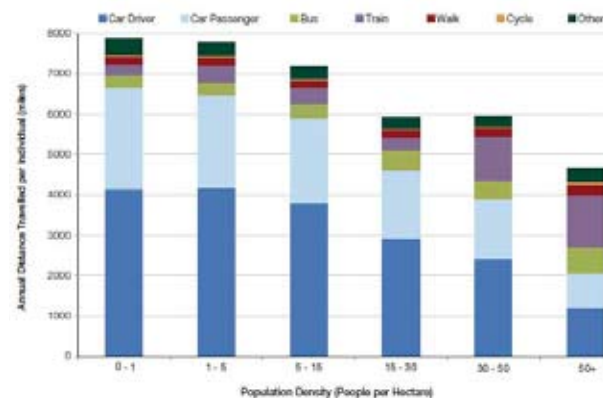
REGIONAL PLANNING CONTEXT

The Department of Communities and Local Government awarded Growth Point Status to Grantham in 2007. The Growth Point Vision pursues the growth of Grantham in a context of sustainability objectives with the ambition of being a well-connected town.

The East Midlands Regional Plan (EMRP) sets out the strategic objectives for the region and those areas for growth. Published in March 2009 it highlights the regional objectives of providing housing stock to meet demand, reducing social exclusion, enhancing the environment, improving well-being and economic opportunities and promoting sustainable design and construction. Better design is directed through a context driven approach, taking account of local, natural and historic character and using land efficiently, accommodating sustainable travel choices and integrating green infrastructure.

South Kesteven District Council adopted the Core Strategy on the 5th July 2010. The primary objectives for the district focus on the need for sustainable growth, seeking development in a sustainable pattern (2) and a reduction in the need to travel (3). The need to access housing, employment and services by public transport, cycling and foot is stressed (4), especially in the context of Grantham's strengthened role as a Sub-Regional Centre (6).

The Sustainable Communities Strategy is focused around a set of objectives that seek to improve local neighbourhoods, through safer and healthier communities. A Grantham Area Action Plan is to be prepared by the council and is estimated to be adopted at the start of 2012.



Research on national travel patterns shows how when at greater densities, people generally travel less distances and via more sustainable modes of transport.

GROWTH

In summary growth proposals in Grantham include:

- Approximately 90 ha of employment use
- Capacity for additional retail floorspace of 50,800 m² gross by 2026 possibly increasing to 63,100 metres gross by 2026 if market share increases
- Strategic Housing Land Availability Assessment identified sites with potential to accommodate approximately 430 dwellings within built up area of Grantham
- Need to identify additional greenfield sites on edge of Grantham to meet growth targets (sites not yet identified)

The Core Strategy focuses on maintaining Grantham's role as the primary retail and service centre for South Kesteven and as a sub-regional centre. Regeneration of key areas in the town centre is to be the focus of council activity and investment to reinforce and enhance the viability of the town including an expanded retail offer, office provision, more housing, and improved transport facilities and services.

Importantly the Core Strategy aims to deliver a total of 13,600 new homes in South Kesteven between 2006 and 2026, and Grantham is expected to deliver 7680 new homes within this period. As all the allocation cannot be met within the existing built up area alone, two strategic locations have identified to meet this growth in the form of Sustainable Urban Extensions.

The Northwest Quadrant is proposed to accommodate up to 3500 new dwellings, whilst the Southern Quadrant is to accommodate up to 4000. A masterplan will be developed for each Urban Extension and is to be progressed as a Development Brief or a Supplementary Planning Document.

Each urban extension is expected to deliver new community infrastructure, including a local retail and service facilities. The Core Strategy identifies the need for a new primary school on the Poplar Farm site, and two new primary schools and a new secondary school in the Southern Quadrant. The PCT have also identified the need for a 2 GP practice to serve the Northwest Quadrant and a 4-6 GP practice to serve the Southern Quadrant. Further requirements for sewage treatment and water resources are highlighted.

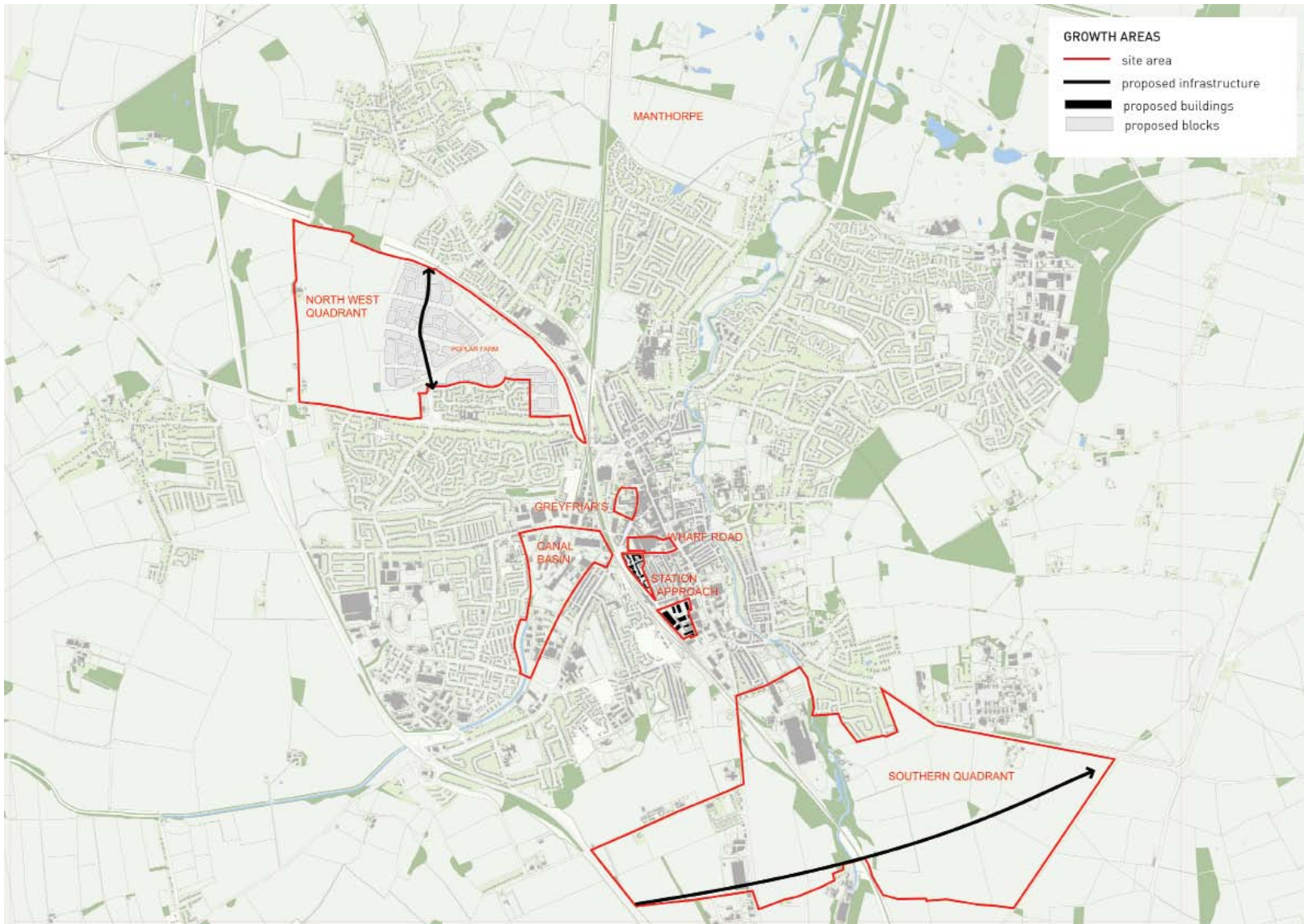
MOVEMENT AND INFRASTRUCTURE

The Core Strategy centres on the need for a sustainable integrated transport network (SP3) and using developer contributions to assist in the delivery where appropriate (SP4).

The Core Strategy acknowledges the potential for a Grantham relief road as part of the need to remove Heavy Goods Vehicles from the Town Centre and generally improve the pedestrian environment. The urban extensions are seen as a major opportunity for delivering the relief road as well as other transport improvements.

	Employment (m ²)		Entertainment		Schools	Residential		Hotel	Public parking
	B1	B2	Retail	Cinema		50dw/hect	30dw/hect		
Northwest quadrant			Local centre		1 primary	875	2625		
Greyfriars (option 2)			2970	2430			53		
Wharf Road (option 1)			5500						
Station Approach North	12800		1200			62		117	
Station Approach South	2900	5200				46			760
Canal Basin			4000			126	882		
Southern Quadrant			Local centre		2 primary 1 secondary	1000	3000		
	15700	5200	-	2430		2109	6560	117	760

Summary of growth point development proposals by site.



Growth areas

- The east-west relief road will not only reduce through traffic into the town, but also provide access to and open up the Southern Quadrant Sustainable urban extension. The construction of the relief road is estimated to start in 2014 and take around two years.
- The Pennine Way link between the A52 and B1174 is to be delivered by the eastern-most part of the Northeast Quadrant's (Poplar Farm) development. This will help relieve traffic from the town centre and requires the construction of a rail bridge.

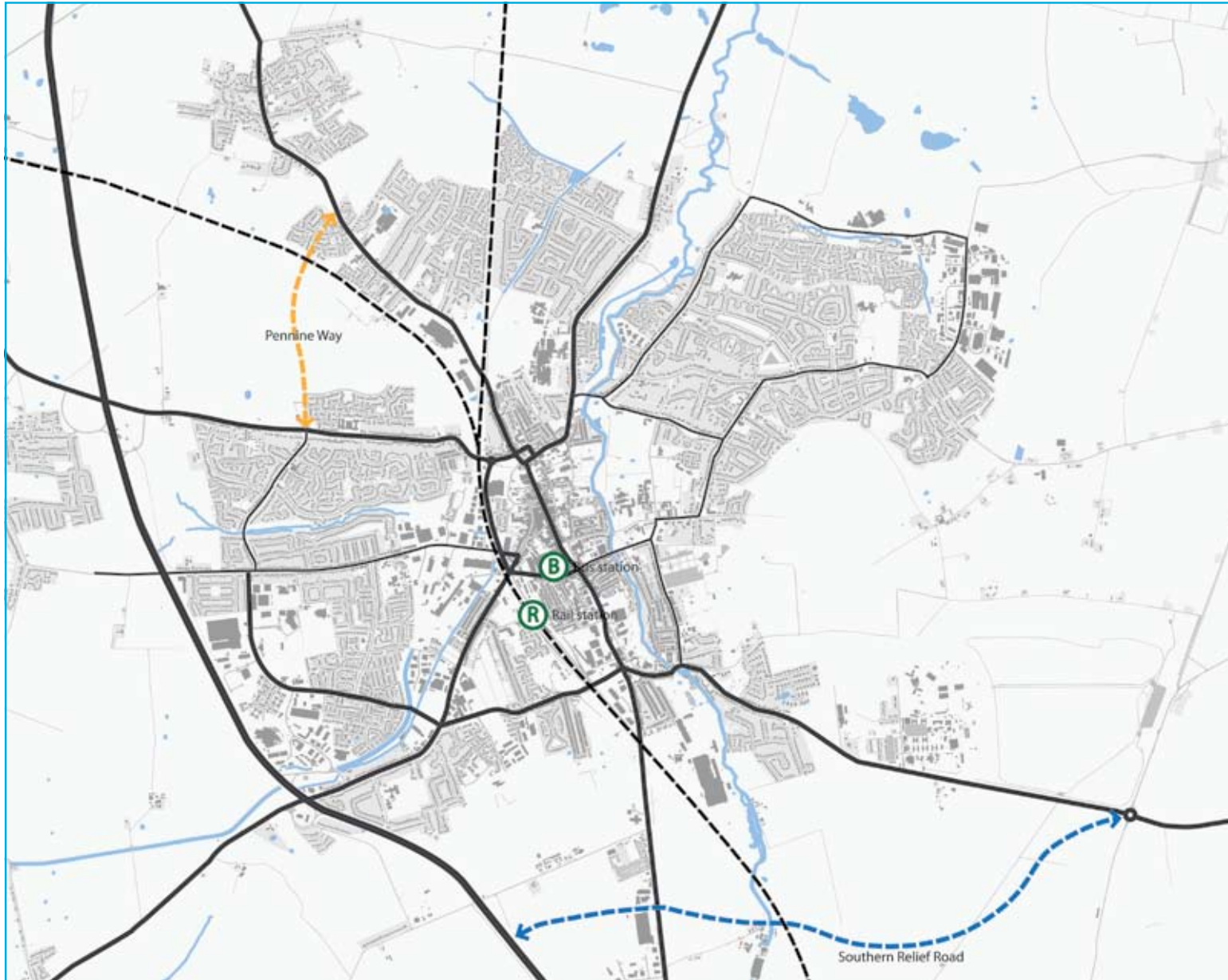
[The 2nd Local Transport Plan](#) has general aims to promote sustainable alternatives to the car for shorter trips. It dedicates a chapter specifically to the objective of dealing with traffic in Grantham. Here it re-emphasises the need for an east-west bypass between the A1 and A52 unobstructed by low bridges. Also highlights are the aspirations for improved cycle and pedestrian infrastructure, the reopening of the canal as a catalyst for regeneration and a set of improvements to the existing movement network within the town centre.

[The Transport Strategy for Grantham](#) identifies a series of long-term and short-term schemes that target the shared priorities of tackling congestion, delivering accessibility, safer roads and better air quality. The long-term view looks at funding options and measures to deliver a range of schemes. The short-term includes town centre traffic management, improved bus services, walking, cycling and signage, and the long-term covering more strategic interventions such as the relief road and new Pennine Way link, as well as better rail station access and junction improvements. These collectively work towards the objectives of more sustainable

transport, improved accessibility, safety and security and protecting and enhancing the built environment.

Green infrastructure is supported by the aim to protect and enhance the natural environment, reinforced in the [Core Strategy \(EN1\)](#). The policy seeks that development is approached with consideration of its impact on landscape character and access and value of the landscape.

[The Green Infrastructure Study](#) has highlighted the need for more interventions in creating cycling and walking linkages, strengthening biodiversity, transforming the setting of the towns and provision of recreational areas.



Key movement infrastructure

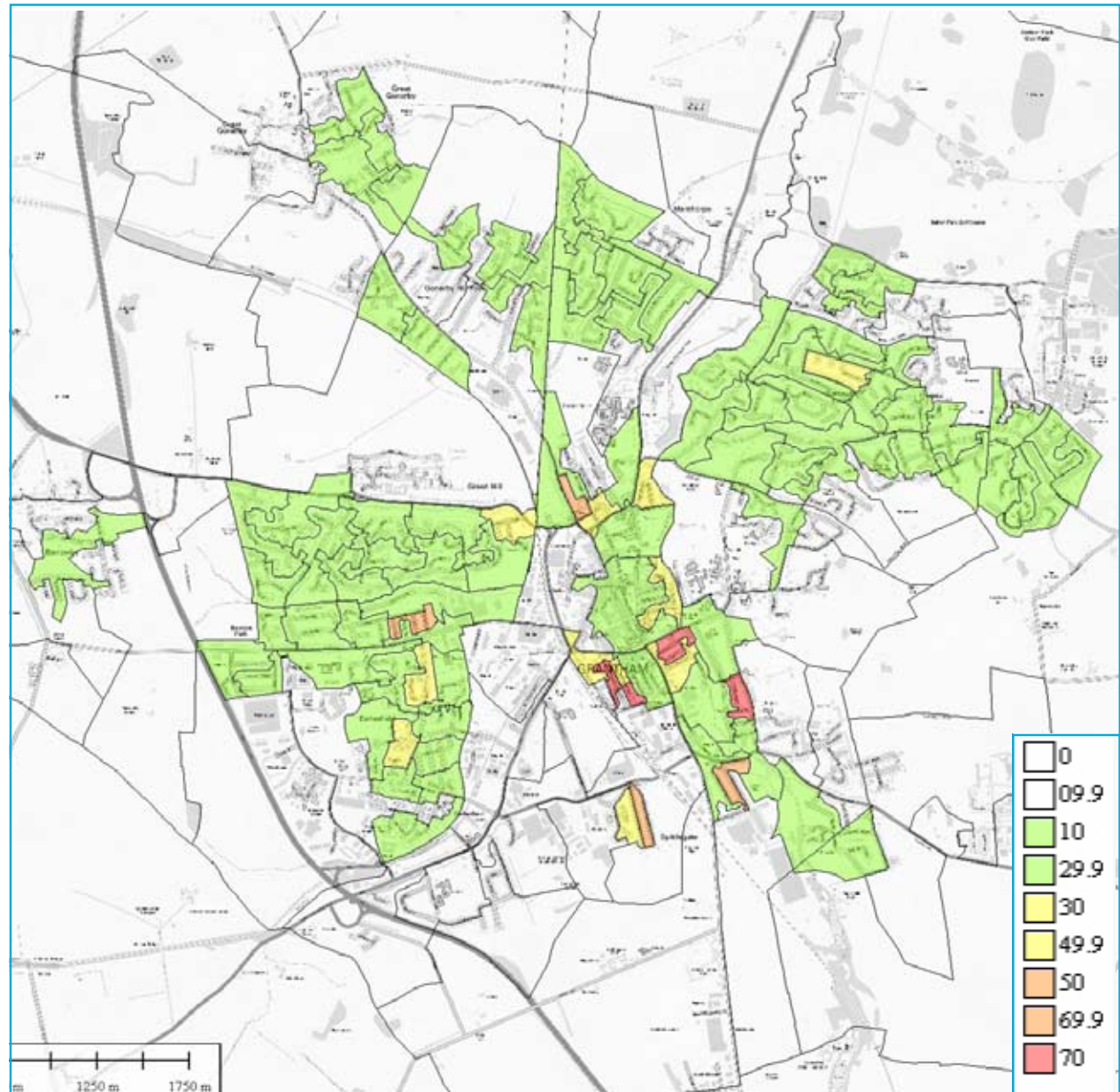
03 EXISTING TRAVEL CHARACTERISTICS

POPULATION AND EMPLOYMENT

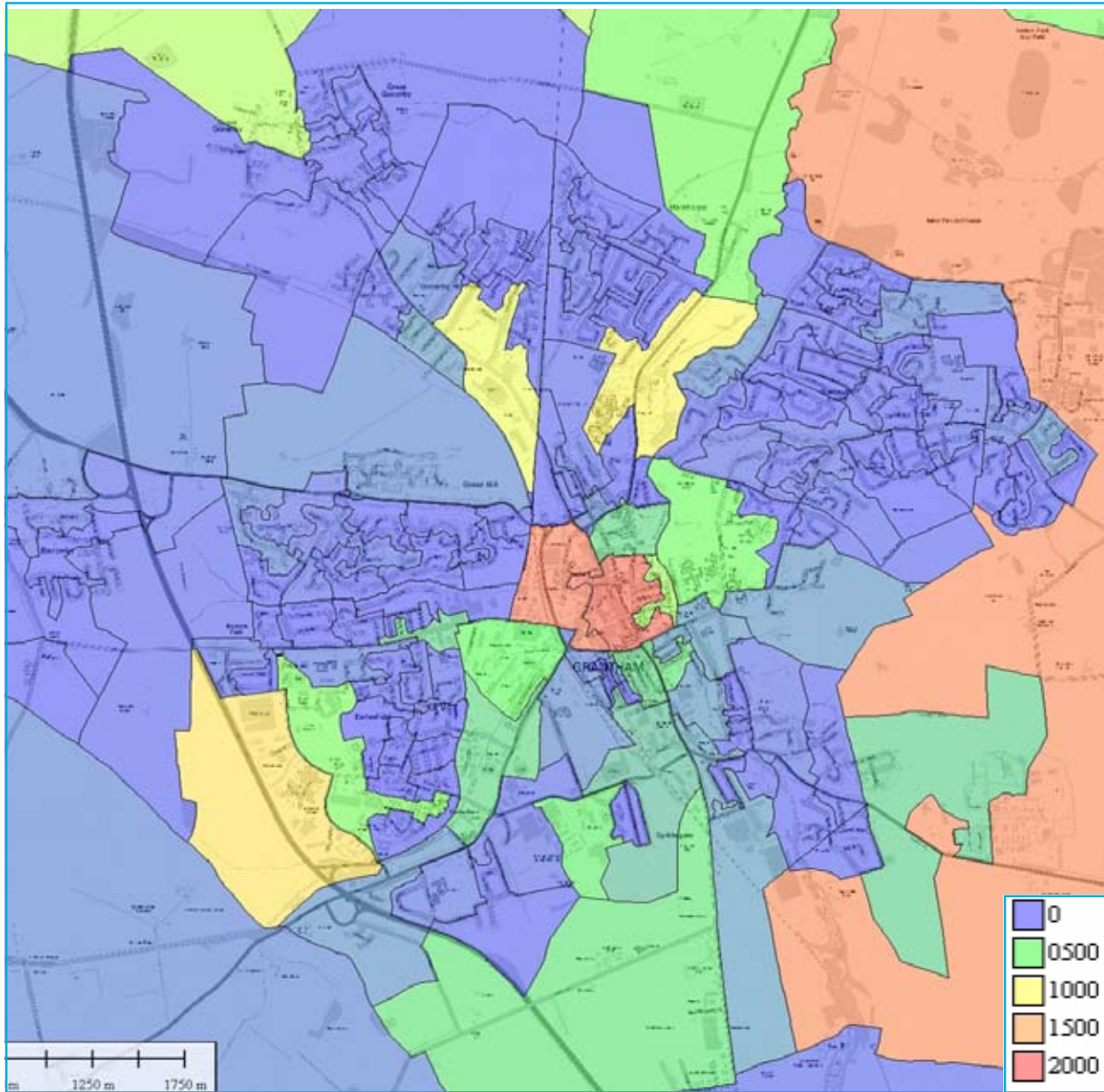
Grantham is a small market town with a population of approximately 47,000 residents in total with a travel to work population rising to approximately 60,000 during the day. Approximately 38,000 people live in the existing built up area.

Residential densities are generally around 30 dwellings per hectare (gross), with areas of remaining Victorian railway worker housing reaching between 50 and 70 dwellings per hectare on the periphery of the town core.

Employment is concentrated on the town centre with approximately 3000-4000 employees. There are three employment areas outside of the town to the northeast, the southwest, and in the Canal Basin area. These areas are largely large format retailing, light industry and warehousing and distribution uses.



Residential Density (dwellings per hectare, 2001 Census)



Employment Density (daytime population, 2001 census)

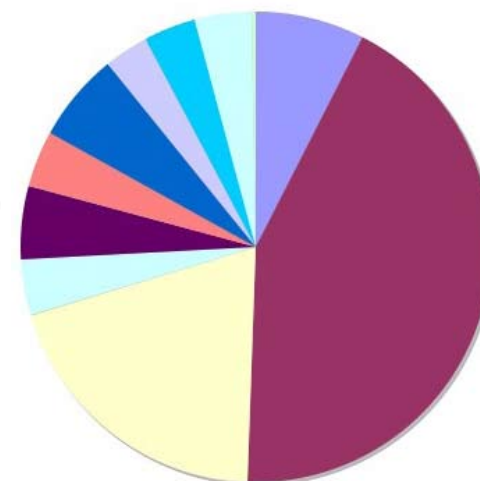
CENSUS JOURNEY TO WORK TRAVEL PATTERNS

The two graphs below shows patterns of journey to work as recorded in 2001 for the built up area of Grantham. This data is compared with South Kesteven, the East Midlands and England both in relation to actual percentages and proportions.

As can be seen, Grantham has a lower proportion of people travelling to work by car (57%) with corresponding higher proportions of people travelling to work by foot (17%). Public transport has an overall mode share of 7%, split 5% by bus and 2% by train. 5% of people travel to work by cycle.

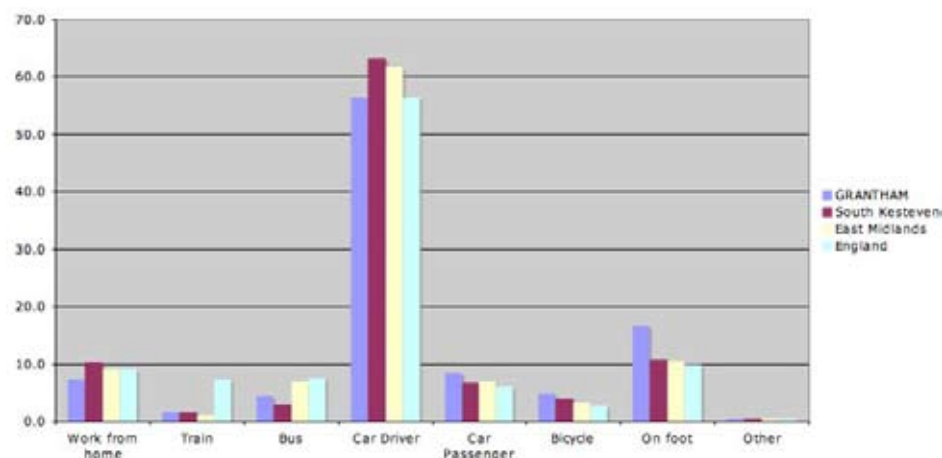
Interestingly, 70% of people in the built up area of Grantham travel 2km or less for journeys to work. This is important in that it highlights the significant potential for cycling and walking to play a greater role in local trip making.

- Works mainly at or from home
- Less than 2km
- 2km to less than 5km
- 5km to less than 10km
- 10km to less than 20km
- 20km to less than 30km
- 30km to less than 40km
- 40km to less than 60km
- 60km and over
- No fixed place of work
- Working outside the UK
- Working at offshore installation



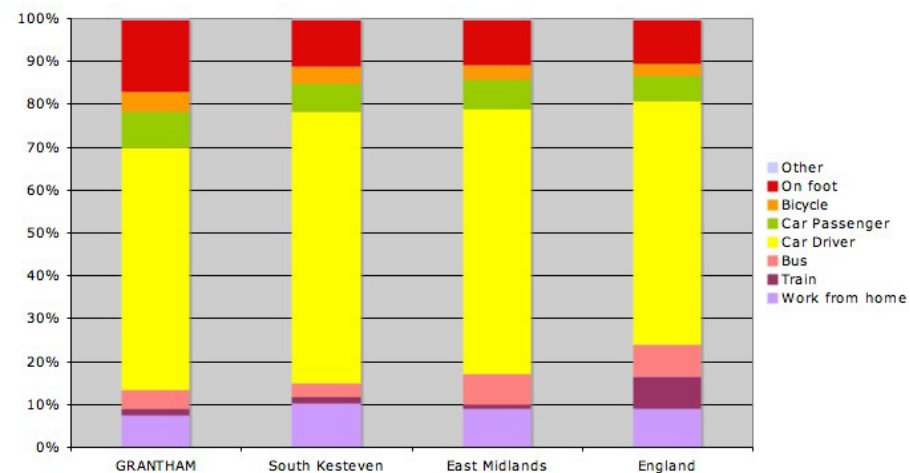
Distance travelled to work data

Census 2001 Journey to Work Mode Share Comparison



Overall JTW mode share actual

2001 Census journey to work mode share comparisons



Overall JTW mode share proportions

A more detailed assessment of census JTW data has been undertaken for the study area to understand the spatial distribution of mode share. As can be seen the town centre generates much lower proportions of car based commute than the peripheral suburban areas, with corresponding higher proportions of walking and cycling. It is assumed that the provision of much higher densities and an appropriate mix of uses has a significant impact on commuting patterns. In peripheral areas where local facilities and amenities are not present much higher car use is observed. A critical issue for Grantham is to ensure that future growth and development aims to achieve a similar foot and cycle mode mode share as the town centre.



Car mode share



Public transport mode share

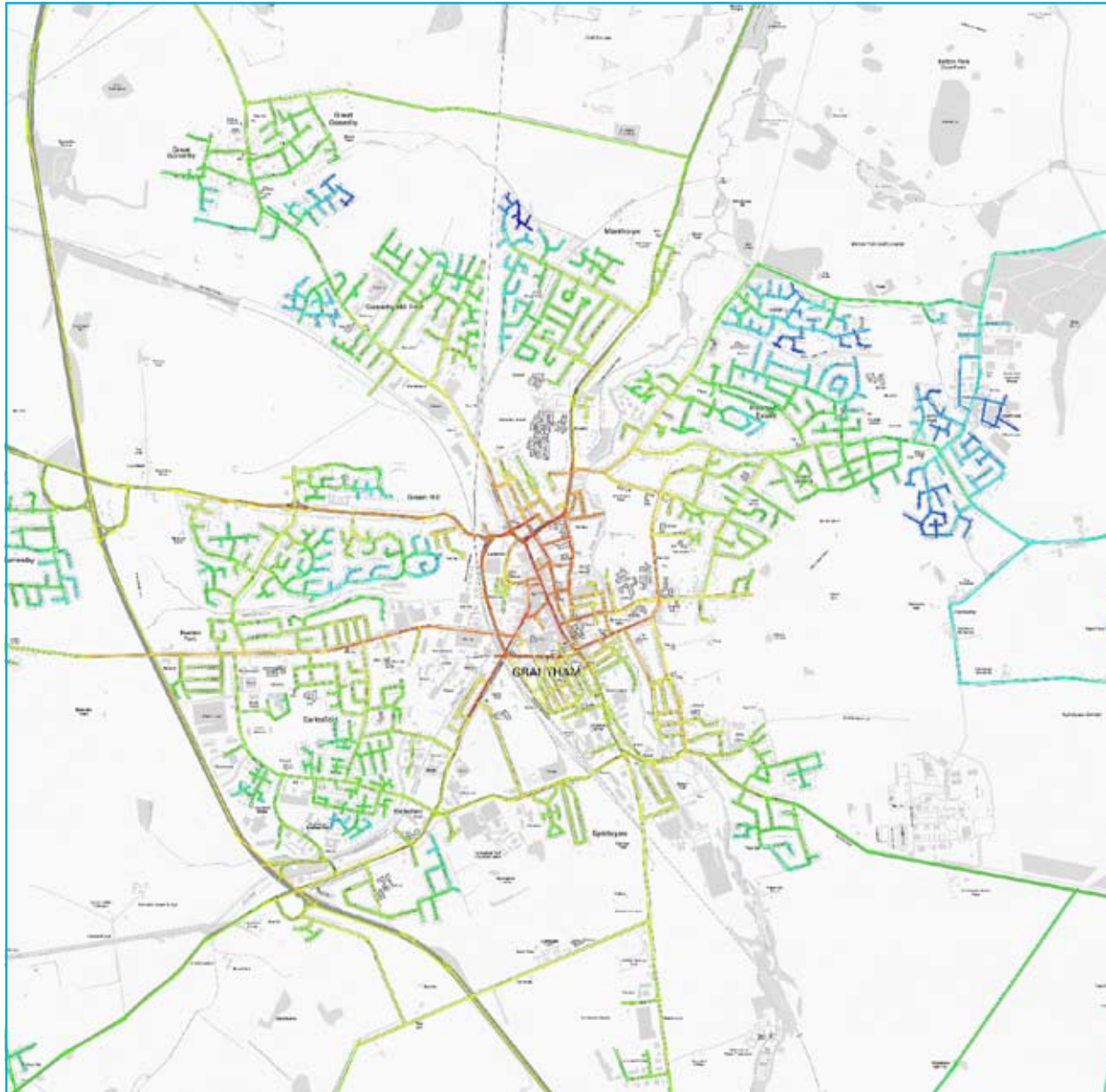


Cycling mode share



Walking mode share

04 TRAFFIC AND PARKING NETWORK



Street network connectivity

NETWORK ACCESSIBILITY

An assessment of the underlying connectivity of streets throughout Grantham has been undertaken as shown opposite.

Every street in Grantham has been assessed in terms of the number of street segments that it has to use to reach every other street segment in the area. The higher the number of streets that has to be used, the less connected the other street segment. Using an aggregate measure of the total number of connections to every street in the network, it is possible to rank each street in terms of its 'global connectivity'.

Street segments in the centre of town need to use less streets to reach every other street in the network and therefore are more connected, as indicated by the red spot around the core.

Suburban areas on the periphery of the town are shown in blue as they have poor connectivity.

Research has shown a strong correlation between connectivity and movement and it is intuitive that areas in red are the places where the most movement occurs on the street network.

PENNINE WAY

Pennine Way is planned as a local distributor route linking Gonerby Road with Barrowby Road. This link will provide the main point of access to and from the Poplar Farm urban extension site and is to be fully delivered by this development.

The route will also serve to provide an important missing link in the network. Vehicles that would have had to travel via the town centre traffic collar to move between Gonerby and Barrowby Road now have a means of moving locally. This is not to say that this route is designed to fulfil a relief function, but rather it has local circulation benefits over and above that of access to the development.

An image is provided opposite of the proposed layout and character of the route included as part of the Poplar Farm design codes. It should be noted that this is still the subject of review by county council.



Pennine Way indicative layout (FPCR Poplar Farm Design Codes 2010)

THE SOUTHERN RELIEF ROAD

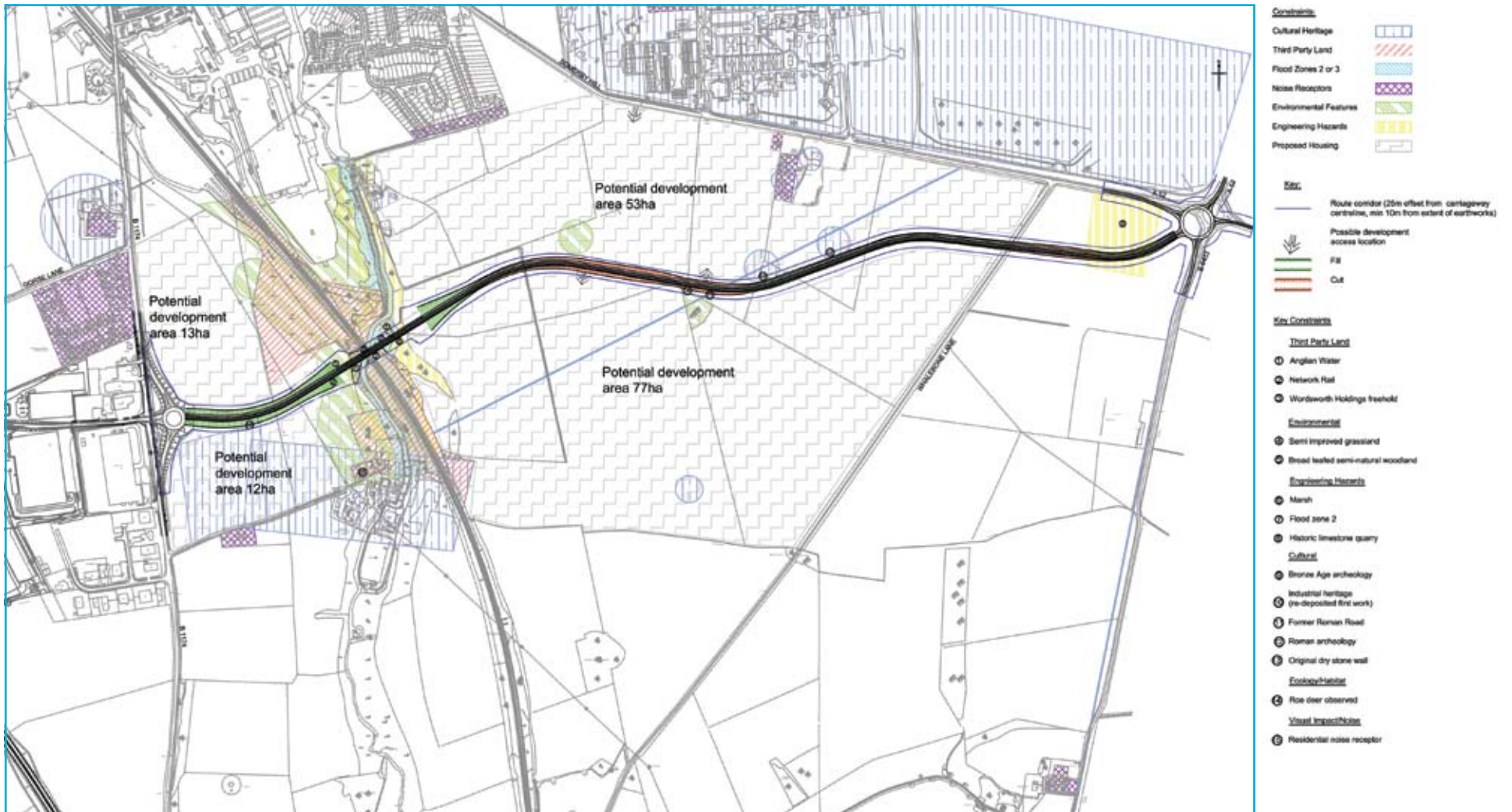
Traffic moving between the A1 and settlement and industry to the east are currently forced to travel through the town centre due to the lack of alternative routes. Low bridges also constrain freight to using Wharf Road and the A52 to access agricultural industries to the east.

The southern relief road (SRR) is designed to resolve these issues by providing a high quality alternative route for traffic and freight not heading to the town centre by linking the A1 to the south of the town eastwards over the River Witham and ECML to connect into the A52.

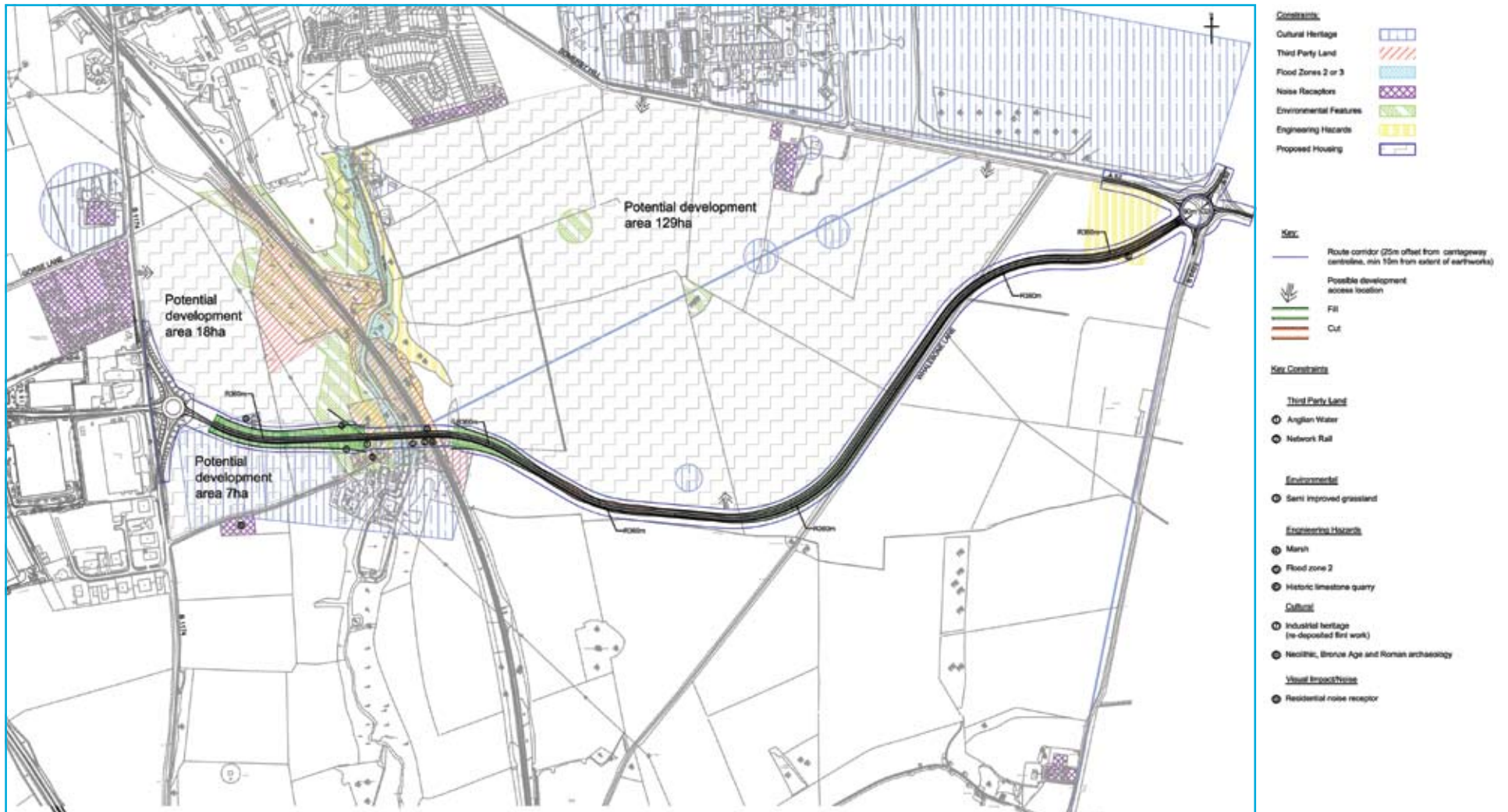
This route will provide a measure of traffic relief from town centre streets and remove superfluous freight vehicles. It will also provide a key strategic access point to the Southern Quadrant residential led Urban Extension to the east of the River and proposed new employment areas to the west.

Two key options have been considered: a central running alignment through the urban extension; and a peripheral alignment running along the southern boundary of the urban extension. Plans of the route are shown on the following pages.

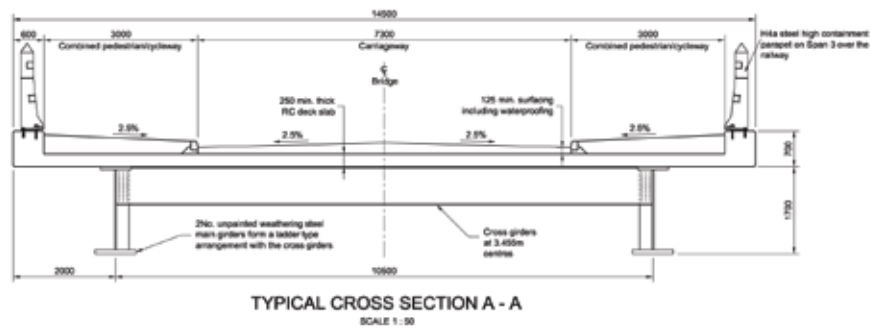
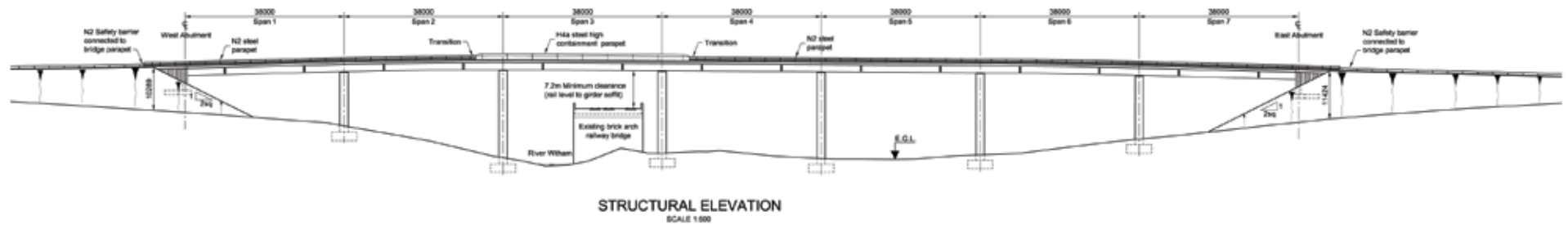
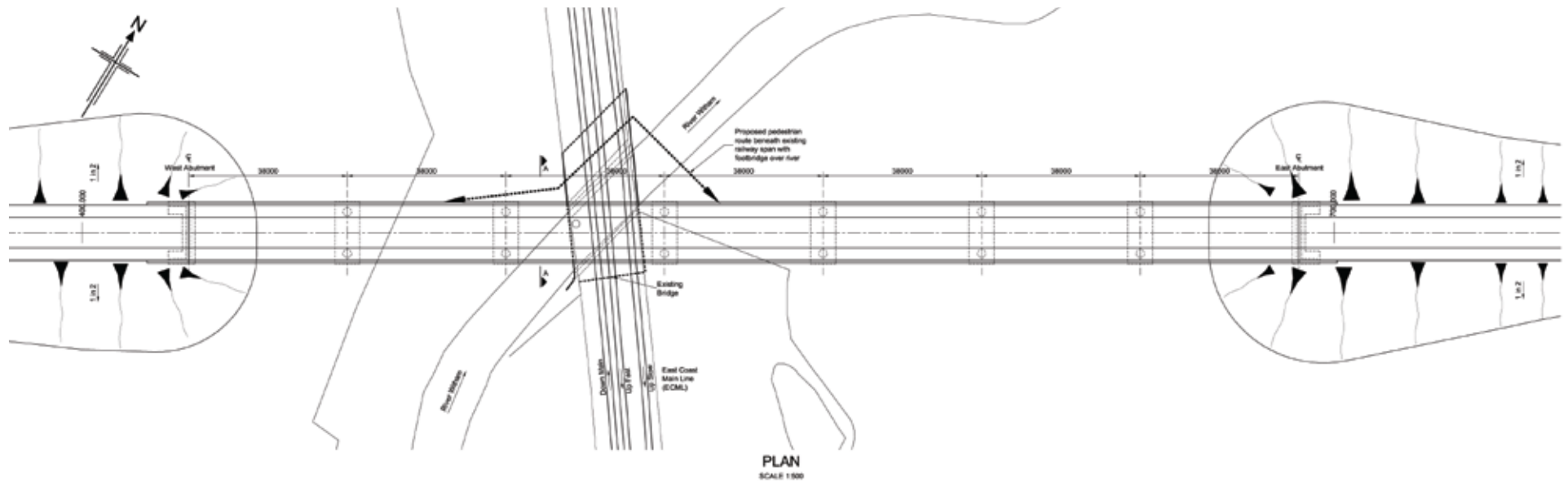
Critical issues exist with delivery. In order to provide a relief to the town centre streets it is critical that the route is delivered in its entirety. However, at a cost of £30-35 million, it is unlikely that it can be fully funded by development. Various delivery models are being considered by the Grantham Growth Team and SKDC to forward fund this strategic piece of infrastructure.



Southern Relief Road – Central alignment (Jacobs, 2009)



Southern Relief Road - Peripheral alignment (Jacobs, 2009)



Southern Relief Road – Bridge structure option for the peripheral alignment (Jacobs, 2009)

TOWN CENTRE PARKING NETWORK

The drawing opposite shows all town centre parking locations, type and size in the town centre and its surrounds. Two further drawings are then shown illustrating surveyed parking occupancies for a Wednesday and Saturday in 2007. This information has been sourced from the Town Centre Study undertaken by Grantham Growth Point.

In summary there are approximately:

- 955 public off street car parking spaces
- 2265 private off street car parking spaces

Public off street parking spaces are largely at grade and located to the rear of building blocks, for example Greenwoods Row and Conduit Lane. The new Welham Street multi-story car park has been delivered to the east of the town. This parking building stands approximately half full during both week and weekend days. This is anecdotally due to its peripheral location, although as can be seen it is well within an acceptable 400m walking distance from the town centre.

Private off street car parking areas provide an important town centre car parking offer given that there are not enough public car parks available in close proximity to key activity generators such as supermarkets.

On street car parking areas around the Market Place, St Peters Hill and the old town around St Wulfrums Church are all at capacity during both weekdays and weekends.

The at grade Morrison's car park is also at capacity during the weekday and weekends being located directly adjacent to the Isaac Newton Shopping Centre. Anecdotal evidence suggests that the top floors of the adjacent multi story lie empty on

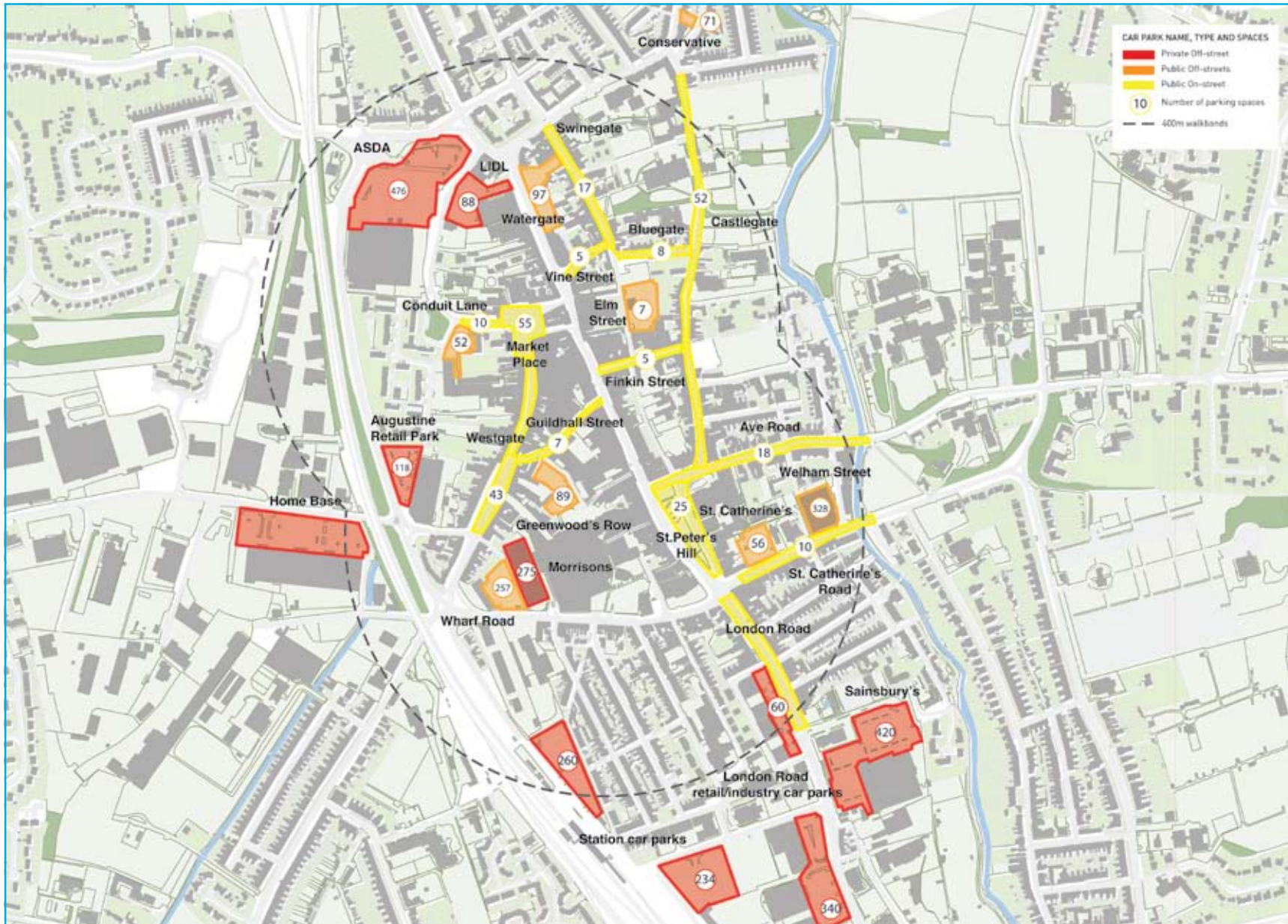
most days. During the weekend the ASDA car park is also at capacity.

The Watergate car park is currently under utilised, although this is considered a prime development site and it is likely that in the future this car park area will go, as with the Conduit Lane Car Park as part of other town centre regeneration proposals. The Market Place is also due for a face lift that will involve the removal of approximately 20 on street parking spaces. It is likely that further town centre car parking will be required.

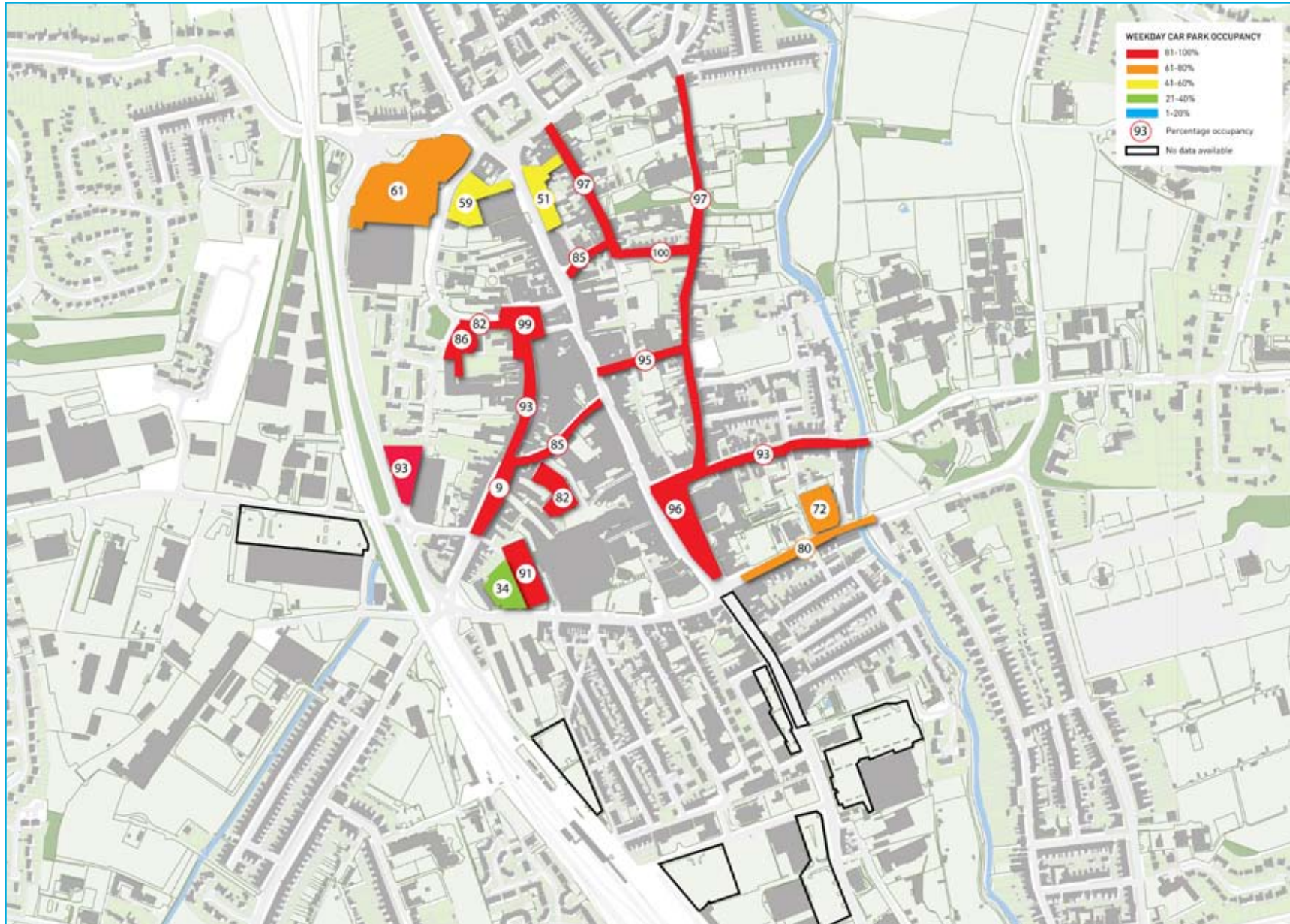
It should be noted that some errors have been found in the data received from the Town Centre Study, specifically for the Morrison's Car park. As is shown on the drawings opposite the data states that the site provides for approx 270 spaces in the multi story and 280 spaces at grade. It is believed that this is overestimating the number of at-grade spaces as can be seen by the very low occupancies shown.

The table below documents the parking assessment for town centre development sites. The assessment uses the Lincolnshire County Parking guide as a starting point. It is generally assumed that all non-residential parking requirements are maximum figures.

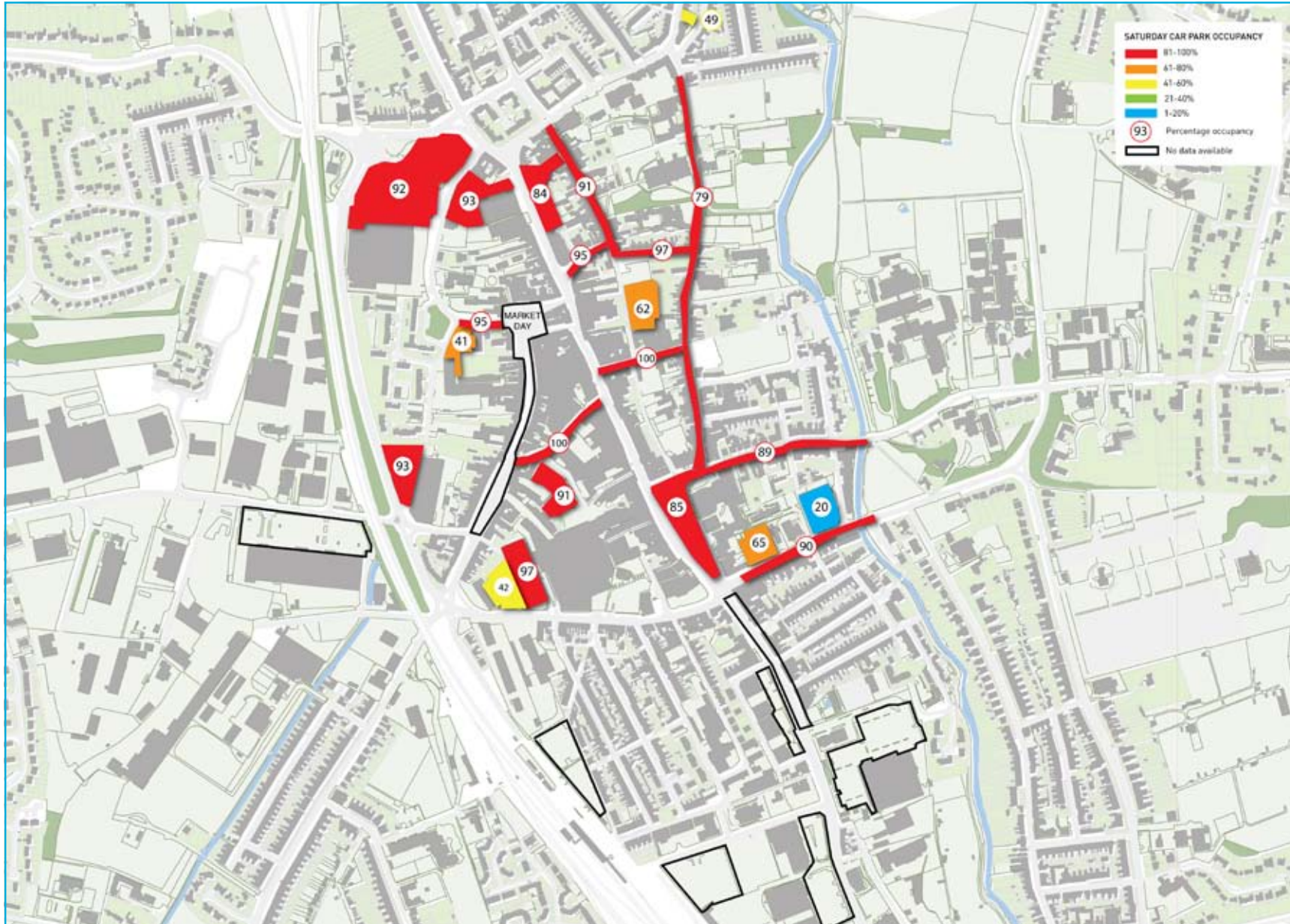
	Employment (B1 - 1:30) (B2 1:65 m2)	Town centre retail (1:30m2)	Leisure (1:5 seats)	Residential (1:1)	Other	Total
Greyfriars (option 2)		99	100	53		252
Wharf Road (option 1)		183				183
Station Approach (north)	427	40				467
Station Approach (south)	177	0		46	150	223
TOTAL	603	322	100	99		1125



Car Parking location, type and size.



Parking Occupancy Weekday



Parking Occupancy Weekend

05 PUBLIC TRANSPORT NETWORK

EXISTING BUS NETWORK

Grantham has a well established bus network, although only an average town wide journey to work mode share of 5%.

The inter urban bus network provide connections from the towns bus station to surrounding villages and settlements. A recently delivered local bus network also connects the towns residential and employment areas to and through the town centre.

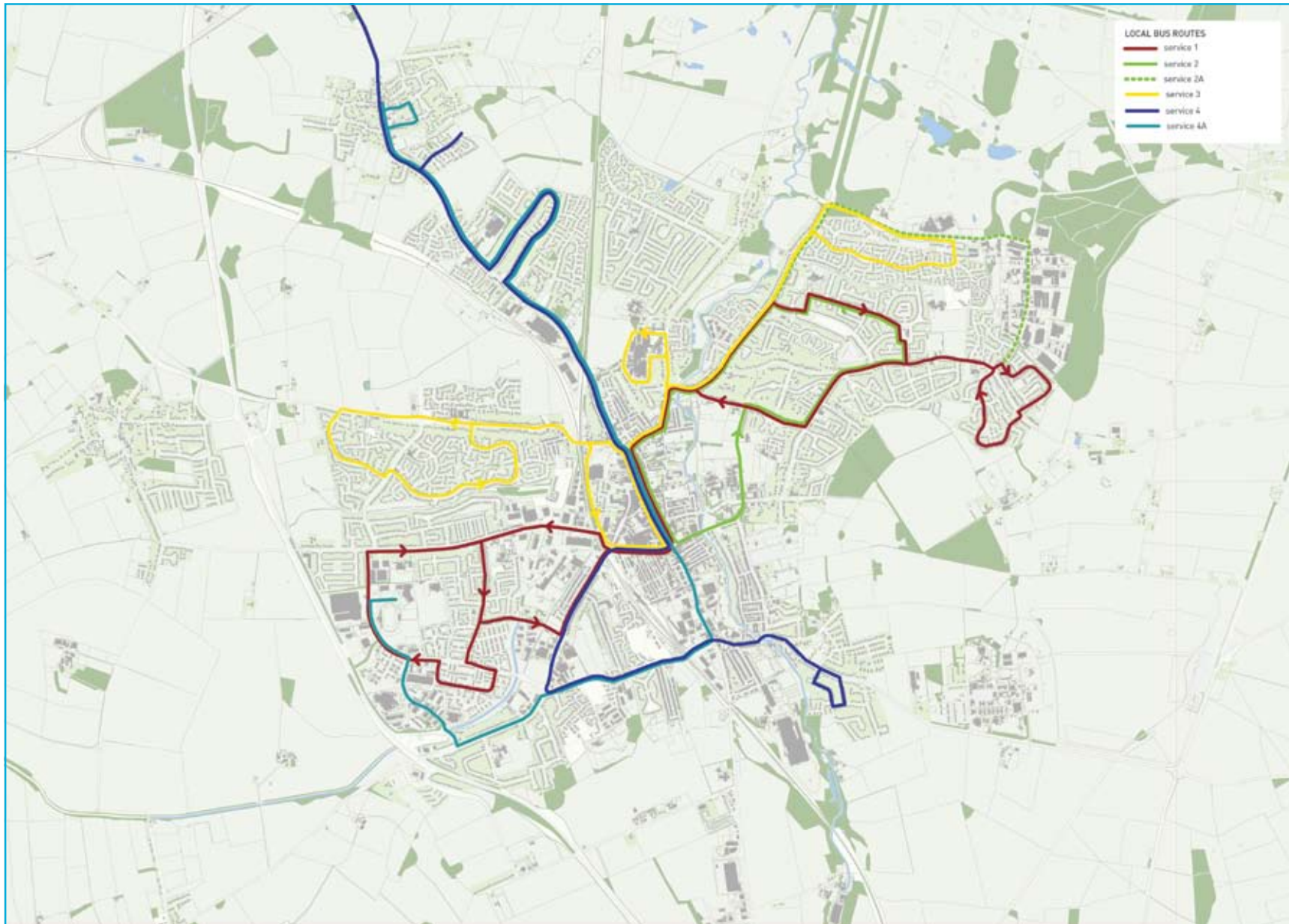
The table below documents all local and interurban routes, destinations, frequencies and hours of operation. As can be seen frequencies are generally low for interurban routes. This is because Grantham is a market town, with low bus patronage and at present has insufficient population and employment to generate additional demand for higher frequency services.

Recent improvements to local bus services have markedly improved town centre bus access and have better frequencies, although these frequencies have been achieved by operating a single direction figure of eight pattern linking outlying suburbs to and through the town centre and the bus station.

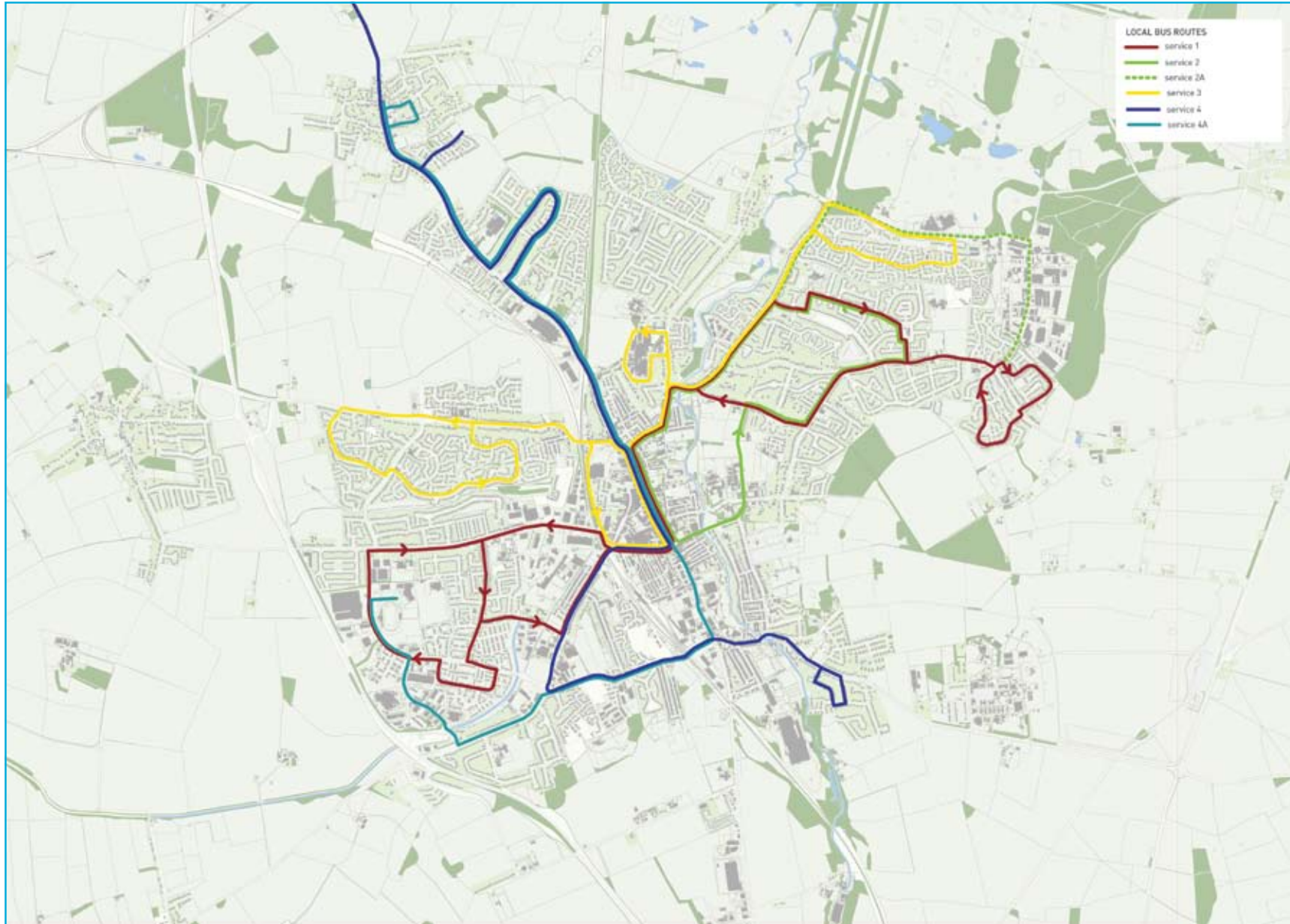
While a two way service pattern would provide a more legible service, the figure eight network is affordable, has been successfully delivered by commercial operators and LCC, and provides an important local service to the local populus than would have otherwise been possible had a different service pattern been used.

The inter urban and local bus network largely begins and ends at Grantham's bus station location adjacent Morrison's site. Accessed off Wharf Road this facility, this station is located in the heart of the town, adjacent to its biggest attractor – the Morrisons and Isaac Newton Shopping Centre. Its location affords bus services and users efficient access to the traffic collar and radial routes connecting to it.

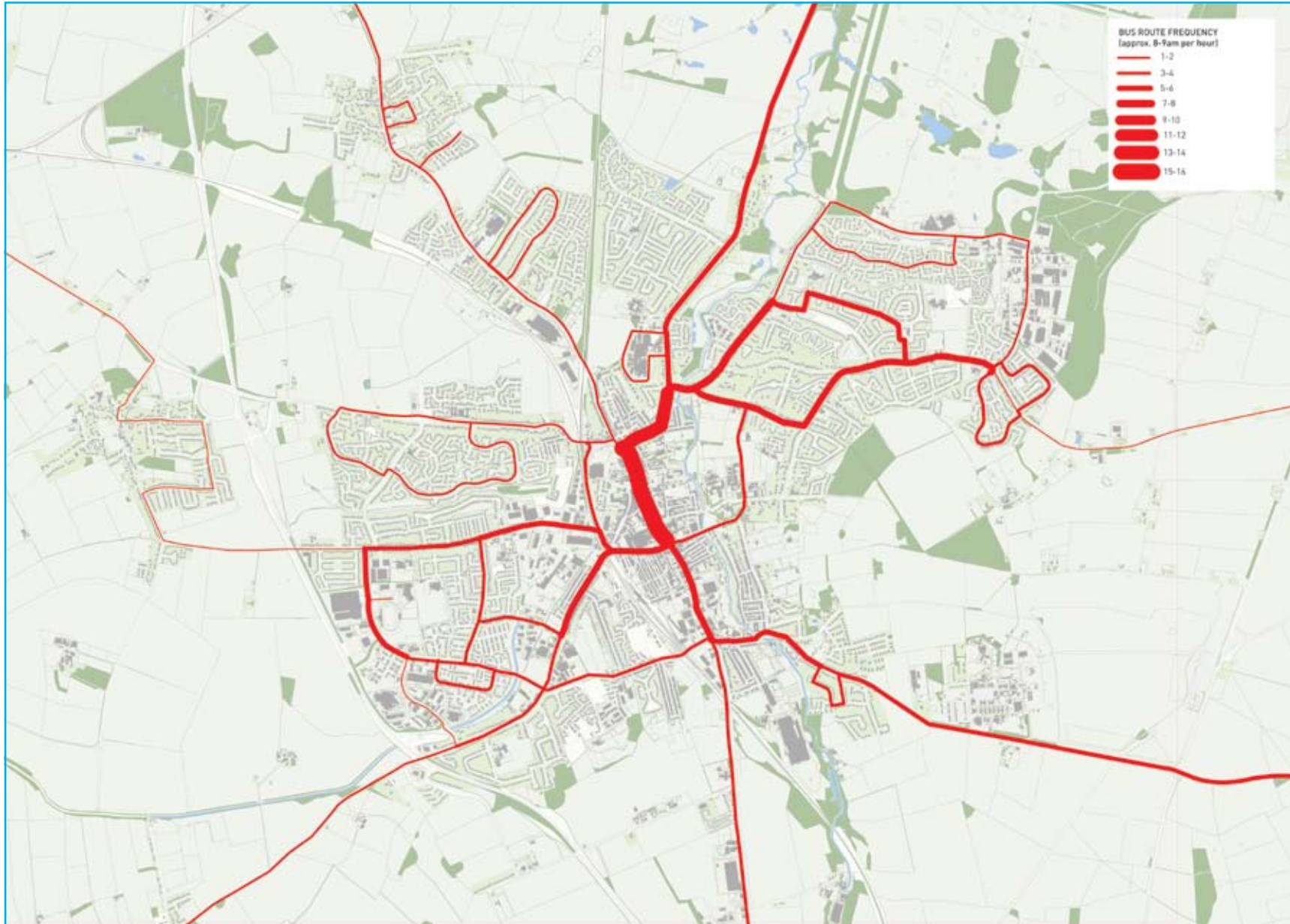
Number	Route	Mon - sat	Sun	Operator
LOCAL SERVICES				
1	Alma Park – Grantham – Earlsfield	20 mins		Centrebus
2 /2A	Grantham - Harrowby	30 mins		Centrebus
3	Barrowby Gate – Grantham Hospital – Sunningdale	30 mins		Centrebus
4	Downtown - Great Gonerby – Grantham – Somerby Hill	60 mins		Kimes
4 A	Great Gonerby – Grantham – Meres Leisure Centre	60 mins		Centrebus
INTER URBAN SERVICES				
4	Grantham – Stamford	4 - 6 per day		Kimes
5	Grantham - Ropsley	2 per day		Centrebus
6	Grantham - Barrowby – Bottlesford	60 mins		Centrebus
8	Grantham - Melton Mowbray – Loughborough	60		Veolia Transport
26	Grantham – Billingborough – Aslackby	3 – 4 per day		Kimes
27	Grantham – Sleaford	4 - 6 per day		Kimes
55	Grantham – Saltby – Melton Mowbray	4 per day		Veolia Transport
602	Grantham – Long Bennington – Newark	6 – 7 per day		Centrebus
608	Grantham – South Witham	4 – 6 per day		Centrebus
Interconnect 1	Lincoln – Grantham	60 mins	5 per day	Stagecoach
Interconnect 1	Grantham - Manthorpe	30 mins	5 per day	Stagecoach



Interurban Bus Network



Local bus Network



AM Peak Hour Frequencies

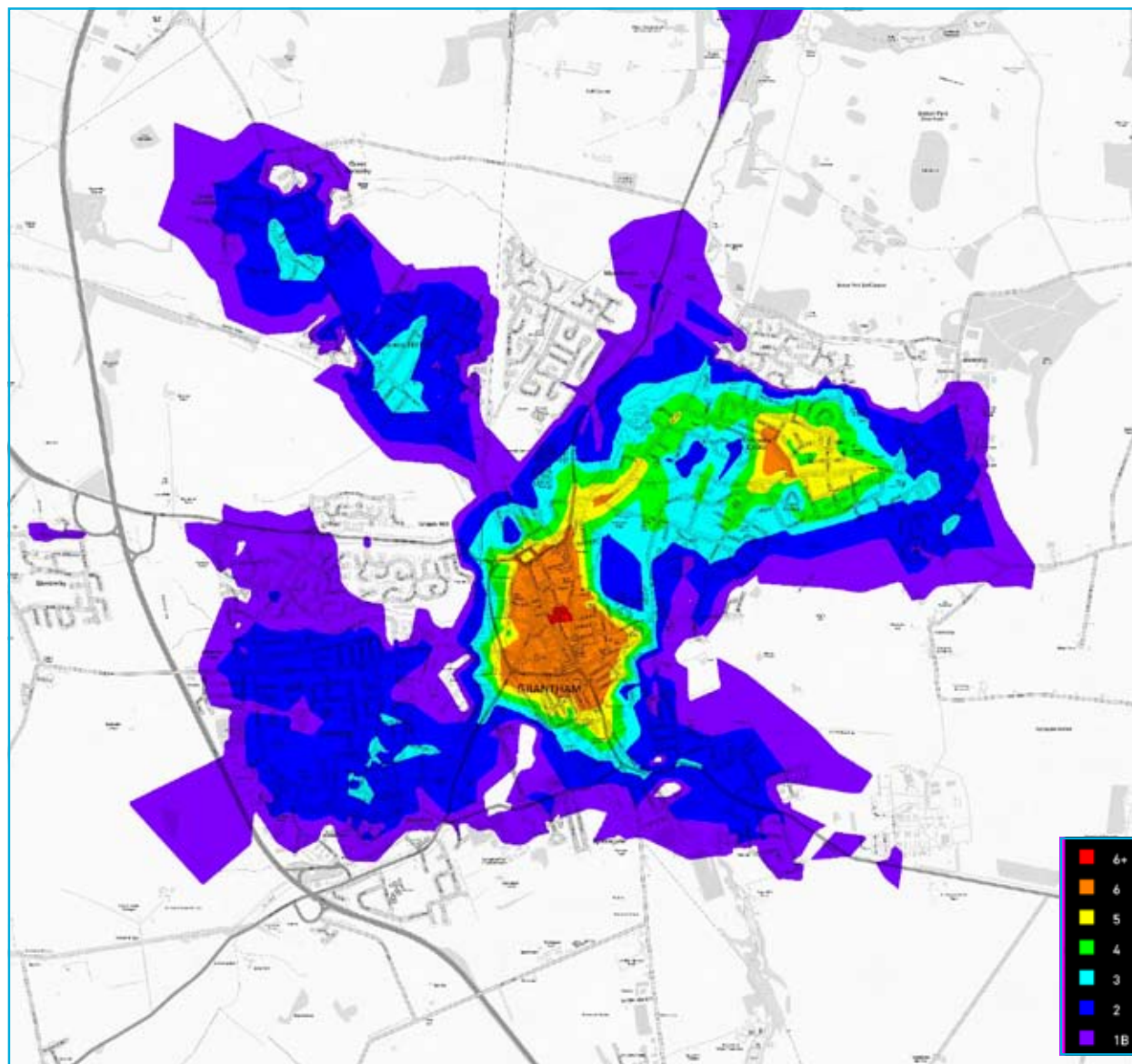
PTAL ANALYSIS

Public Transport Accessibility Levels (PTAL) is a broad measure of public transport accessibility across the town. It measures how close an area in the town is to a bus stop (only counts bus stops or rail stations within 640m and 960 respectively), and to a certain frequency of bus or rail routes. An index is derived by calculating an approximate average wait time for each bus stop or rail station.

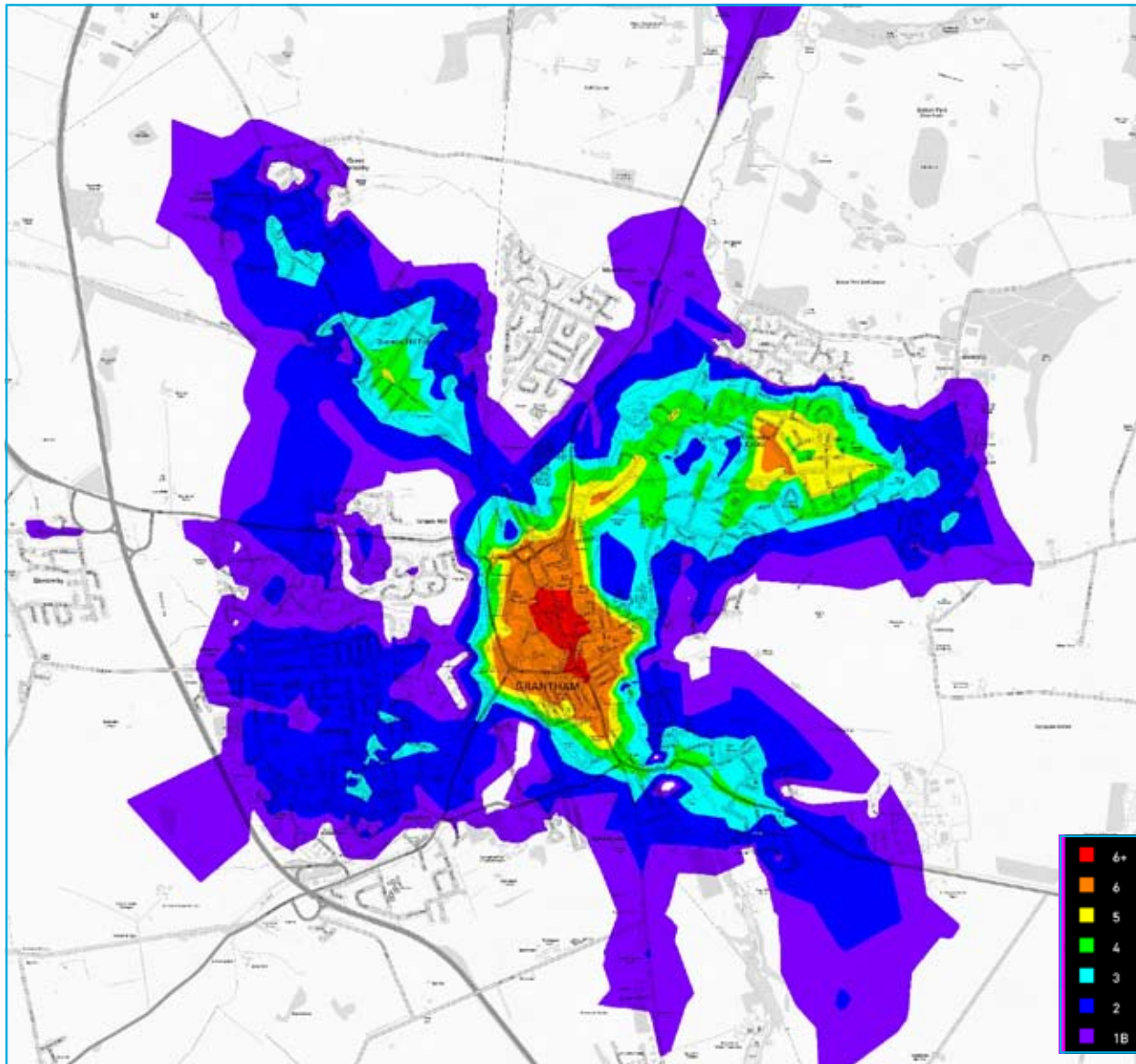
It should be noted that the index levels give an indication of overall relative accessibility. It does not distinguish between access to different services to different destinations and ascribe importance to different routes.

EXISTING PTAL LEVELS

The image opposite shows the overall PTAL analysis of Grantham town. As can be seen a high level of public transport access in the town centre given all buses pass through here. Reasonable levels of bus services are present along radial routes. Clear gaps in the network exist where the urban extensions are planned.



PTAL Existing Network



PTAL Future Network

FUTURE PTAL LEVELS

The image opposite shows the the change in PTAL that can be generated through the delivery of a high frequency service of 6 buses per hour linking the northern and southern urban extensions via the town centre.

This service is notional only and has been based on trip generation assessments presented in the final chapter of this report dealing with future travel patterns. In reality a more comprehensive bus network analysis should be undertaken as development comes forward so as to meet bus demands in terms of service route/destination and frequency.

06 CYCLE NETWORK

EXISTING CYCLE NETWORK

Grantham has an established network of cycle routes and facilities across the town. Open space improvements along the River Witham have included a network of off-road cycleways through parks for a significant length of the River.

A network of both segregated and shared cycleway/footways also exists along radial routes into the town centre. Issues exist with the level of priority across side streets and driveways. Also these routes generally end leading up to the town centre traffic collar, a key severance feature for cyclists in the town.

Local orbital routes and facilities also exist along quieter streets with a range of signage and facilities provided.

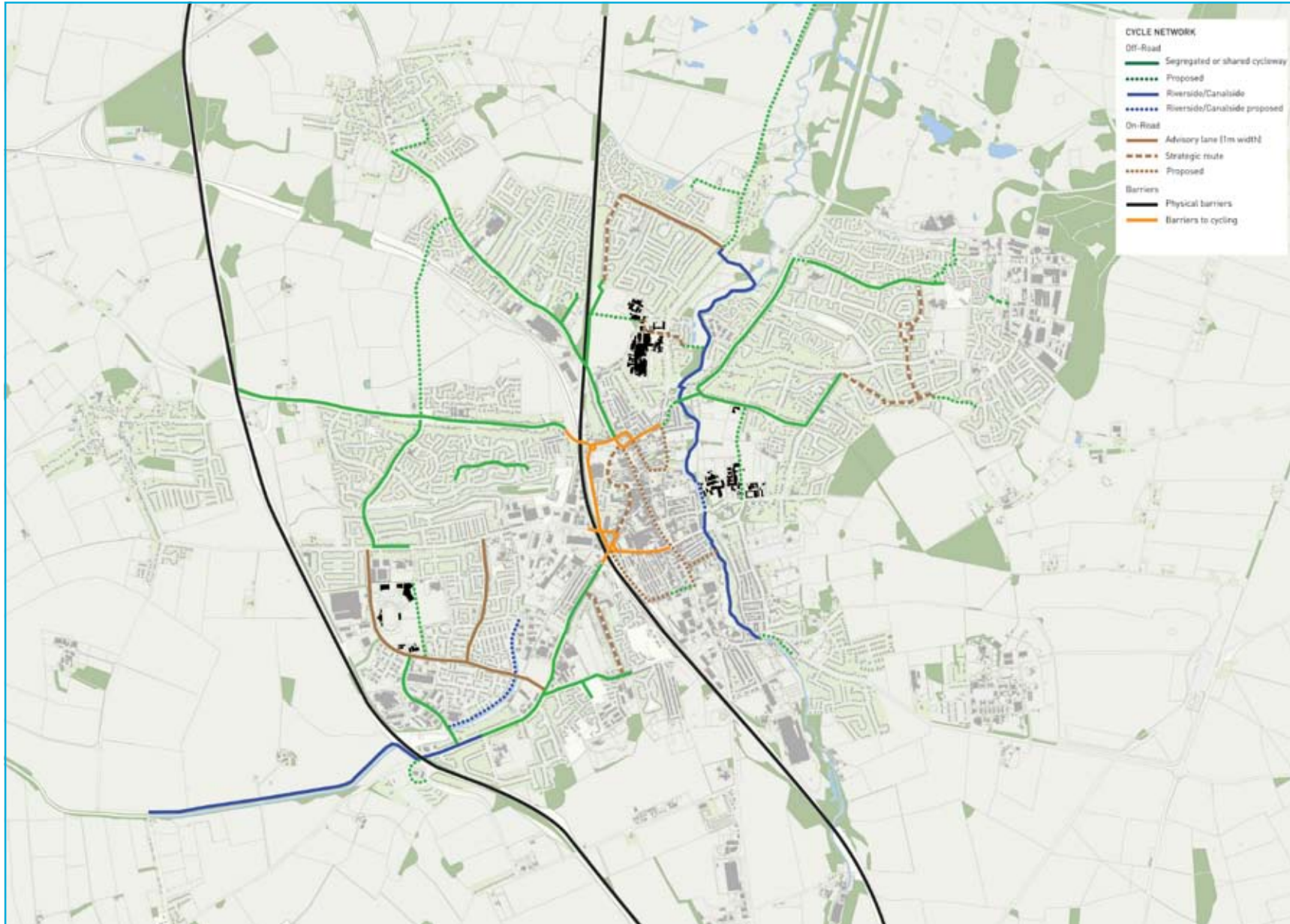
60% of journeys to work in Grantham are under 2km. This indicates that there is significant potential for cycling to take a greater share of these trips. The town is also relatively small, with distances of only 2 – 2.5km from the town centre to the edge of the built up area and the peripheral villages of Manthorpe, Great Gonerby, Barrowby and Harlaxton.



Radial cycle facilities



The River Witham cycle path



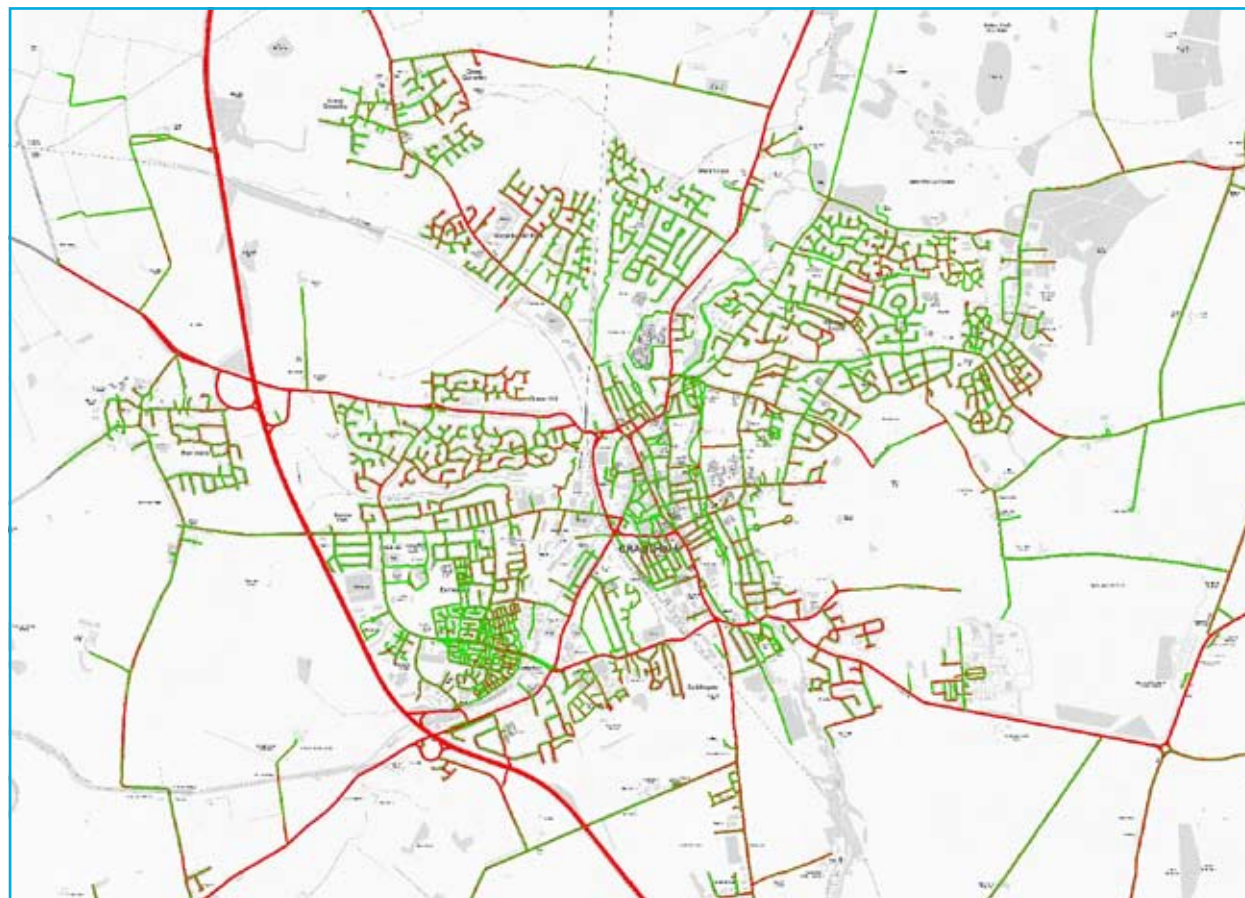
Cycle Routes

CYCLE ISM

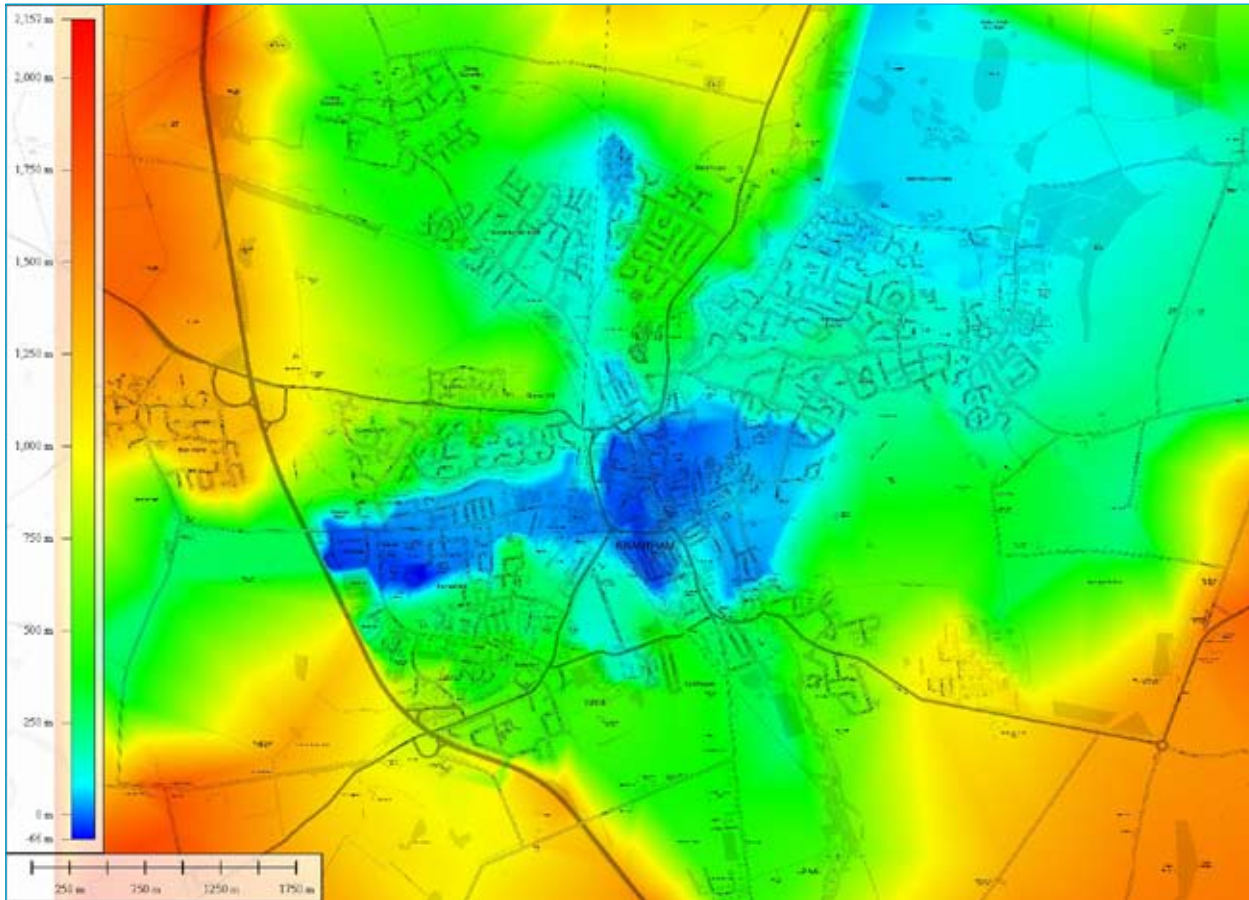
We have used our CycleISM method to assess the barriers to cycling in Grantham. The method combines shortest distance calculations, road danger, terrain and street classification criteria to determine optimum cycle routes. This is then visualised to help develop cycle network recommendations. Our analysis is able to inform cyclists' network design. These are some of the key factors which influence cycle movement as identified in Chartered Institute of Highway and Transportation (IHT) Cycle Audit and Cycle Review. This allows testing of options and development of cycle network strategies for all user types including 'Bikeability' Audits.

UrbanISM blends the influences used to determine cycle potential and produces effective cycle accessibility diagrams. Armed with this analysis the user is able to make better decisions about cycle network design and route selection.

The effective cycle accessibility map indicates that much of the central area (shown in blue) has reasonable cycle access along flat roads of low road danger. However many of the surrounding suburbs (green) show an effective journey distance of +750m to the town centre. In other words the effective journey distance is longer than would be expected on more cycle friendly streets which are flat. Much of the Northern Quadrant is within this zone and would therefore benefit from improved dedicated cycle infrastructure linking to the town centre. Much of the Southern Quadrant is within 'green zone' but some is within the orange zone, reflecting the adverse cycle condition created by road danger and topographic issues. Again high quality dedicated cycle infrastructure would enhance the effective cycle accessibility.



Cyclism Desireability

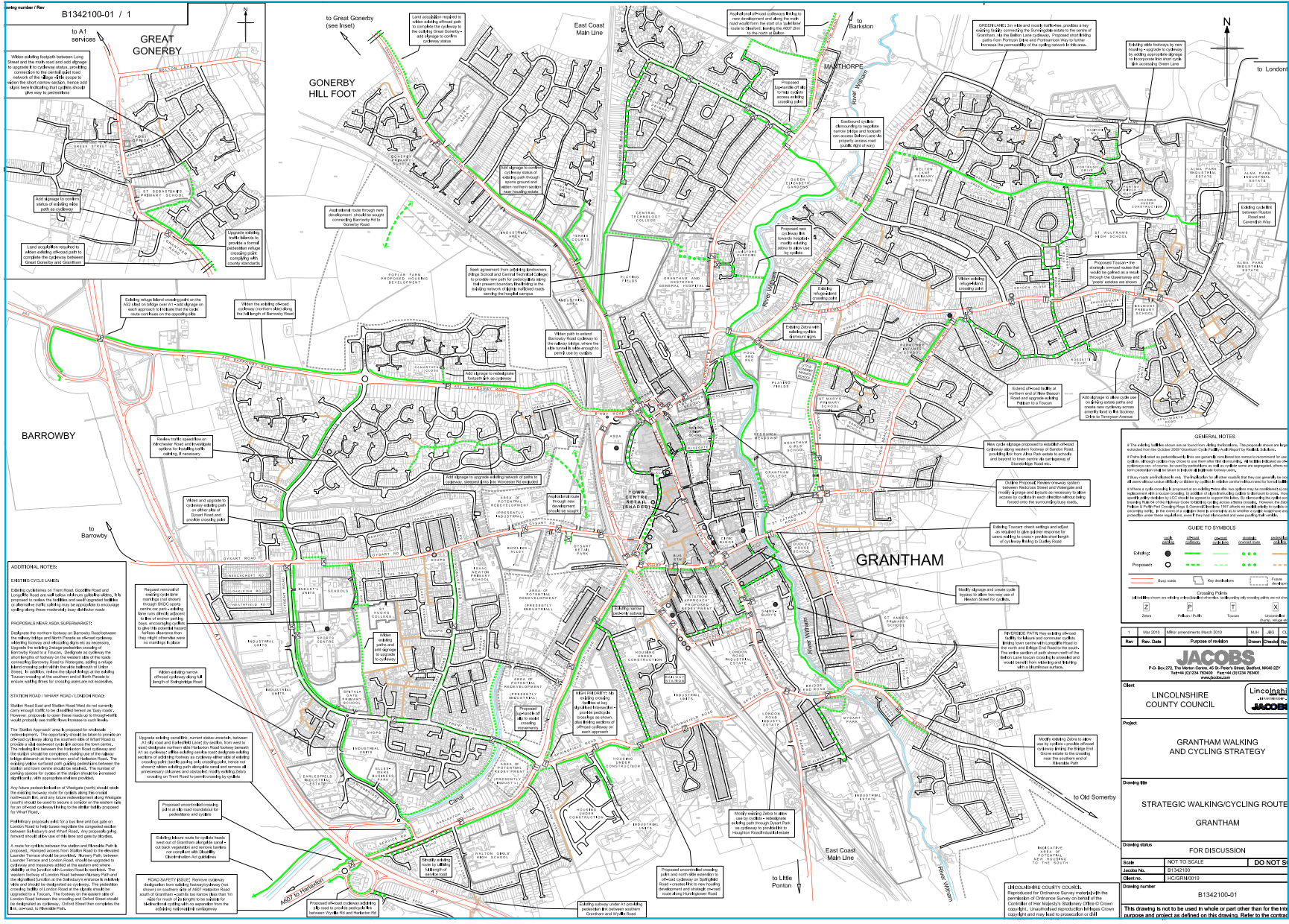


Calibrated cycle accessibility plot

CURRENT PROPOSALS

LCC and Jacobs consultants have produced a cycling strategy for the town, as shown opposite. This detailed strategy is essentially reflected above, and forms a core input into the cycle strategy.

A detailed infrastructure list has also been developed. While outside the scope of this study, it is recommended that this list be reviewed on the basis of the Grantham Movement Strategy to balance recommendations with all other modal priorities. Consideration should also be given to the street planning framework.



Cycle Strategy

07 WALKING NETWORK

GENERAL NOTES

1. This strategy is based on the current walking and cycling network. The proposed routes are based on the current walking and cycling network. The proposed routes are based on the current walking and cycling network. The proposed routes are based on the current walking and cycling network.

GUIDE TO SYMBOLS

Route Type	Symbol
Primary Route	Solid Green Line
Secondary Route	Dashed Green Line
Tertiary Route	Orange Line
Footpath	Blue Dotted Line
Cycle Lane	Blue Dotted Line
Other Features	Various Symbols

Rev	Rev. Date	Author/Amendment	Revision	Mark	Scale
1	Mar 2016	JACOBS	1		

JACOBS

PO Box 270, The Avenue, Lincoln, LN6 7YU. Tel: 01522 534300. Fax: 01522 534301.

Client: **LINCOLNSHIRE COUNTY COUNCIL**

Project: **GRANTHAM WALKING AND CYCLING STRATEGY**

Document Title: **STRATEGIC WALKING/CYCLING ROUTE**

Document Area: **GRANTHAM**

Document Status: **FOR DISCUSSION**

Scale:	NXT TO SCALE	DO NOT SCALE
Drawn by:	BY: JACOB	
Checked by:	BY: JACOB	
Drawn number:	B1342100-01	

This drawing is not to be used in whole or part other than for the intended purpose and project as defined on this drawing. Refer to the contract for further details.

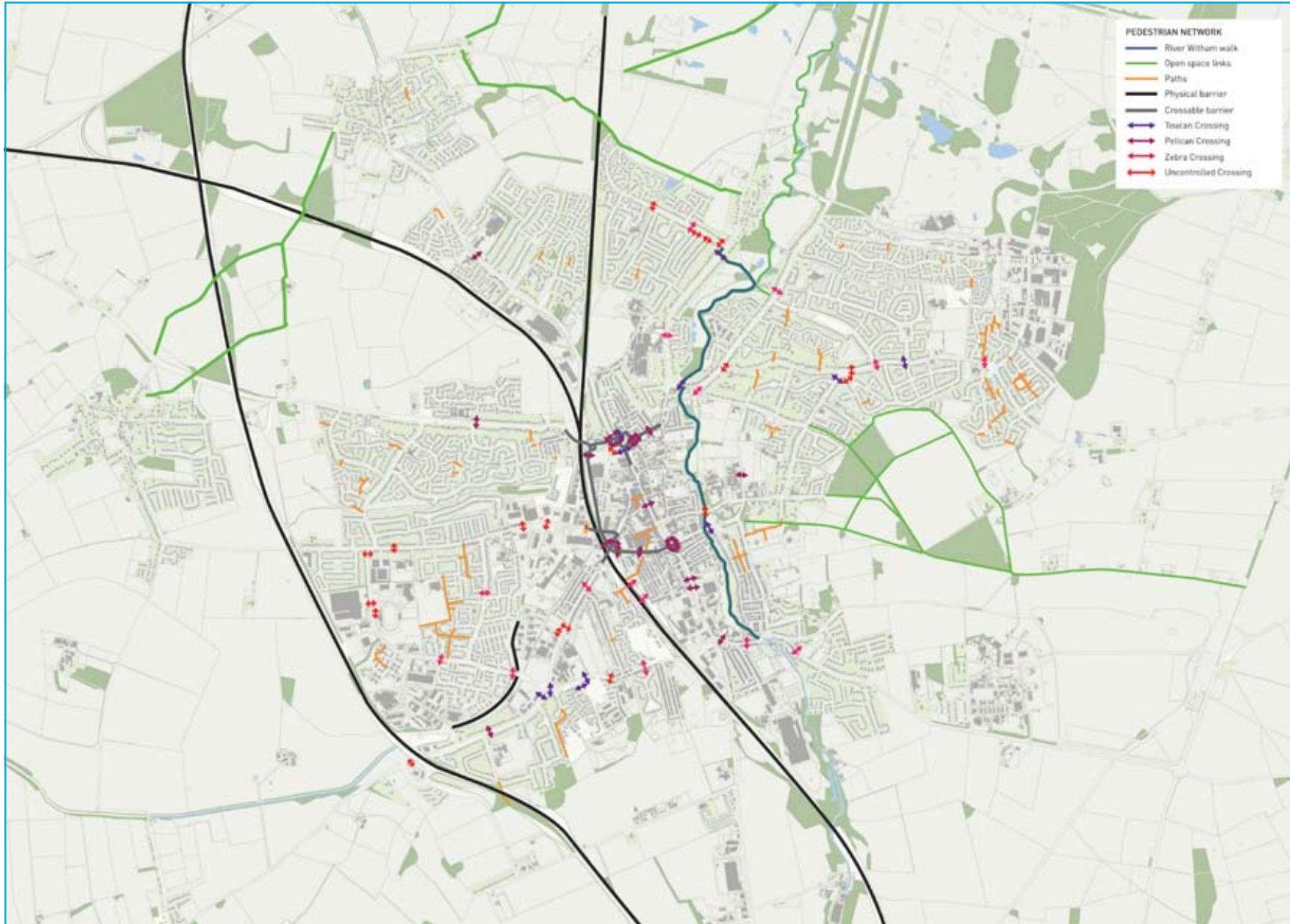
07 WALKING NETWORK

WALKING FACILITIES

Walking is generally provided for by way of footpaths on Grantham's network of streets. A range of crossing facilities are present as indicated on the plan opposite. A network of off street paths is also provided through residential and employment areas providing linkages between streets.

Open space paths are also an important part of the towns walking network, as with the River Witham. These links provide important connections through the town in a more recreational setting.

It is important that the town centre streets and spaces provide for efficient and high quality pedestrian movement to, from and between key activities in the town core. Activated frontages have a significant bearing on walking quality.



Specific walking facilities across the town, in addition to the existing street footways

WALKING ANALYSIS

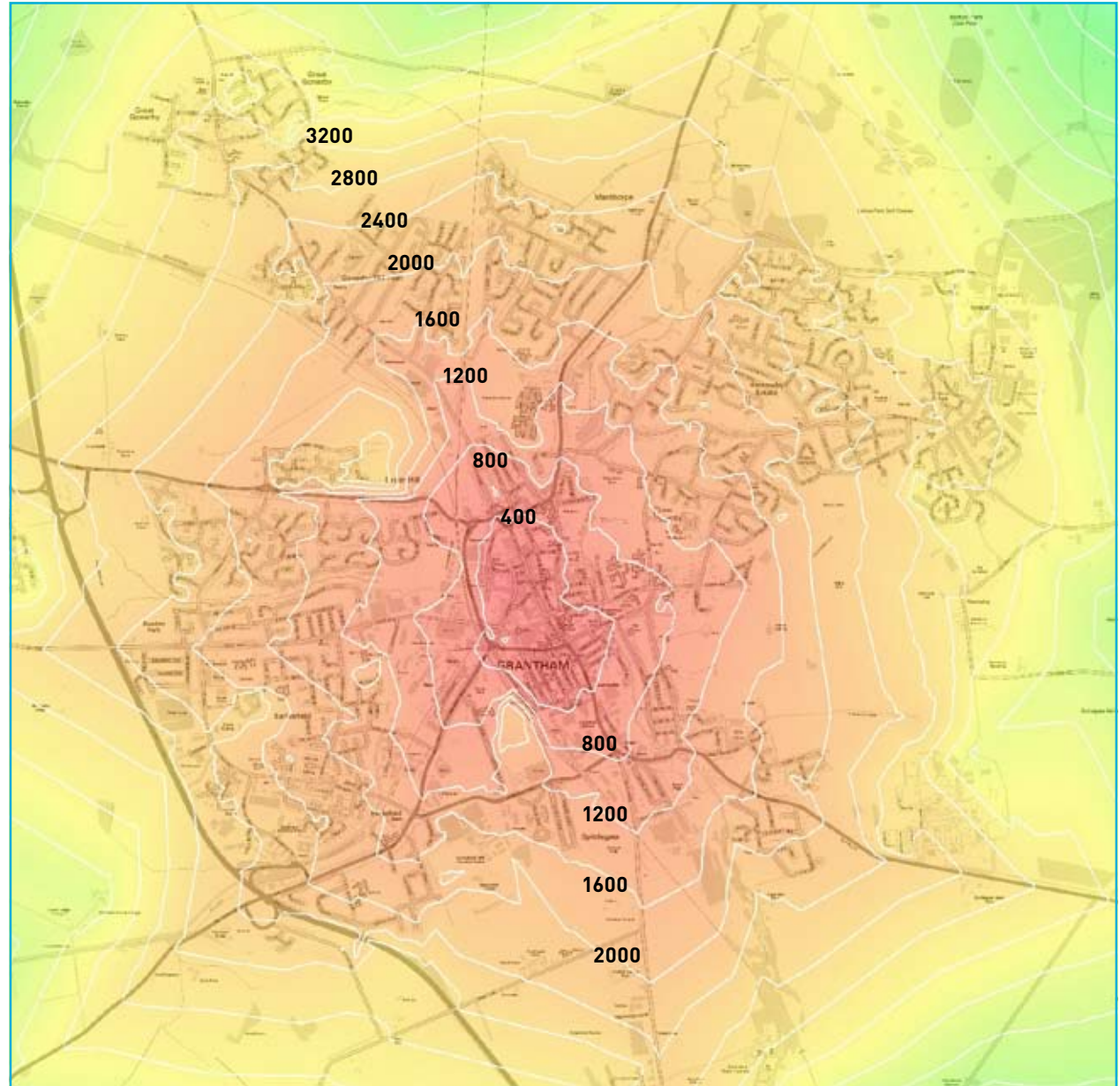
WALKING DISTANCES

An analysis of actual walking distances along streets has been undertaken for Grantham based on two key 'centroids' located at the town of the Market Square and the Bus Station/Sir Isaac Newton Shopping Centre.

As can be seen, distances to the outlying villages of Barrowby, Great Gonerby and Manthorpe are approximately 2.5 to 3km, or an approximate 30 minute walk (80m per minute).

Severances such as the railway line have a significant impact on walking distances.

It is also observed that the Welham Street multi story car park is less than 400m walk from the town centre.



Pedestrian Shortest Path Analysis - 400m isochrones from two centroids of the bus station and market square

VISIBILITY GRAPH ANALYSIS

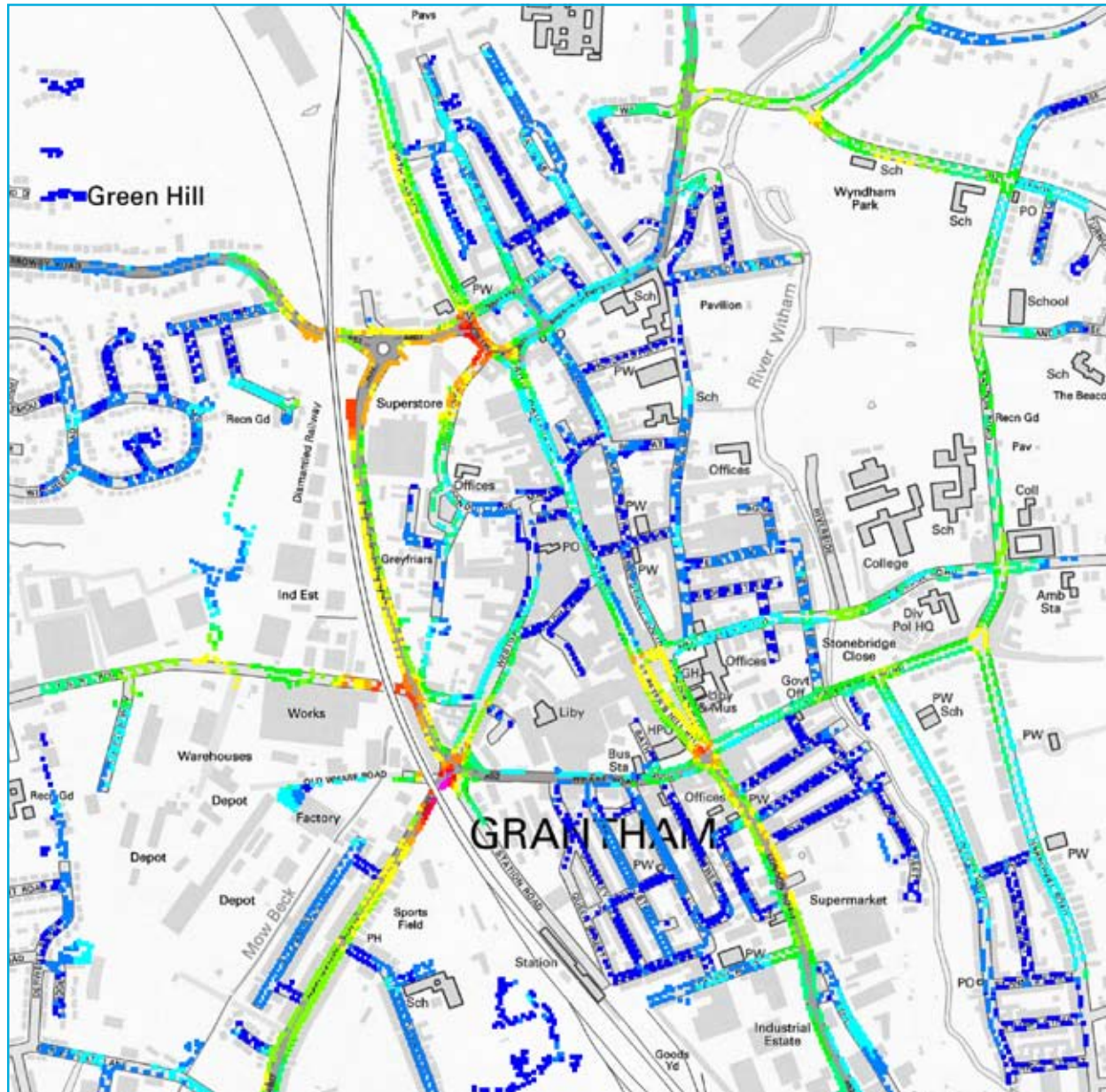
This is an analysis of visibility from any given point of the town centre footway network and can be very useful in a number of ways. The areas where visibility is highest often correlates well with where movement is concentrated (although this is often distorted by the location of activities). This is an important indicator of areas of pedestrian intensity, and can provide guidance on where particular kinds of land uses are best located to capture upon this intensity. The most obvious example is how retail streets or circuits can be designed to maximise footfall. Higher levels of visibility are also good indicators of the highest levels of pedestrian provision in terms of footway widths, crossing facilities, and public realm quality.

Looking at the drawing opposite, a heat map has been produced of pedestrian visibility along footways in the town centre. This analysis has focused on footways to focus in on pedestrian issues. Footway width effects the number of points that are available. This means where footway widths are narrow, less points will be inter visible than areas with wider footways with more points that are visible. Also junctions are generally more visible as any given point on the footway is able to 'see' along a number of streets, rather than just up and down a single street.

What the analysis shows is that the key junctions on the town centre traffic collar are the most visible areas on the network. These are the gateways to the town, the areas where people enter from numerous different paths, and as such warrant a greater level of attention than currently given.

St Peters Hill shows up as a strategically important open space, and this correlates well with its high level of use and townscape prominence.

The market square is shown to be less visible than other areas. This is due to the fact that footways are currently very narrow. This is being rectified by LCC.



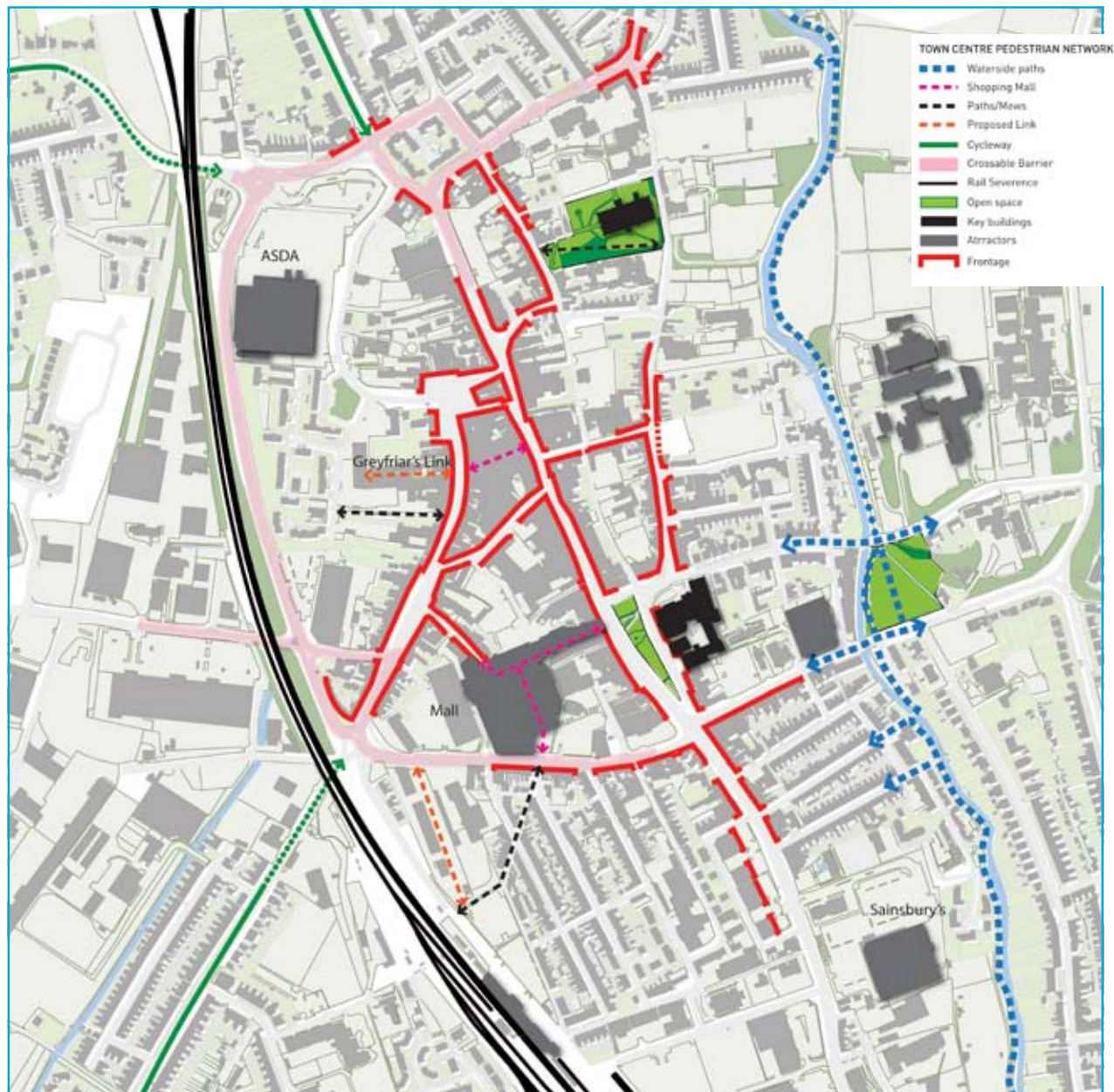
Visibility Graph Analysis

CURRENT PROPOSALS

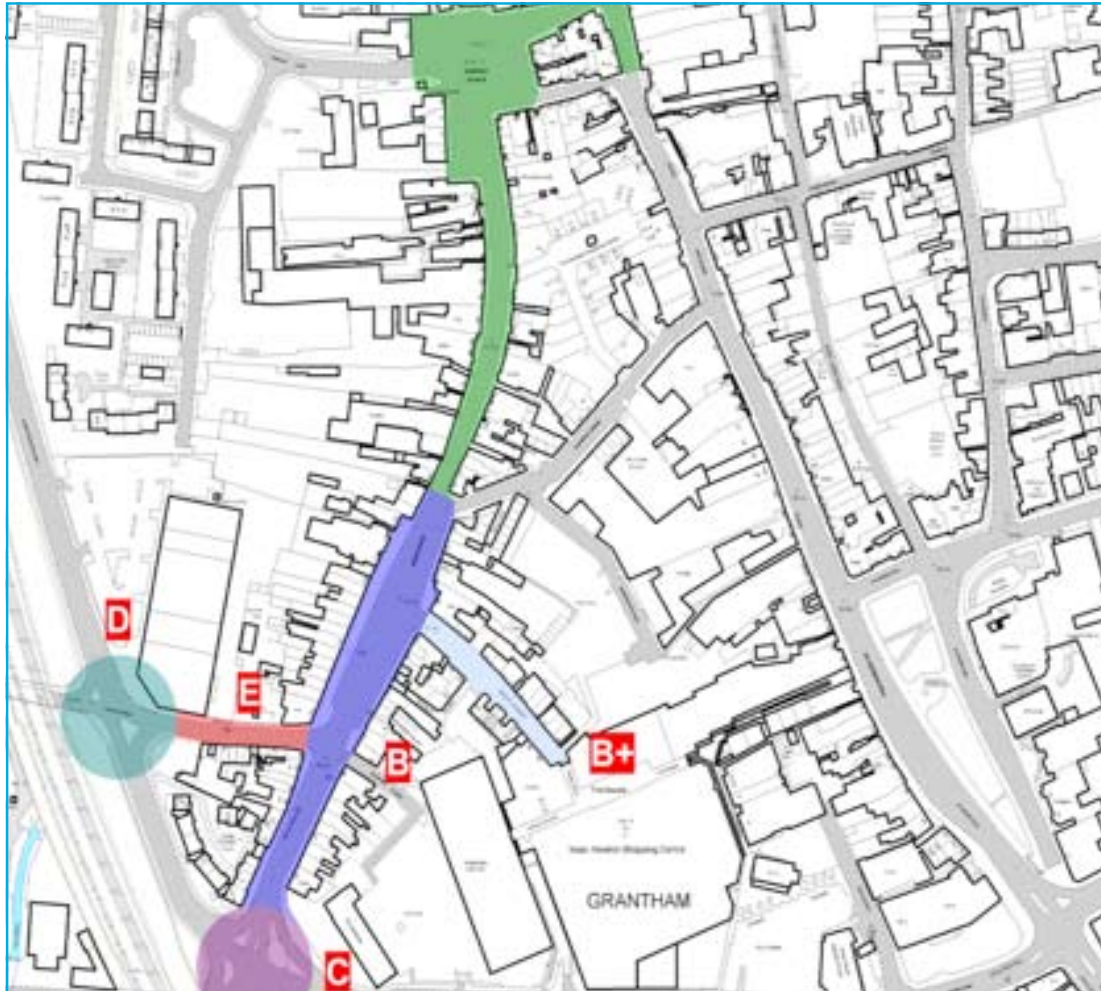
A series of new links are to be provided as part of the three town centre development briefs of Station Approach, Wharf Road and Greyfriars. These are indicated on the plan opposite.

Lincolnshire County Council have a series of proposals to improve the quality of town centre streets. The plan opposite gives an indication of the proposals for the key town centre triangle of streets consisting of the High Street, Market Square and Westgate.

The first phase of work is to improve the Market Square. The High Street and Westgate junction is being upgraded to a signalised crossing facility, and significant public realm enhancements are being proposed for the Square itself due in April 2011, including the rationalisation of car parking and the delivery of new public spaces.



Town centre pedestrian network



- **A** Market Place / Westgate and Angel & Royal Junction
- **B** Wide Westgate
- **B+** Welby Street
- **C** Wharf Road / Harlaxton Road Junction
- **C** Saint Augustin Way / Dysart Road Junction
- **D** Dysart Road Link

LCC Town Centre Pedestrian Improvements Plan



- **A** Market Square
- **B** Market Square
- **C** Market Square
- **D** Market Square

LCC Market Square Proposals

08 FUTURE TRAVEL PATTERNS

TRAVEL ESTIMATION PROCESS

To assess the implications of the development growth and the effect of new link roads, a spreadsheet traffic model has been built. The model incorporates data from the Grantham SATURN model, which is held by Lincolnshire County Council. A full description of the work undertaken is enclosed in Appendix 2. This section provides a basic summary of the results and highlights key traffic flow outputs and changes in demand.

The model has been build to show traffic demand during 3 main test scenarios:

- 2006 Base – to indicate the current level of traffic on the network and general traffic patterns
- 2026 Future Base – to indicate the forecast level of traffic with general traffic growth and the effects of Local Development Traffic (LDF) except urban extension traffic arising from Northern and Southern Quadrants.
- 2026 Resultant – to indicate the additional effects of urban extension traffic, over and above the 2026 Future Base.



2006 base year AM peak period



2006 base year PM peak period

2006 BASE

- Traffic flows are highest on the A1(M) and the main arterial routes into Grantham, particularly A607 and A52.
- Traffic flows in the order of 1000+ vehicles per hour are typical on many arterial routes.:
- Within the town centre traffic flows are highest on the traffic collar - Wharf Road, St Augustine Way and Broad Street.
- There is a moderate flow of about 1000 vehicles per hour on St Peters Hill



2029 future base year AM peak period

2029 FUTURE BASE

- As would be expected, the model indicates that in 2026 flows levels will grow on all key routes, generally in the order of 30 – 50% on key radials routes.
- Routes most effected include A52 and A607, with flows in the order of 1000 - 1500 vehicles.
- Within the town centre traffic levels are shown to grow, both on the traffic collar and St Peters Hill, particularly during the PM peak.
- This means that any benefit arising from the relief roads has been removed by rising general traffic levels.



2029 future base year PM peak period



2029 resultant flows with development AM peak period



2029 resultant flows with development PM peak period

2026 RESULTANT

- With urban extension traffic in place, traffic levels are set to rise further in the town centre particularly London Road and St Augustine Way with traffic increasing to over 2000 vehicles on London Road.
- Traffic levels remain more or less constant on St Peters Hill.
- The proposed Pennie Way is forecast to carry about 1500 vehicles during each peak, some of which will be diverted from other routes but mostly associated with the North Quadrant urban extension.
- The proposed Southern Relief Road is forecast to carry in the order of 1000 vehicles per hour. About half of which would be redirected trips currently using existing streets and about half associated with the urban extensions.

APPENDIX 01
RESEARCH ON GROWTH PROPOSALS

TOWN CENTRE:

GRANTHAM GROWTH POINT PROGRAMME OF DEVELOPMENT

Redevelopment of key areas to reinforce and enhance viability of the town including an expanded retail offer, office provision, more dwelling units, improved transport interchange and station facilities.

SITES

Station Approach: Development Brief adopted on 4th October 2010 Aims to:

- Provide a connected public realm
- Create sustainable transport solutions
- Consolidate, improve and diversify town centre retail offer
- Create a town centre of different parts

Site 1: 12800m² office, 1200m² retail, 117 room Hotel and 62 units (17 townhouses, 45 flats).

Site 2: 5200m² light industry, 46 townhouses, 2900m² start up units and a multi-storey car park (760 spaces).

Wharf Place: Demolition, new retail frontage, landmark building and public realm improvements. This includes a new morrisons and retail area plus car parking.

Canal Basin: A long-term scheme to create a high quality residential and office-led business district to transform the town's image and offer.

CORE STRATEGY

- Maintain Grantham's role as the primary retail and service centre for South Kesteven and as a sub-regional centre.
- Retain and enhance existing areas of employment use.

LOCAL TRANSPORT PLAN

- Premier Court Gyratory – improvements completed 2005.
- Wharf Road/Great Northern Terrace – improve traffic and pedestrian movement at southern end of relief road. First phases completed 2005, second phase in 2006.
- Market Place pedestrianisation.
- Widening of Footway on High Street.
- East-West Bypass – a route unobstructed by low bridges between the A1 and A52 going east.
- Whole of Grantham promoted as part of Community Travel Zones. Aim to encourage alternatives to the car for shorter trips through improved cycle and pedestrian infrastructure and lorry bans.
- Interest in reopening the canal as a catalyst for regeneration.
- Possible park and ride facility adjacent to A1 and Gonerby Moor.

TRANSPORT STRATEGY FOR GRANTHAM

- Sets out a series of short-term and long-term priorities for various schemes that help deliver the sustainable objectives and identifies funding sources
- Short-term programmes include town centre traffic management schemes, improved bus services, reviewing and improving cycling, walking and signage.
- Longer term measures include reducing the number of bridge hits, providing improved access to the rail station, better bus interchanges and delivering the two major road schemes (Peninne Way link and the East-West Relief Road).

GRANTHAM SUSTAINABLE URBAN EXTENSION (SUE) SITES

GRANTHAM (GENERAL):

CORE STRATEGY

- Approximately 90 ha of employment use
- Capacity for additional retail floorspace of 50,800 m² gross by 2026 possibly increasing to 63,100 metres gross by 2026 if market share increased
- Local Service Centres provided as part of comprehensive planning of large urban areas.
- Strategic Housing Land Availability Assessment identified sites with potential to accommodate approximately 430 dwellings within built up area of Grantham
- Need to identify additional greenfield sites on edge of Grantham to meet growth targets (sites not yet identified)

NORTH WEST QUADRANT:

GRANTHAM GROWTH POINT PROGRAMME OF DEVELOPMENT

- 3500 units with small scale employment opportunities through the school and local shops, not industrial development and new education provision.

CORE STRATEGY

- Yield up to 3500 new dwellings, with construction potentially starting in 2011.
- Incorporates housing, employment and local community facilities.
- Strong links (in terms of accessibility not built development) into town centre and across to Great Gonerby and Barrowby Gate reflecting topography of site.
- Need to establish pedestrian and cycle routes to the town centre, as well as extending bus routes.
- Expected to complete road link between Pennine Way and Barrowby Gate
- Provide a range of community facilities and recreational spaces.

DELIVERABILITY REPORT

- Fund new road/rail crossings.
- Buckminster Trust Estate control 44% of site. Other's include Norwich Hub, (eastern part of SUE). Western part of site has different interests (including Jelson Homes, Galliford Try, Kier Group).
- First units to be produced late 2010. 250 units can be served off existing infrastructure before upgrades required. This threshold is for upgrades to sewage network capacity.

APPLICATION

- Outline application submitted 30th June 2009 (S08/1231) for Poplar Farm (eastern) part of NWQ.
- 43.1ha of residential development providing approximately 1800 units at an average density no less than 30dph.
- Mixed of dwelling and housing types from 1 to 5 bedroom.
- 4ha of mixed use including a primary school, community centre and retail.
- Community park, landscape corridor, allotments and play areas.
- A hierarchy of streets with a main street running north-south.
- Principle of walkable neighbourhood with direct and safe streets, active frontage, homezones.

SOUTHERN GRANTHAM QUADRANT

Negotiations underway with Highway Agency. New relief road will be provided as part of the development.

GRANTHAM GROWTH POINT PROGRAMME OF DEVELOPMENT

Potential for 4000 homes, alongside a new employment area, shops and community facilities. Delivery of the Southern Quadrant proposal will also enable the provision of the East/West Relief Road.

CORE STRATEGY

- Spans the East Coast Mainline. Land between the A1 and A52.
- Housing envisaged to be contained between railway and A52.
- Up to 4000 new homes with employment and community facilities. Construction expected to start 2011/2012.
- New road from the A52 required.
- Issues of contamination around railway line.
- High risk flooding on land adjacent to River Witham – should not be developed on and SUDS incorporated to development to reduce increase to flood risk.
- River corridor and wooded areas important for biodiversity and landscape character. Development should respect and respond to this accordingly.
- Part of the Site is a Site of Nature Conservation Importance (SNCI).
- Known archaeological remains on part of the site.

DELIVERABILITY

- Hampton Brook Commercial Scheme (phase 1 of relief road). East of B1174. New grade separated junction on the A1 and new road from A1 to new roundabout on B1174 along the line of a widened Tollemache Road. Planning permission has now been issued.
- Early 2007 Buckminster Estates appointed team to explore feasibility of SGQ. JMP looked at relief road, Faulks Perry Cullen and Rech urban designers and masterplanners.
- Developed plan for 3,500-4,000 new homes with community, educational uses, open space, recycling and commercial areas.
- 65m change in level over the site. Eastern part of the site more visible and therefore more sensitive. Development should be buffed by landscaping.
- Known archaeological remains on part of the site.
- Must be connected to the town.
- Site area: 195.2 ha. Buckminster Estates own 97%. Third party interests include Anglian Water, East Cost mainline.
- Projected cost of £11.2m for draining foul and storm water.
- High Voltage Cables cross the western part of the site. There is a 60m 'cordon sanitaire' for residential and educational development.

RELIEF ROAD

- Development expected to fund cost of relief road.
- 2 options for relief road alignment.
- Fund new road/rail crossings.
- To cross river and railway requires viaduct of between 300 and 400m.
- Air rights required from Network Rail.

MANTHORPE PLANNING APPLICATION

- Application for 1000 new homes, retirement community, neighbourhood centre incorporating primary school and Primary Healthcare facility, retail uses, public house, public space and biodiversity enhancement.
- Outline Application submitted January 2010.
- Local Authority did not support the scheme and discounted this site as part of the LDF growth up to 2026.

CABE Review (April 2010) - Application refused.

APPENDIX 02

DETAILS OF TRAVEL ESTIMATION

Grantham Spreadsheet Model Technical Note

PTG285404A

Prepared for
Urban Initiatives
1 Fitzroy Square
London
W1T 5HE

Prepared by
Parsons Brinckerhoff

www.pbworld.co.uk



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APPENDICES

Appendix 1 – TRICS Outputs

September 2010



1 INTRODUCTION

1.1 Purpose

1.1.1 The Grantham spreadsheet model has been developed by Parsons Brinckerhoff (PB) Ltd on behalf of Urban Initiatives in order to assess the traffic impacts of the North Quadrant (Poplar Farm) and South Quadrant developments on the road network in Grantham town centre and the surrounding area.

1.1.2 Initial tasks were to produce the following model scenarios, based on the flows from the existing SATURN model for the wider Grantham area.

- 2006 Base, AM & PM
- 2029 Forecast year (no additional development), AM & PM
- 2029 Forecast year with development, AM & PM
- Development flows for the North Quadrant Poplar Farm, AM & PM
- Development flows for the South Quadrant development, AM & PM

1.1.3 The 'with development' scenarios in the 2029 Forecast year include:

- North Quadrant Poplar Farm + South Quadrant development flows as calculated previously by JACOBS, AM & PM;
- North Quadrant Poplar Farm + South Quadrant development flows as calculated by PB using the TRICS trip rates described in this Technical note, AM & PM;
- Net change in development flows for North Quadrant Poplar Farm + South Quadrant (calculated by subtracting the JACOBS development flows from the PB development flows), AM & PM.

1.1.4 The following additional scenarios were added to ascertain the net effect of the development impacts:

- Difference between 2029 Forecast year flows (no development) and 2006 Base year flows, AM & PM
- Difference between 2029 Forecast year flows (with all development) and 2029 Forecast year flows (no development), AM & PM

1.1.5 From the outset it was agreed that a spreadsheet model would be used in this assessment given the high level assessment required, this was also due to suitability and access issues with the SATURN model currently held by Mouchel but developed by Jacobs. It should be noted however that the spreadsheet model uses extracts from the SATURN model to ensure a good level of compatibility in the base year.

1.1.6 In order to obtain data from the SATURN model Mouchel were commissioned to extract and provide a number of outputs from the model for use in the spreadsheet model, this includes:

- 2006 Base & 2029 Forecast link flows



- 2006 Base & 2029 Forecast turning flows
- 2006 Base & 2029 Forecast Demand matrices
- 2006 Base & 2029 Forecast time & distance skim matrices
- 2029 Select link analyses for North and South Quadrant developments

2 NETWORK

2.1 Study Area

- 2.1.1 The spreadsheet model focused on four main areas of the local road network around Grantham. Figure 2-2 on the following page is drawn in Excel over an OS map background of the area, incorporating only the major roads and approximately extending between Harlaxton in the southwest to Syston north of Belton Park in the northeast.
- 2.1.2 The extent of the model to the east was limited by the SATURN network and therefore the base data available, which ends just east of Whalebone Lane before the A52 / B6403 High Dike / B1176 junction.
- 2.1.3 A more detailed model was required for Grantham town centre, incorporating the majority of the SATURN network links. This was again produced by drawing in Excel over an OS map background of the area to ensure the correct representation of the network, and extends between the A607 Harlaxton Road (just north of the junction with Springfield Road) to the southwest and the Lodge Way / A607 Manthorpe Road / Belton Lane junction to the northeast. The extent of the town centre spreadsheet model is shown in Figure 2-1 below.

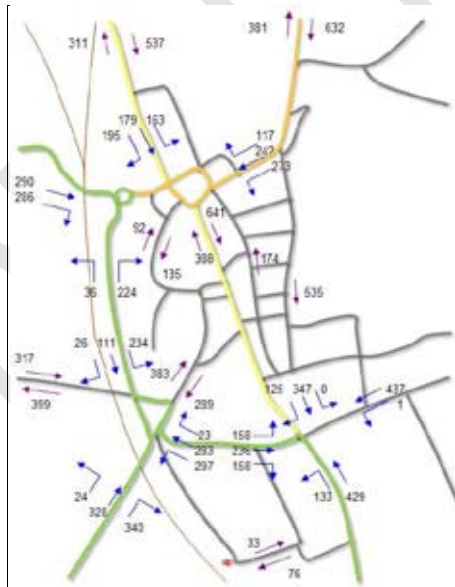


Figure 2-1 – Grantham Town Centre Network



Figure 2-2 – Grantham Wider Area Network

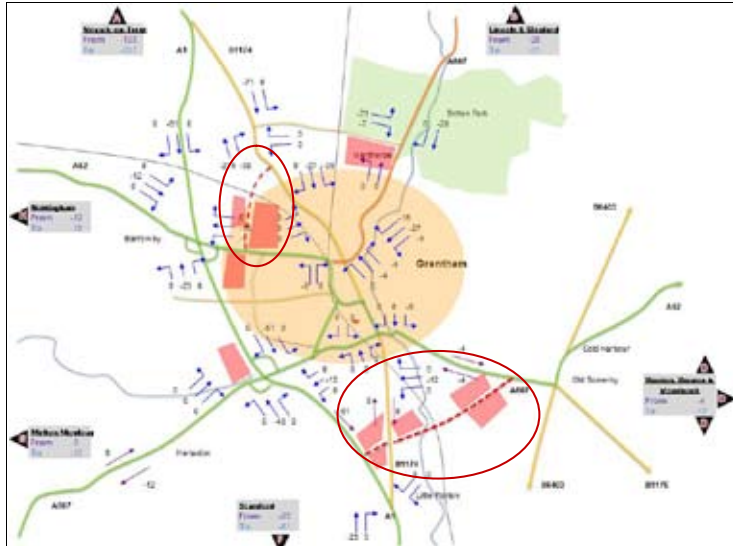


Figure 2-5 – North & South Quadrant Development Accesses (Wider Area)



3 DEMAND

3.1 Background Traffic

3.1.1 An existing SATURN model has been used to determine the background flows of the spreadsheet model. Therefore all 'trips' referred to in the context of the forecast background traffic are in fact Passenger Car Units (PCUs) rather than actual trips. However, for the purposes of this report these are assumed to be one and the same, since this gives a more robust assessment of the number of trips impacting on the road network.

3.1.2 Background traffic for the spreadsheet model is based directly on the actual flows in the existing SATURN model, and therefore has an identical distribution and (generally) flows. However, the North Quadrant Poplar Farm and South Quadrant development traffic (as calculated by JACOBS) is present within the SATURN model. This existing development traffic therefore had to be removed in order to calculate the true background traffic levels for the forecast year.

3.1.3 To remove the existing JACOBS development traffic, the trip generation for the development sites were removed from the model using the same distribution that was subsequently used to assign the trip generation (i.e., the proportion of change in development trips should be the same for each link on the network). The housing trips for removal are given in Table 3-1 of the JACOBS Forecasting Assumptions Report (October 2009).

3.1.4 It should be noted that the JACOBS employment trip generation given in Table 3-K was assumed not to be part of the North Quadrant and South Quadrant development sites, although this was not entirely clear within the report. Therefore these trips have currently not been removed from the 2029 background traffic in the road network.

3.1.5 The trips removed using the figures in the JACOBS report are in Table 3-1 below:

Development	Trip Generation					
	AM			PM		
	Arrivals	Departures	Total	Arrivals	Departures	Total
North Quadrant / Poplar Farm	468	1824	2292	780	468	1248
South Quadrant	410	1596	2006	683	1334	2017
TOTAL	878	3420	4298	1463	1802	3265

Table 3-1 – JACOBS Vehicle Trip Generation

3.1.6 As a double-check on the removing of JACOBS development trips, an alternative method for removing the existing North and South Quadrant development trips was also tested. This confirmed that removing the JACOBS trip generation produced the least extreme net change in development traffic, although the difference is still significant for the reasons discussed in 3.3.10 below.

3.2 Alternative Background Traffic method

3.2.1 To represent background growth, TEMPRO v5.4 O-D growth factors were calculated for years 2006 to 2029. Figures for the AM & PM peaks are given in Table 3-2 below.



Place	AM TEMPRO growth factors with fuel & income adjustment		PM TEMPRO growth factors with fuel & income adjustment	
	O	D	O	D
	Grantham	1.1478	1.2148	1.2297
Lincoln(main)	1.1477	1.1883	1.1853	1.1591
Louth	1.0947	1.1860	1.1825	1.1237
Sleaford	1.1718	1.1824	1.1821	1.1705
Boston	1.0975	1.1801	1.1703	1.1171
Stamford	1.1093	1.1783	1.1725	1.1271
Melton Mowbray	1.0916	1.1777	1.1705	1.1142
Nottingham(main)	1.1519	1.1962	1.2060	1.1736
Newark-on-Trent	1.2250	1.2098	1.2138	1.2149

Table 3-2 – TEMPRO Growth Factors

- 3.2.2 Several assumptions in the JACOBS Traffic Forecasting Assumptions Report (October 2009) paragraphs have been used to calculate these growth factors – namely that all housing within TEMPRO is explicitly included in the model, and therefore all housing should be removed from the planning assumptions when growing using TEMPRO. However, employment in the model is assumed additional to TEMPRO employment, so no jobs have been removed from the planning assumptions when calculating TEMPRO growth.
- 3.2.3 For consistency, fuel and income adjustment factors for 2006 – 2029 for the TEMPRO growth factors are also taken from Table 3-F of the JACOBS report.
- 3.2.4 From Table 3-2 above, the TEMPRO growth factors for Grantham were used and were applied to Base traffic in the North and South Quadrant zones.
- 3.2.5 The North Quadrant development zones within the demand matrix are 71, 72, 150, 182 and 191 – 202.
- 3.2.6 The South Quadrant development zones within the SATURN demand matrix are 22, 75, 82 – 84, 101 – 110 and 121 – 135.
- 3.2.7 All zones with numbers over 100 are included in the Forecast SATURN model specifically to represent the new North and South Quadrant development zones, and it is assumed that all trips to and from these developments originate or end in these zones, and conversely that there are no trips to or from these zones in the base year.
- 3.2.8 All trips were assumed to be removed from the North and South Quadrant specific zones (i.e. 101 – 110, 150, 182, 121 – 135 and 191 – 202).
- 3.2.9 The difference between the TEMPRO-growthed 2006 trips and the existing 2029 SATURN demand were assumed to be removed from zones which were expected to have both background and development-specific traffic (i.e. 71, 72, 75 and 82 – 84).
- 3.2.10 The total reduction in trips above was calculated separately for the North and South Quadrant sites, and for arrivals and departures. The trips were then removed from the spreadsheet using the same distribution as the PB trip generation assignment. The trips removed using the matrix manipulation method are given in Table 3-3 below.



	2029 Trips (dev - no dev) - South Quadrant									
	71		72		182		150		191 - 202	
	From	To	From	To	From	To	From	To	From	To
AM	6.7	39.9	0.0	6.5	0.0	0.0	91.0	24.4	1884.0	843.0
PM	42.7	11.3	12.5	0.0	0.0	0.0	39.8	76.0	1122.8	1611.6

	2029 Trips (dev - no dev) - North Quadrant / Poplar Farm									
	22		75		82 - 84		101 - 110		121 - 135	
	From	To	From	To	From	To	From	To	From	To
AM	0.0	0.0	8.8	7.9	0.0	0.0	1772.6	497.2	478.7	143.3
PM	0.0	0.0	10.1	14.5	0.0	0.0	822.0	1600.6	213.3	399.5

Table 3-3 – JACOBS Development Trips Removed

- 3.2.11 Although these figures have been included in the spreadsheet model (tab 'Trips') for use if preferred, the method currently used for calculating background traffic subtracts the JACOBS figures given in their Forecasting report, as shown in Table 3-1. This method appears to produce less extreme differences between the JACOBS and PB trip generation. However, it is still useful to have the option of the matrix manipulation method available, i.e. if any re-assignments are required in the SATURN model using the PB development figures, the figures above can quickly be used to adjust the matrix demand.
- 3.3 Development Trip Generation
 - 3.3.1 Trip generation for the North and South Quadrant developments has been calculated explicitly using trip rates from the TRICS database. TRICS has been interrogated for both vehicular and public transport trip rates.
 - 3.3.2 The land use category assumptions have again been taken from a combination of the JACOBS Forecasting report and the powerpoint slides from Urban Initiatives (dated 05/08/10). These are given in Table 3-4 below.

Development	Houses (30 dph)	Employment (jobs)	Primary School (jobs)	Secondary School (jobs)	Retail (no. jobs = no. employees)	Active open space (ha)	Natural open space (ha)
North Quadrant / Poplar Farm	3510	0	50	0	100	16	4
South Quadrant	4020	0	50	25	1240	24	12
TOTAL	7530	0	100	25	1340	40	16

Table 3-4 – Development Land Use Categories

- 3.3.3 Additional assumptions include classing the 'Natural open space' of the development as 'Country Park' category within TRICS, and designating all employment which is not explicitly classified to be retail (split between local shops and convenience store).
- 3.3.4 Within the broader land use categories in Table 3-4 above, other assumptions of development type splits have been made. The assumptions for housing, employment (which has not been explicitly given within the model) and retail may be adjusted within the spreadsheet model (tab 'Trip_Rates'), but the current splits used are:



Housing proportions	
Houses privately owned	50%
Flats privately owned	10%
Houses rented	10%
Flats rented	30%
Employment proportions	
Office	40%
Industrial unit	30%
Warehousing (Commercial)	30%
Retail proportions	
Convenience Store	20%
Local Shop	80%

Table 3-5 – Development splits within Land Use Categories

- 3.3.5 It should be noted that no employment is currently assumed for the North and South Quadrant developments, other than the school and retail described in the Urban Initiatives 'Planning game' powerpoint slide (05/08/10).
- 3.3.6 Within TRICS, the Scotland, Ireland, Wales and Greater London areas were excluded from suitable regions from which to calculate trip rates. The site types included were limited to suburban areas, neighbourhood centre or edge of town only. Car ownership levels per household were constrained to be between 0.6 and 1.5. Finally, since the AM and PM peaks are the time periods of interest, only Monday to Thursday trip rates were used in the TRICS calculation.
- 3.3.7 A summary of the vehicular TRICS trip rates calculated is given below in Table 3-6 below.

	VEHICLE Trip Rates (individual)					
	AM			PM		
	Arrivals	Departures	Total	Arrivals	Departures	Total
Houses privately owned	0.155	0.418	0.573	0.403	0.234	0.637
Flats privately owned	0.071	0.202	0.273	0.185	0.095	0.280
Houses rented	0.096	0.181	0.277	0.235	0.165	0.400
Flats rented	0.085	0.070	0.155	0.109	0.124	0.233
Office	0.321	0.033	0.354	0.023	0.237	0.260
Industrial Unit	0.148	0.031	0.179	0.015	0.113	0.128
Warehousing (Commercial)	0.079	0.032	0.111	0.043	0.113	0.156
Primary School	3.296	2.454	5.75	0.139	0.250	0.389
Secondary School	1.694	1.104	2.798	0.136	0.282	0.418
Convenience Store	1.477	1.614	3.091	1.614	1.545	3.159
Local Shop	0.944	0.871	1.815	0.920	0.951	1.871
Open space ('Country parks')	0.080	0.047	0.127	0.085	0.134	0.219

Table 3-6 – Vehicle TRICS trip rates

- 3.3.8 The multi-modal TRICS outputs are attached in Appendix 1, which include the lists of specific sites used to calculate the trip rates for each land use type.



- 3.3.9 Using the above trip rates, the land use splits given in Table 3-5 and the development figures given in Table 3-4, the trip generation in Table 3-7 was calculated for the development.

Development	Trip Generation					
	AM			PM		
	Arrivals	Departures	Total	Arrivals	Departures	Total
North Quadrant / Poplar Farm	657	1031	1688	969	699	1669
South Quadrant	2135	2589	4724	2540	2213	4752
TOTAL	2792	3620	6412	3509	2912	6421

Table 3-7 – PB Vehicle Trip Generation

- 3.3.10 It is noted that the retail trip rates for South Quadrant are a lot higher than the JACOBS figures, whilst the North Quadrant figures are a lot lower. Development levels assumed in this report are very similar to those assumed in the JACOBS Forecasting report, although a more detailed development type split has been included for the North and South Quadrant development sites as in Table 3-4. Given the very similar development levels, differences in the TRICS trip rate assumptions are the main reasons for the disparity in trip generation.
- 3.3.11 The smaller North Quadrant trip generation is mainly due to the fact that JACOBS Forecasting robustly assumed that all residential development would be 'houses privately owned' and used the corresponding TRICS rates. This gives the highest trip generation of the residential land use categories in TRICS, whereas PB trip generation assumes the housing splits given in Table 3-5. This gives an overall lower trip rate (as an example, 0.328 vs. 0.573 in the AM peak) however is assumed to be more representative.
- 3.3.12 The larger South Quadrant trip generation is attributed mainly to the retail assumptions. While the JACOBS Forecasting report assumes a split between types of employment, the assumption in our trip generation is that most of this employment is within retail development (and the remainder within schools, as detailed in Table 3-4). The retail development is currently split equally between TRICS 'local shop' and 'convenience store' categories, which have very high trip rates in comparison to other employment and residential land uses, hence the differences in trips.
- 3.3.13 Given this disparity, it should be noted that there is potential for refinement of the retail land use assumptions for the South Quadrant development as and when further information is known.
- 3.3.14 As noted in 3.3.4, the development type splits can be changed within the spreadsheet model (tab 'Trip_Rates') easily to correspond to the SATURN model assumptions if required.
- 3.4 **Development Trip Distribution**
 - 3.4.1 The trip generation from the development sites was assigned to the network links by calculating the percentage of traffic (using a given link) from the overall arrivals and departures flow in to and out of the development. These percentages were calculated separately for the North and South Quadrant developments.
 - 3.4.2 The percentages of development flow assigned to each link were determined using the SATURN model select link analyses provided by Mouchel. The links selected were the access roads to the developments. Since the spreadsheet network is less detailed than the SATURN network, there are several areas in which trips 'disappear'

or 'appear' from zones not modelled within the spreadsheet; therefore the trips on the Grantham network do not add up exactly.

- 3.4.3 Again there is potential for alteration of this distribution by using the initial SATURN flows to assign proportions of the development traffic out of the access roads, and then a manual distribution referring to the previous link flow, which would not 'lose' the trips currently disappearing in and out of the SATURN zones excluded from the spreadsheet model.
- 3.4.4 Such a distribution is likely to be significantly more worst-case than the current distribution used, but may be deemed more consistent and cut out any potentially unexplained trip loss (or increase) based on the select link analyses to assign proportions of the development turning at each junction.
- 3.4.5 Figure 3-1 to Figure 3-4 show the select link analyses used to determine the distribution proportions are given below.



Figure 3-1 – Select Link Analysis for North Quadrant Development (AM)



Figure 3-2 – Select Link Analysis for North Quadrant Development (PM)



Figure 3-3 – Select Link Analysis for South Quadrant Development (AM)



Figure 3-4 – Select Link Analysis for South Quadrant Development (PM)

4 PUBLIC TRANSPORT

4.1 Initial Public Transport Trip Generation

4.1.1 Bus flow data was not available for the Grantham area, and instead TRICS multi-modal trip rates were initially used to estimate the proportions of trips in and out of the development sites using public transport (i.e. bus and coach) and 'slow' modes (i.e. walk and cycle).

4.1.2 The TRICS Public Transport (PT) and slow mode trip rates were split by arrivals and departures, and also by land use type. The development assumptions in Table 3-4 were applied with the new trip rates, and summed to get the total trip generation for PT and slow modes.

4.1.3 To apply the correct proportions of PT to each turning movement in and out of the development access roads, the following factor was applied:

$$= (\text{Vehicle trips by turning movement}) \left(\frac{\text{PT Trip Generation}}{\text{Vehicular Trip Generation}} \right)$$

4.1.4 It should be noted that the PT and slow mode trips were not assigned to the entire network, but only up to the turning movements in and out of the development access roads where they enter the local road network.

4.1.5 The above method was found to overestimate the number of walking and cycling trips to and from the South Quadrant development due to the very high proportions of walking trips calculated in TRICS for retail development. Internalisation assumptions were therefore applied to both development sites to ensure slow mode trips were made at a realistic level. The assumptions are editable within the spreadsheet model (tab 'MultiMode_Rates'), and are currently set to the values in Table 4-1.

INTERNALISATION FIGURES	
Walking internalisation	95%
Cycle internalisation	50%
PT trip internalisation	0%
Other vehicle internalisation	0%

Table 4-1 – Multimodal Trip Internalisation

4.2 Final Public Transport Trip Generation

4.2.1 A number of issues were highlighted with the above method, since the TRICS sites did not take into account the fact that the majority of public transport trips would head directly to Grantham town centre (possibly via settlements en route), with a few inter-urban trips. Therefore Census 2001 information for Grantham wards was interrogated instead to produce the following flow proportions from the development.

4.2.2 For simplicity, if fewer than 5% of the mode's trips originated (or ended) in a given ward, this ward was omitted from the distribution. This is because 5% of the trip generation calculated in 4.1.3 was not thought to be significant. The percentages of trips assigned to the remaining wards were scaled so that the totals came to 100%.

4.2.3 Table 4-2 below gives the wards for which the number of public transport or slow modes trips are thought to be significant, and the proportions for which public transport trips were assigned to them.



	Census Ward	Bike & Walk		Public Transport	
		IN	OUT	IN	OUT
NORTH QUADRANT	Barrowby	4.5%	13.3%	0.0%	0.0%
	Belmont	17.3%	18.1%	5.1%	5.5%
	Earlesfield	19.9%	19.0%	12.2%	14.3%
	Grantham St John's	14.7%	8.6%	22.7%	26.8%
	Green Hill	0.0%	0.0%	0.0%	0.0%
	Greyfriars	16.3%	2.9%	24.6%	6.2%
	Harrowby	10.3%	21.9%	6.3%	11.8%
	St Anne's	8.7%	5.7%	21.5%	25.7%
	St Wulfram's	8.3%	10.5%	7.6%	9.7%
	Isaac Newton	0.0%	0.0%	0.0%	0.0%
SOUTH QUADRANT	Barrowby	0.0%	0.0%	0.0%	0.0%
	Belmont	20.0%	23.2%	0.0%	0.0%
	Earlesfield	36.5%	42.1%	13.1%	15.7%
	Grantham St John's	0.0%	0.0%	14.2%	16.5%
	Green Hill	0.0%	0.0%	10.2%	11.6%
	Greyfriars	11.2%	3.4%	27.5%	15.1%
	Harrowby	23.9%	27.9%	8.2%	10.9%
	St Anne's	0.0%	0.0%	13.8%	16.4%
	St Wulfram's	0.0%	0.0%	13.2%	13.9%
	Isaac Newton	8.4%	3.4%	0.0%	0.0%

Table 4-2 – Multimodal Trip Internalisation

4.2.4 The distributions for North Quadrant are based on the 'Greyfriars' census ward, and South Quadrant is based on the Grantham St John's and St Anne's census wards, which are close to the development sites in question.

Census Ward	North Quadrant		South Quadrant	
	Proportion	Direction	Proportion	Direction
Barrowby	1.00	A52 W	0.90	A1 N
		B1174 S into Grantham	0.10	B1174 N
Belmont	0.45	A52 E into Grantham	1.00	A52 N
		B1174 S into Grantham		
		B1174 NW to go via Belton lane		
Earlesfield	1.00	Barrowby Gate S	1.00	A1 N
		Barrowby Gate S	0.17	A1 N
Grantham St John's	0.70	A52 E onto St Augustin Way	0.17	A1 S
			0.17	B1174 N
			0.17	B1174 S
			0.17	A52 N
			0.17	A52 S
Green Hill	0.40	A52 E	0.80	A1 N
		A52 W		
		Barrowby Gate S	0.20	B1174 N
Greyfriars	0.20	B1174 NW	0.70	A1 N
		B1174 SE	0.30	B1174 N
Harrowby	0.50	B1174 SE	0.30	A1 N
		A52 E	0.50	B1174 N
St Anne's	0.50	B1174 SE	0.20	A52 N
		A52 E	0.20	A52 N
		B1174 SE	0.33	A52 N
St Wulfram's	0.50	B1174 SE	0.33	B1174 N
		A52 E	0.33	A1 N
Isaac Newton	N/A	N/A	0.50	B1174 S
		N/A	0.50	A1 S

Table 4-3 – Public Transport Distribution by Ward



4.2.5 The 'proportion' of PT and slow mode trips heading along specific roads from the census wards are given in Table 4-3 above. These figures are generally based on the distances between the census wards via the given routes, but also consider the likely road hierarchy.

4.2.6 It was additionally assumed that the 'to' trips followed the reverse route of the 'from' distribution.

4.2.7 The final percentage of PT and slow mode traffic assigned to roads outside the development locations is given in Table 4-4 below.

	Roads	Bike & Walk Trips		PT Trips		
		IN	OUT	IN	OUT	
NORTH QUADRANT	A52 W	4.5%	13.3%	0.0%	0.0%	
	A52 E	31.7%	33.2%	35.9%	44.8%	
	B1174 S	34.5%	29.5%	39.7%	31.0%	
	B1174 N	5.0%	2.4%	5.4%	1.8%	
	Barrowby Gate S	24.3%	21.6%	19.0%	22.3%	
	Barrowby Gate N	0.0%	0.0%	0.0%	0.0%	
	SOUTH QUADRANT	A1 N	51.5%	52.8%	49.6%	46.1%
		A1 S	4.2%	1.7%	2.4%	2.7%
A52 S		0.0%	0.0%	2.4%	2.7%	
A52 N		24.8%	28.8%	11.1%	12.8%	
B1174 N		15.3%	15.0%	32.1%	32.7%	
B1174 S		4.2%	1.7%	2.4%	2.7%	

Table 4-4 – Final Public Transport Distribution by Road

4.2.8 A limitation of this distribution is that the 2001 Census does not differentiate between time periods. Therefore currently the AM and PM distributions for public transport and walk trips in the spreadsheet model are identical. However, the numbers of arrivals and departures for each peak differ, since these depend on the TRICS multimodal trip rates for each peak.

4.2.9 Bypass public transport or slow mode trips (i.e. trips which do not enter or exit the development sites) have been omitted from the model.

4.2.10 A visual check of the new census distribution shows much higher flows between Grantham town centre and the developments, rather than away from the town centre. This is thought to be more sensible than the previous SATURN vehicle-based distribution.

5 MODELLING ISSUES

5.1 Lost Flows

5.1.1 The SATURN model contains a number of zones not included in the spreadsheet model, and this explains most of the 'trip loss' whereby flows disappear (or appear) from the network into or out of zones.

5.1.2 However, some instances have been noted where no centroids are present but flows have 'disappeared' off the network. This flow disappearance occurs within the select link analysis of the SATURN model used to determine the development traffic distribution, rather than the development trips calculated in the spreadsheet model. The query has therefore been forwarded onto Mouchel to determine the cause and will be reported once the reason is known.

5.1.3 Figure 5-1 below shows the location of the flow disappearance (AM peak, south of the North Quadrant development access road). The flow of 270 PCUs outbound from the development splits 3 ways on the SATURN network; but the 3-way flow outbound from the junction is around 100 PCUs lower than the flow outbound along the access road of the development, even though no centroids have been encountered where the flow changes. This might potentially be explained by congestion at the access road junction preventing outbound flow from the development entering the local road network.



Figure 5-1 – Select Link Analysis Flow Disappearance for North Quadrant Development (AM)

5.2 Large increases or decreases in flows (relative to the JACOBS figures)

5.2.1 Large flow differences on the network are generally explained by the differenced in the JACOBS and PB land use assumptions (and therefore the TRICS trip rates) used to calculate trip generation for the development. This problem is discussed in more detail in 3.3.10 to 3.3.13 above. Although not an error with the spreadsheet model, the land use assumptions and TRICS trip rates given in Table 3-4 to Table 3-6 above could be revised if necessary.

6 FURTHER WORK

6.1.1 Two further items have been identified to inform this study, as discussed below.

6.2 Smarter choices / options tests

6.2.1 The effects of Smarter choices, generic public transport improvements (rather than specific bus routes) and demand management measures could be tested by reducing the vehicle demand matrix by the factors from the findings of 'Sustainable Travel Towns' (DfT, February 2010). These factors reduce demand for trips based on trip length, since in general shorter trips are more able to be replaced by slow modes, public transport, or linked into other existing trips.

6.2.2 This could potentially be tested by factoring down the demand matrix (including the North and South Quadrant developments) and then re-assigning the reduced demand matrix in SATURN to produce new link and turn flows for the spreadsheet model. However, this would require going through Mouchel for the re-assignment and would require re-inputting.

6.2.3 Alternatively, a simplified factor could be applied to background growth by merging zones in the demand matrix into a limited number of sectors, and using the distance skims (also rezoned into sectors) to find average trip length for each sector. These sectors would correspond broadly with the main directions along the road network. Factors would be applied by direction along main roads.

6.2.4 A different, more detailed set of factors could then in theory be applied explicitly to the trips from the North and South Quadrant developments. While this method would not require going through Mouchel, the process is likely to be more difficult to apply correctly, and less accurate.

6.3 Capacity testing

6.3.1 This would require obtaining mid link capacity information from Mouchel. The link capacities would be required in a similar format to the flow information already supplied, and for the same links. Some additional link capacities would also be required for the northeast of the model near Manthorpe.

6.3.2 The link capacities would then be applied in another spreadsheet tab for the scenarios required. Volume / capacity percentages would be produced by dividing the link flow for the relevant scenario by the capacity for the relevant link.

6.3.3 A more detailed junction capacity assessment would again require re-assignment of a new demand matrix, as produced by PB to incorporate the new North and South Quadrant development flows (rather than the previous JACOBS figures).



7 CONCLUSION

7.1 Summary of Spreadsheet Model

7.1.1 As described in the note above, we have used the existing Grantham SATURN model to base our spreadsheet model background flows on. We have then explicitly calculated the net North and South Quadrant development traffic using the assumptions given in the above note, and added these to our spreadsheet network.

7.1.2 Within the spreadsheet model, different trip generation scenarios may be selected, including JACOBS-only development trips, PB-only development trips, and the net difference between the JACOBS and the PB development trips.

7.1.3 The North and South Quadrant development flows are shown individually as well as combined with background flows within the spreadsheet. Various parameters may be altered within the spreadsheet, including the PB development type assumptions table, the housing, retail & employment land use splits and the internalisation for multimodal trips.

7.2 Development Flows

7.2.1 In the AM peak, the outbound trips impacting on the local road network from the North Quadrant development are: 703 trips heading northwest along the B1174 Grantham Road; 173 trips heading southeast along the B1174 Gonerby Road; 87 trips heading either west via the A52 Barrowby Road or south via Barrowby Gate into south Green Hill / Earlsfield wards; and 362 trips heading east along the A52 towards Grantham town centre.

7.2.2 In the AM peak the South Quadrant development outbound trips include: 485 trips heading north along the A1 Great N Road from the development; 243 heading south along the A1 Great N Road; 391 heading north along the B1174 Spittlegate Level; 503 trips heading north along the A52 Somerby Hill and 70 trips heading south along the A52 Somerby Hill.

7.2.3 In the PM peak, the trips heading into the North Quadrant development are: 316 trips into the development from the southbound B1174 Grantham Road; 437 in from the B1174 northbound Gonerby Road; 65 in from the A52 eastbound; and 154 into the development from the A52 westbound (Barrowby Road).

7.2.4 In the PM peak the inbound South Quadrant development trips are: 910 trips southbound from the A1 Great N Road; 529 trips northbound from the A1 Great N Road; 501 trips southbound along the B1174 Spittlegate Level; 672 trips southbound along Somerby Hill; and 213 trips northbound along Somerby Hill.

7.3 Development Impacts

7.3.1 The North Quadrant development can be seen to have a much smaller impact on the road network than the South Quadrant development, and in fact shows a net decrease in flow (compared to the JACOBS figures) in the AM peak. This is again because of the land use assumptions as detailed in 3.2.10.

7.3.2 The high trip levels along the B1174 specifically (and around the South Quadrant development site in general) are similarly due to the high levels of retail development assumed for the South Quadrant site. Since this road does provide a direct route into Grantham town centre, it would seem sensible that this road would be heavily used by the retail traffic. However, it should be noted that Grantham town centre already has



its own retail centre, so the exchange of shopping trips between the South Quadrant and Grantham town centre may be overestimated.

7.3.3 Impacts on the town centre appear fairly low in the AM peak for both developments (particularly South Quadrant) but are much higher in the PM, with increases in flow of over 300 northbound along Grantham High Street.

7.3.4 Although South Quadrant development flows seem to impact on the town centre, several of the North Quadrant trips are shown to route along St Augustin Way rather than go directly through Grantham town centre.

7.3.5 As expected, there are few impacts of North Quadrant development south of Grantham town centre, and almost no impacts from the South Quadrant development north of Grantham.

7.4 Link Road Impacts (With & Without development)

7.4.1 In general, the link roads will provide additional capacity for the local road network, and the opportunity for certain flows to avoid Grantham town centre (e.g. developments south of the A52 wanting to route north via the B1174, or developments southeast of Grantham town centre wanting to route north via the A1).

7.4.2 In the latter case it is more likely that the link road would assist flows on the A607 rather than in Grantham town centre itself.

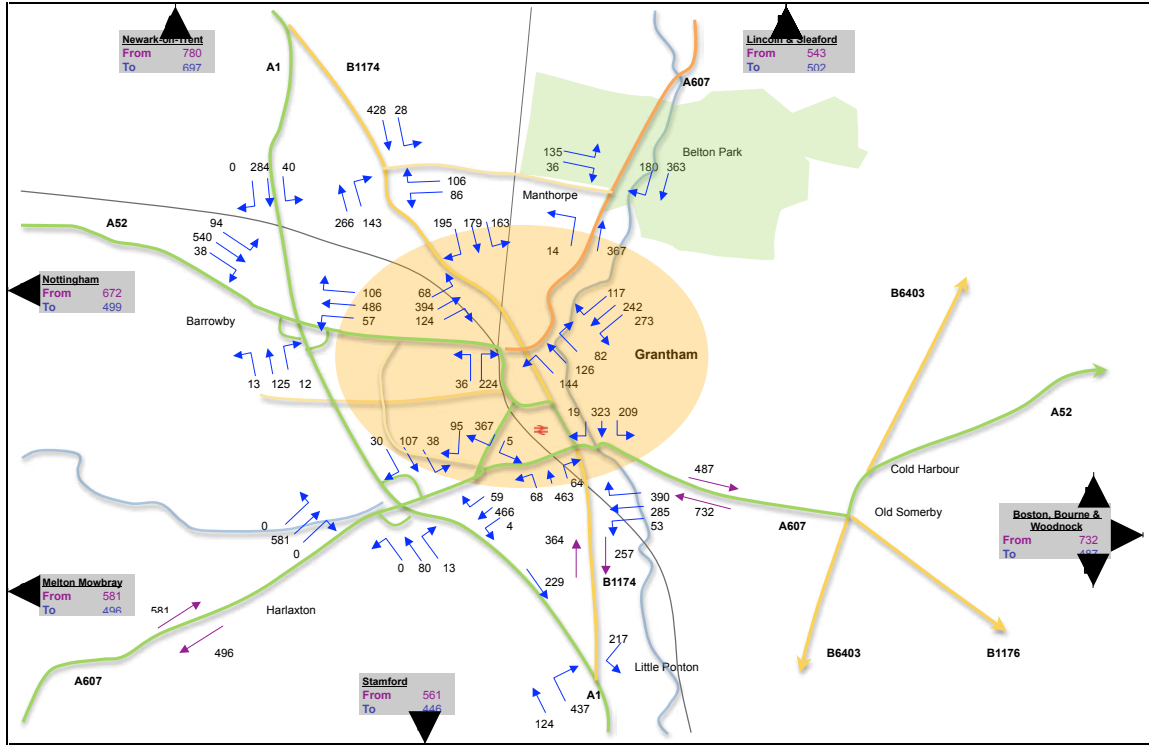
7.4.3 However, given that the link capacity checking has yet to be undertaken, it is uncertain whether the extra capacity provided will have a material impact on the town centre.

7.4.4 The Pennine Way link road is modelled to route a significant proportion of North Quadrant flow north. Most of this flow is likely to have routed via Grantham town centre if no link road had been provided to the B1174, and so can be said to have reduced the impact of the development.

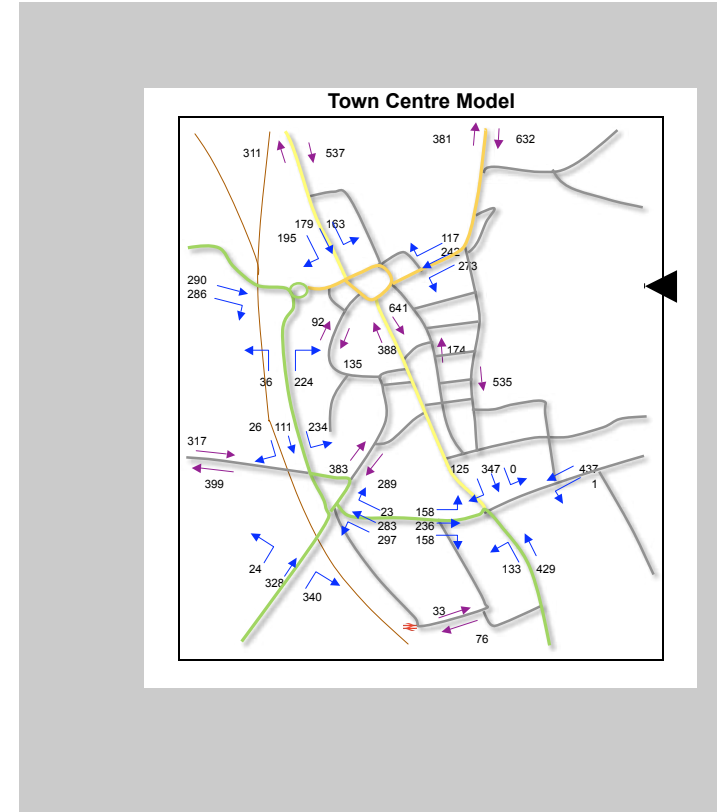
7.4.5 Likewise, there is some flow along the A52 west of North Quadrant which might previously have routed via Grantham town centre; however this is less than 100 trips in all scenarios and is unlikely to have a major impact.

7.4.6 The South Quadrant link road appears more problematic, with some through traffic which is not part of the development site switching between the A1 Great N Road and A52 Somerby Hill via the new access. Traffic seems to favour using the link road over the existing A1 Great N Road / B1174 Spittlegate Level junction, but this may be an issue with the SATURN modelling of the link road.

7.4.7 In the AM peak a significant proportion of traffic heads north, although the flow along Great N Road largely avoids Grantham town centre and routes north along the A1. The northbound Somerby Hill flow reaches the town centre but then disperses, which suggests that there is some commuting to town centre destinations, and therefore that the development still impacts.



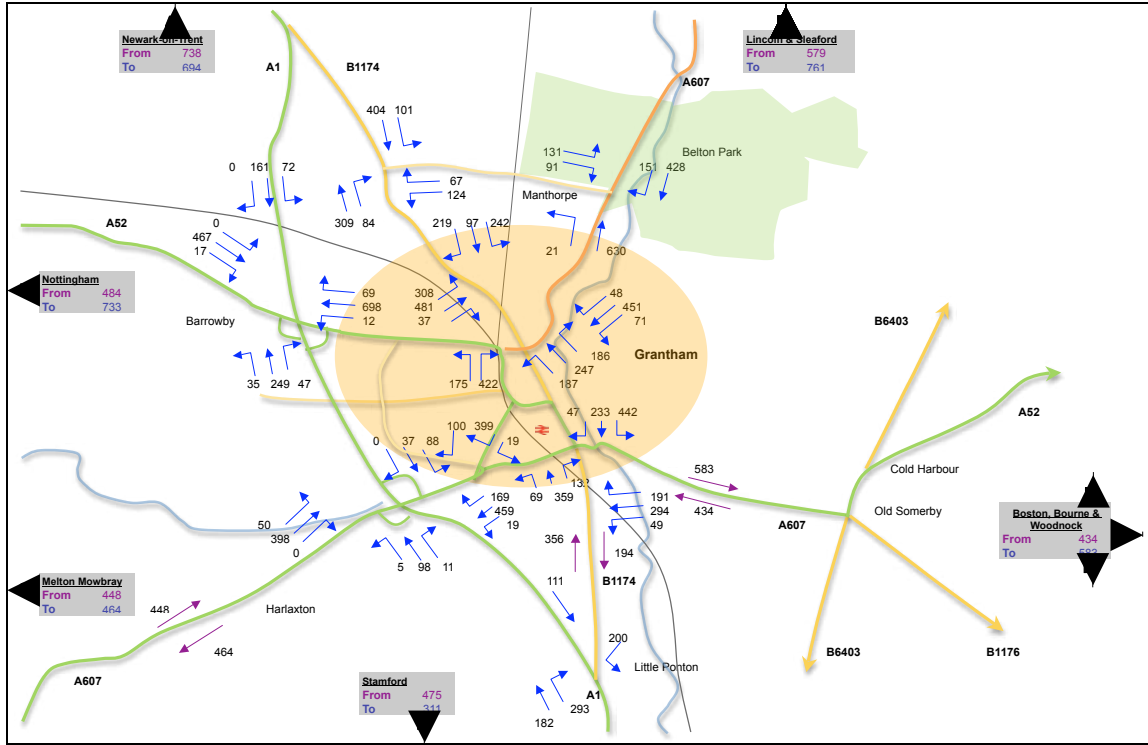
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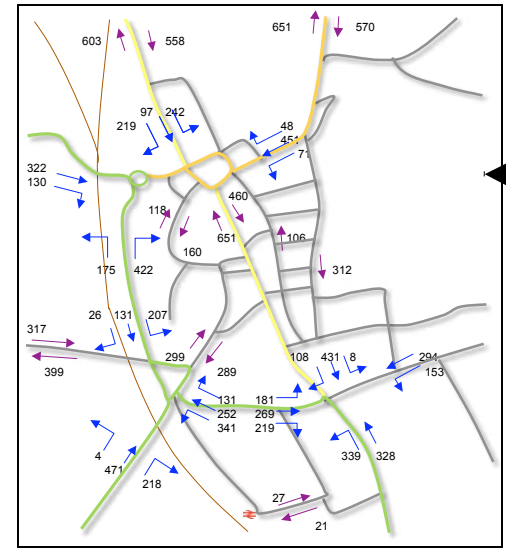
Grantham Spreadsheet Model - Base 2006 PM

Sept 2010

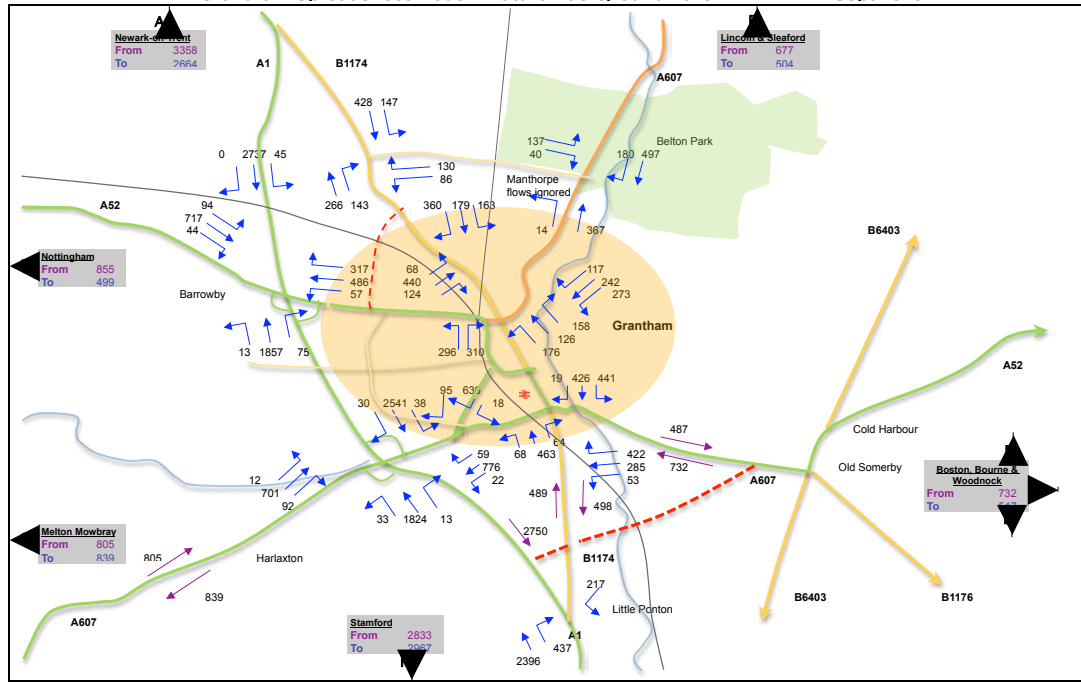


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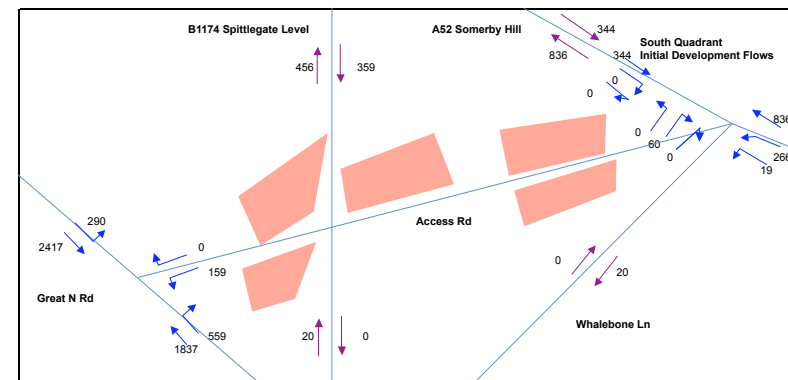
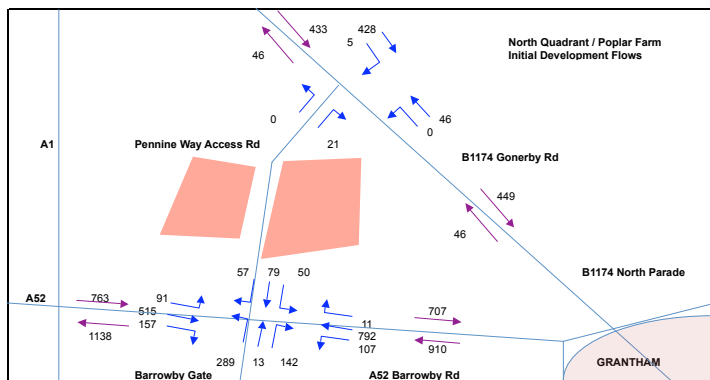
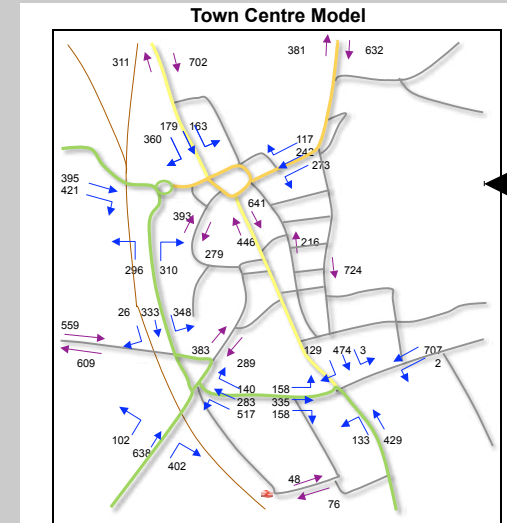
Town Centre Model



Grantham Spreadsheet Model - Future Background 2029 AM Sept 2010



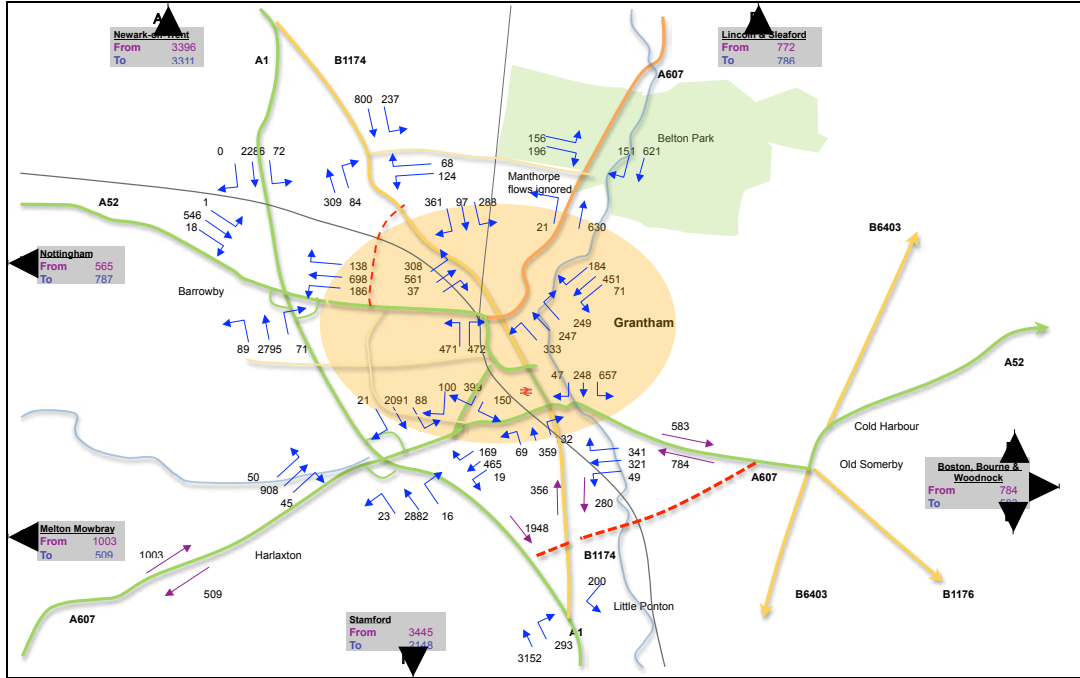
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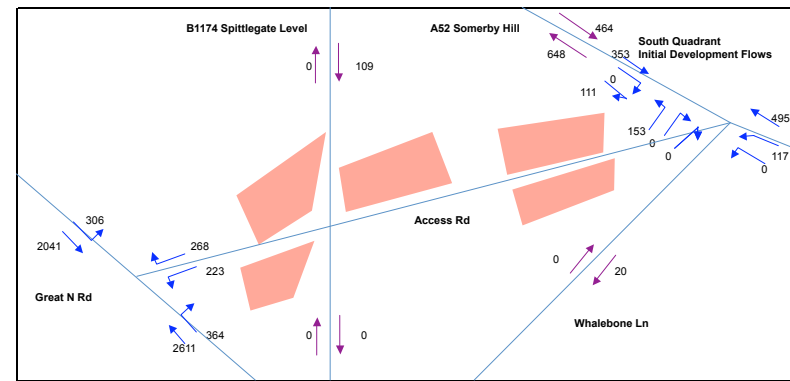
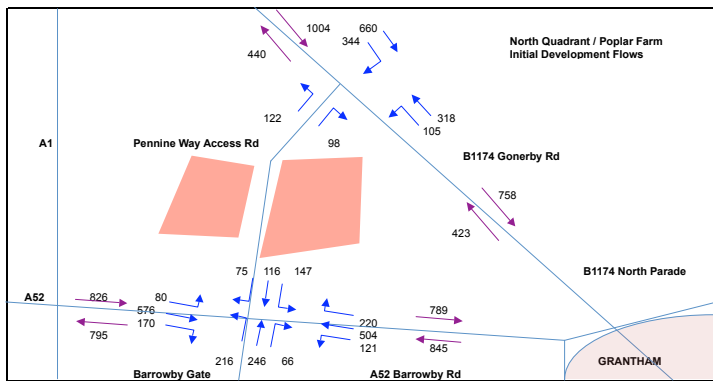
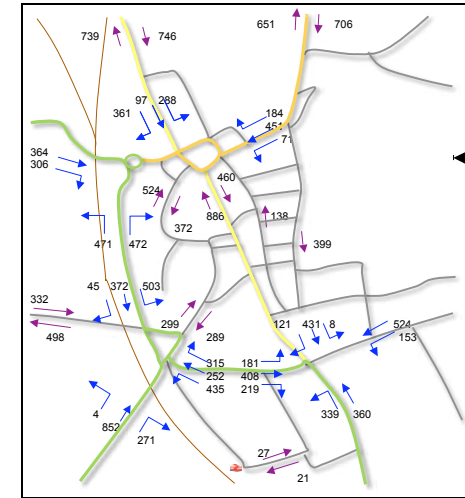
Grantham Spreadsheet Model - Future Background 2029 AM

Sept 2010



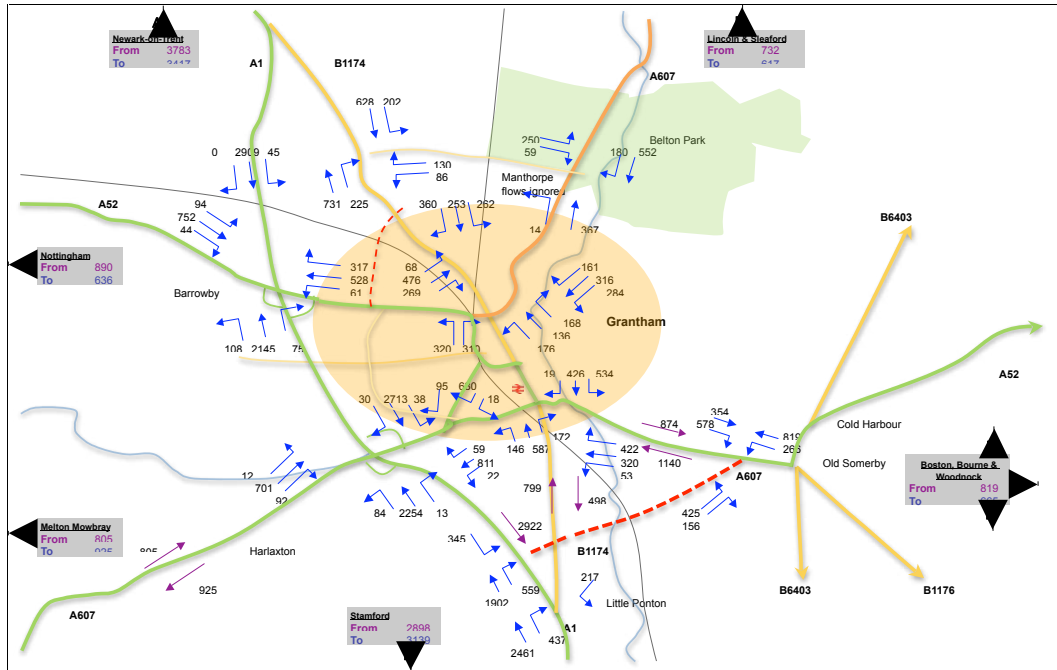
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Town Centre Model



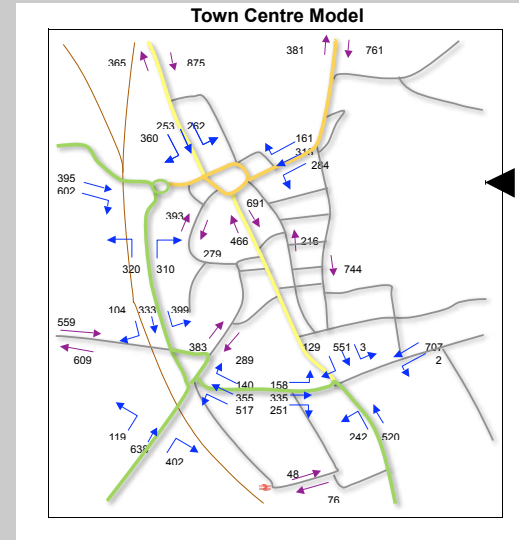


Grantham Spreadsheet Model - Future Background + Development 2029 AM Sept 2010



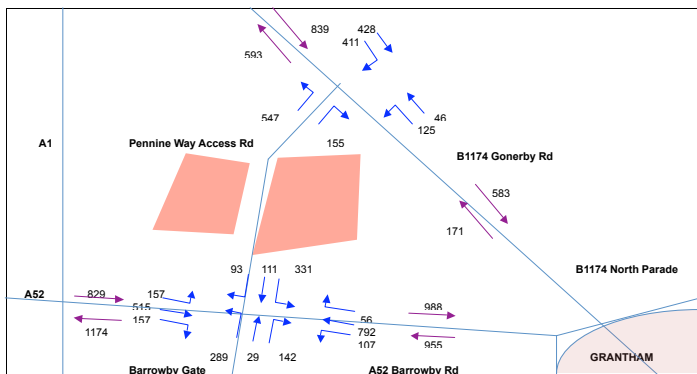
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Town Centre Model



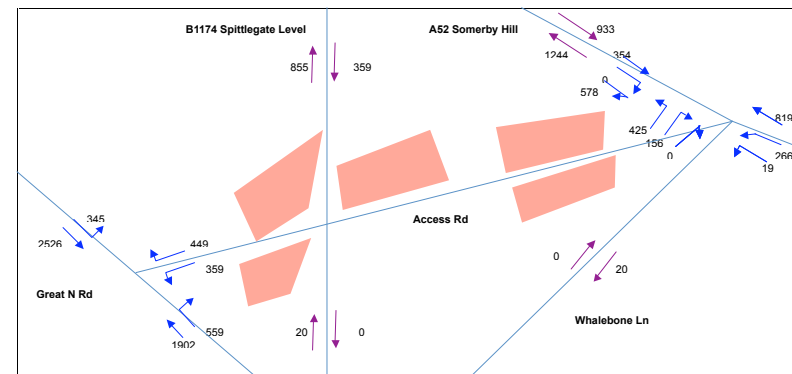
Vehicle Trips in and out of site (inc. background)

North Quadrant / Poplar Farm



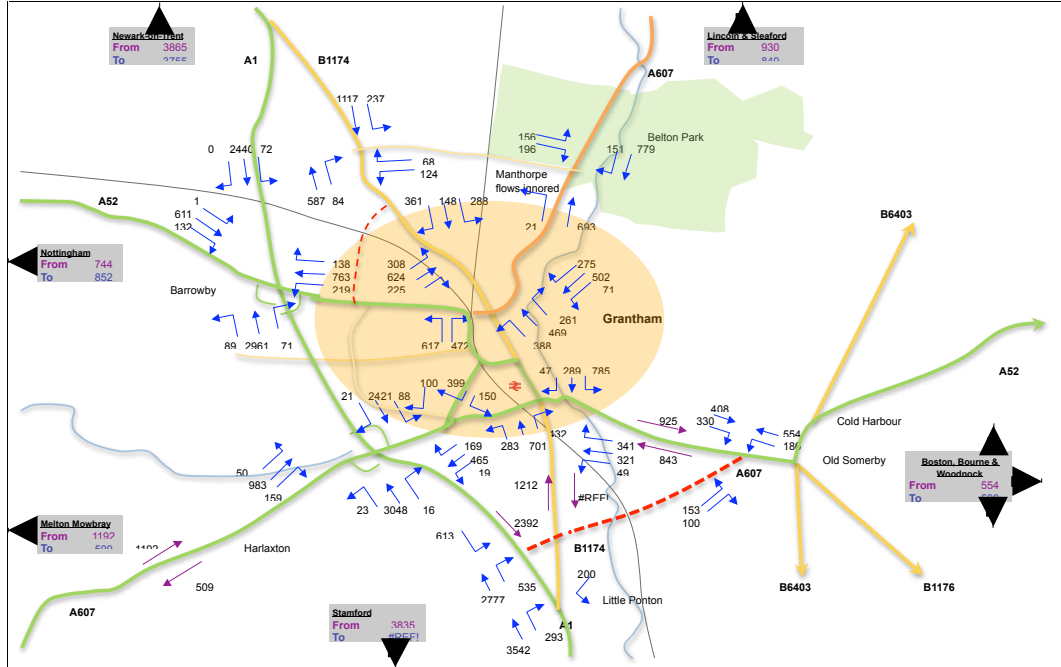
Vehicle Trips in and out of site (inc. background)

South Quadrant



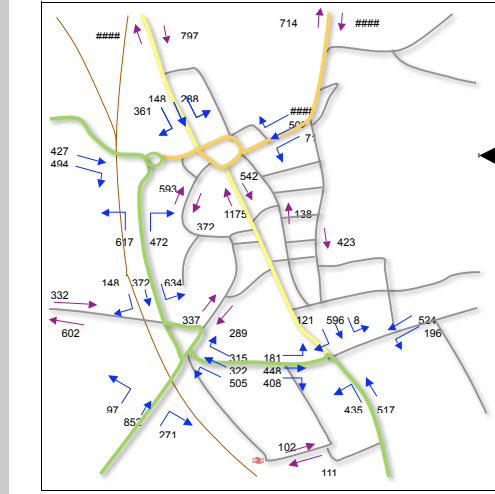


Grantham Spreadsheet Model - Future Background + Development 2029 PM Seat 2010



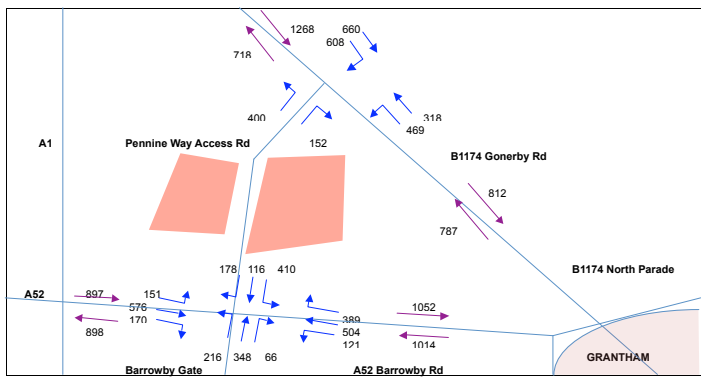
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Town Centre Model



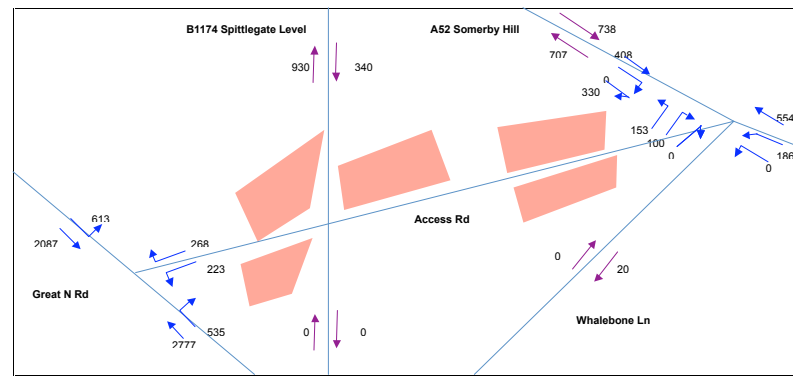
Vehicle trips in and out of site (inc. background)

North Quadrant / Poplar Farm

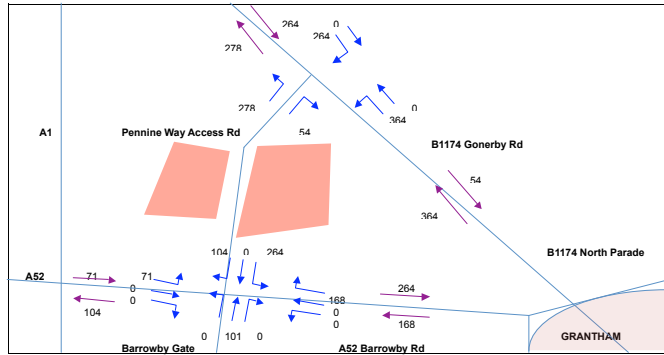


Vehicle trips in and out of site (inc. background)

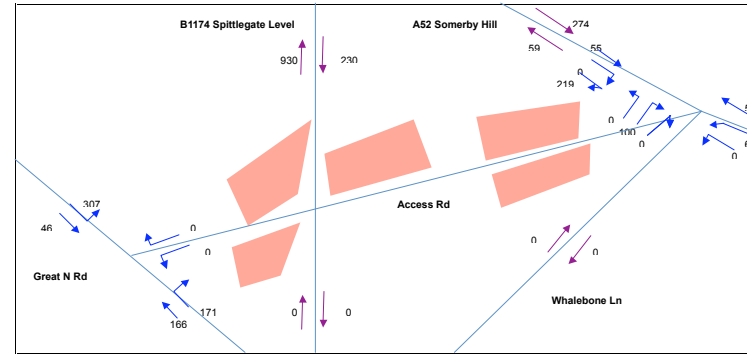
South Quadrant



Vehicle trips in and out of site

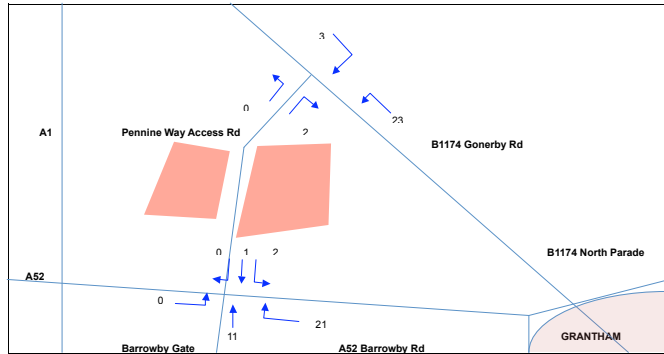


Vehicle trips in and out of site



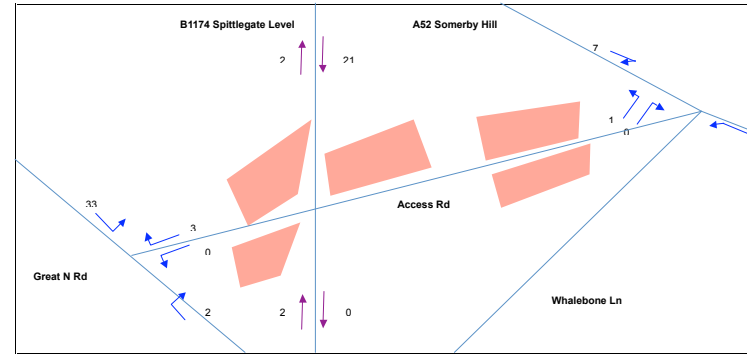
PT Trips in and out of site

North Quadrant / Poplar Farm



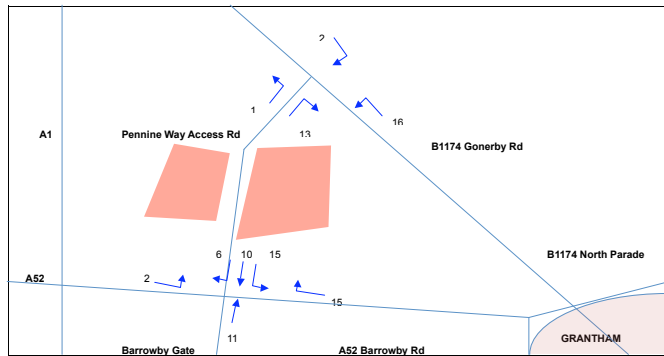
PT Trips in and out of site

South Quadrant



Walk and Cycle Trips in and out of site

North Quadrant / Poplar Farm



Walk and Cycle Trips in and out of site

South Quadrant

