Communities Directorate

Stratford-on-Avon District Council
Local Development Framework
Draft Core Strategy (February 2012)

Warwickshire County Council
Highways Agency

Strategic Transport Assessment
October 2012

Warwickshire County Council

HIGHWAYS AGENCY

Communities Directorate

Project Summary

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1 Executive Summary

1.1 Introduction

1.1.1 This Strategic Transport Assessment (STA) report contains Warwickshire County Council's response on transport matters in relation to the Stratford-on-Avon District Local Development Framework Draft Core Strategy, February 2012.

1.1.2 Warwickshire County Council is the local Highway Authority for Stratford-on-Avon District and the four other Boroughs and Districts within the county. It seeks to ensure the transport network meets the needs of those who live, work in and visit the county and works in partnership with the Highways Agency which is responsible for motorways and trunk roads.

1.1.3 The key objectives of the STA are as follows:-

- To identify the high-level transport and accessibility impacts of proposed broad locations for development;
- To identify the strategic and local transport interventions required to support housing and employment growth in the District;
- To assess the deliverability of these transport interventions in broad terms and inform the preparation of the Infrastructure Delivery Plan.

1.1.4 This Executive Summary outlines the levels of development assumed in the STA, its spatial distribution in terms of broad locations, the methodology used in the assessment process and key findings in relation to the above objectives.

1.2 Background

Levels of Development

1.2.1 The total housing figure assumed in the work undertaken to inform the STA is based on the District Council's Cabinet resolution in September 2011 to provide 8,000 new dwellings during the period 2008-2028.

1.2.2 Approximately 2,800 dwellings were accounted for between April 2008 up to the end of March 2012 by having already been built, being under construction or having planning permission leaving approximately 5,200 dwellings.

1.2.3 The following levels of employment, retail and other development have also been assumed in the STA over the plan period 2008-2028.

- Additional 30.5 hectares (net) employment land;
- 3,842 sqm gross of non-bulky comparison retail;

- 7,982 sqm gross of bulky comparison retail;
- Other significant redevelopment areas in Stratford-upon-Avon (please refer to section 4.2 of this report for details).

Broad Locations for Development

1.2.4 The District Council has provided details on the broad locations for the distribution of housing and employment growth that could take place over the next 16 years up to 2028. However, no specific sites for future development have been identified at this stage.

1.2.5 For the purposes of strategic transport modelling, it has been necessary to make some assumptions regarding which broad locations across the District could come forward to deliver this growth.

1.2.6 The strategic highway and transport implications of accommodating growth in these broad locations has been analysed by creating specific development scenarios as follows:-

- **Scenario 1 -** (Option E – 8,000 dwellings - Wider Dispersal);
- **Scenario 2 -** (Option F – 8,000 dwellings - Wider Dispersal, Preferred Approach).

1.2.7 The broad distribution of development assumed in Scenarios 1 and 2 is outlined in **Table 1.1** below.

Table 1.1 – Proposed Broad Locations for Development

Location Category	Scenario 1 Option E. Wider Dispersal	Scenario 2 Option F. Wider Dispersal Preferred Approach
Stratford-upon-Avon	15% (840)	10% (560)
Main Rural Centres	20% (1,120)	30% (1,680)
Local Service Villages/other rural areas	55% (3,080)	50% (2,800)
Rural brownfield sites	10% (560)	10% (560)
Total	100% (5,600)	100% (5,600)

Source: Draft Core Strategy, February 2012

1.2.8 As noted previously, residential planning permissions and completions between April 2008 up to the end of March 2012 accounted for some 2,800 dwellings so the development totals shown in brackets in the above table are now lower to reflect this.

1.2.9 Further scenarios have also been analysed to provide context and justification for Preferred Approach in Scenario 2 and to provide additional information for the Submission Core Strategy Examination in Public as follows:-

- **Scenario 3** - Option F (7,000 dwellings) + 800 at each of the three large rural brownfield sites near Harbury, Southam and Long Marston;
- **Scenario 4** - Option F (8,000 dwellings) + 5,000 at a new settlement near Gaydon;
- **Scenario 5** - Option F (8,000 dwellings) + 2,500 urban extension in Stratford-upon-Avon including an Eastern Relief Road (ERR) option which includes provision of a third river crossing.

STA Process and Methodology

District-Wide Assessment

1.2.10 The assessment of broad highway impacts associated with the above Scenarios was undertaken by JMP Consultants on behalf of the County Council using the 'CITEware' (**C**ensus **I**nformed **T**ransport **E**valuation Soft**ware**) strategic transport assessment model.

1.2.11 The CITEware model covers the whole District and represents the highway network at an indicative level of detail.

1.2.12 The assessment year adopted in CITEware is 2028 which is the end year of the Core Strategy period. The assessment time periods are the average weekday AM (08:00 – 09:00) and PM (17:00-18:00) peak hours.

1.2.13 The outputs from CITEware were plotted onto maps of the District's highway network and these are included in **Appendix G**.

1.2.14 The maps are colour-coded to illustrate the likely extent of impact on different routes at a strategic level of detail for the following indicators:-

- Increase in two-way link flow (in vehicles);
- Significance of the increase in link flow using the 'GEH' statistic[1].

[1] 'GEH' is used to overcome the problems of assessing the significance of absolute or percentage changes in traffic flow as these vary over a very wide range of values.

1.2.15 The following ranges were used on the link flow plots (included in **Appendix G)** to indicate the increase two-way vehicle flows:-

- 0 - 50 additional two-way vehicle trips (coloured dark green);
- 50 - 100 (light green);
- 100 - 250 (yellow);
- 250 - 500 (orange);
- 500 – 1,000 (red);
- 1,000 and above (purple).

1.2.16 The following ranges were used on 'GEH' plots (also included in **Appendix G**) to indicate the relative significance of the above increase in link flows:-

- GEH = 0 to 5 - zero to slight impact (coloured green);
- GEH = 5 to 7.5 - moderate impact (yellow);
- GEH = 7.5 to 10 - large impact (orange);
- GEH > 10 - very large impact (red).

1.2.17 Two further indicators are included in the CITEware assessment as follows:-

- Absolute and percentage increase in traffic flow (see **Tables 1 and 2 in Appendix I**);
- Impact on the Strategic Road Network (SRN).

Stratford-upon-Avon Detailed Assessment

1.2.18 A more detailed assessment of highway impacts was also undertaken by Ove Arup and Partners Ltd. using the County Council's 'S-Paramics' traffic model which covers routes within and around Stratford-upon-Avon.

1.2.19 The S-Paramics model simulates vehicle movements and interactions on a representation of the local highway network at a much higher level of detail than in CITEware.

1.2.20 The detailed assessment was done in five stages as follows:-

- **Stage 1** – to assess the impact of allocating 'threshold' levels of 'medium' and 'high' growth (i.e. applied incrementally every other year up to 2028) across the entire Stratford-upon-Avon modelled network;
- **Stage 2** – to assess the impact of focussing growth at each of three broad locations in Stratford-upon-Avon (north, east and west) as an alternative to the uniform growth strategy in Stage 1;

- **Stage 3** – to provide further information on the localised impacts the CITEware Scenarios would have within and around Stratford-upon-Avon;
- **Stage 4** – to identify and assess the likely effectiveness of potential mitigation schemes (transport interventions) derived in response to the outcomes from the previous stages above;
- **Stage 5 –** to test the outcome of a specific growth strategy implemented alongside a specific mitigation measure, (CITEware Scenario 5).

1.2.21 For assessment purposes, mean directional speeds on each highway link in the network were output from the S-Paramics model and plotted onto colour-coded maps.

1.2.22 These were used to illustrate differences in the performance of each scenario and are included in **Appendices A – E of the Arup report** which accompanies this STA.

1.2.23 The mean speed bands shown on the Arup plots are defined as follows with red illustrating the lowest speeds (i.e. most congested conditions) and dark green the highest (i.e. least congested conditions):-

- 0 – 5 mph (red);
- 5 – 10 mph (orange);
- 10 – 15 mph (yellow);
- 15 – 20 mph (grey);
- 20 – 25 mph (lime green);
- 25 – 30 mph (green);
- Above 30 mph (dark green).

1.2.24 A report[2] produced by Ove Arup and Partners which includes the methodology and results of the Stratford-upon-Avon detailed assessment accompanies the STA and forms part of the County Council's submission to the District Council.

1.2.25 A summary of the assessment results from the Arup report is included in sections 5.4, 5.5 and 6.2 of this STA report and the headline results are summarised later in this Executive Summary.

[2] 211439-19R0052 - Ove Arup and Partners - Stratford_STA_PARAMICS_modelling_report (October 2012)

Accessibility Assessment

1.2.26 An accessibility analysis was undertaken to assess the ability to reach a range of key destinations and services by public transport from residential locations using 'DirectRoute' software.

1.2.27 Accessibility was assessed in terms of the ability of residents in those locations to use existing public transport services to access the following destinations:-

- Fresh fruit and vegetable retailers (access to healthy food);
- General Practitioners (GP surgeries);
- Hospitals;
- Employment;
- High Schools.

1.2.28 A further "town centre" category was also added which corresponds to accessing Stratford-upon-Avon, Leamington Spa, Warwick, Solihull, Redditch and Banbury; in general terms getting to any public transport stop within the main shopping area of a town, (which generally offer access to financial services, Citizen's Advice, job centres, pharmacies and other facilities).

1.2.29 Accessibility by public transport was assessed for each destination listed above in the time period 07:00 to 09:00 on a Wednesday, with up to one interchange and 400 metres walk permitted at the start, end and during interchange within the journey.

1.2.30 The above accessibility criteria were chosen to give a neutral travel period which would be representative of many journey types including travel to employment, education and access to retail/banking services and GP appointments.

1.3 Assessment Results (District-wide)

Scenarios 1 and 2 (Wider Dispersal)

1.3.1 The CITEware (District-wide) strategic assessment results for Scenarios 1 and 2 are very similar.

1.3.2 The results show that there would be moderate impacts on several key routes in Stratford-upon-Avon as follows:-

- A3400 Shipston Road/A4390 Seven Meadows Road corridor;
- A3400 Birmingham Road corridor;
- A422 Banbury Road corridor;
- M40 Junction 12 on the B4451 north of Gaydon.

1.3.3 The results also show a large impact on A3400 Shipston Road between B4632 Clifford Lane and A3490 Seven Meadows Road/Trinity Way south of the town.

1.3.4 Most the routes referred to above already experience significant capacity problems in peak periods and it is likely that these would be exacerbated under this scenario.

1.3.5 It is likely that the impacts in Stratford-upon-Avon are primarily due to the attraction of the town for residents across the District for a wide variety of trip purposes (e.g. journey to work, retail and leisure opportunities).

1.3.6 The results also show a slight or no material impact on the rest of the District's highway network including the SRN or the Studley AQMA.

Scenario 3 - Option F (7,000 dwellings) + 800 at each of the three large rural brownfield sites near Harbury, Southam and Long Marston

1.3.7 The CITEware results for Scenario 3 show that there would be large impacts on several routes including the following key examples:-

- A425 corridor between Southam and Leamington Spa;
- A3400 Shipston Road/A4390 Seven Meadows Road corridor, in Stratford-upon-Avon;
- C211 Warwick Road in Southam.

1.3.8 There would be very large impacts on the highway network in the vicinity of each rural brownfield site and on key route corridors linking them with main settlements, (e.g. Stratford-upon-Avon, Leamington Spa, Rugby, Coventry).

1.3.9 There would be a particularly significant impact in Bishop's Itchington (approximately 1,000 additional two-way vehicles movements) due to the proximity of the former Harbury Cement works rural brownfield site north-west of the village, (see **Table 1 in Appendix I**).

1.3.10 With the exception of M40 Junction 12, north-east of Gaydon where the results also indicate a significant impact, the results show a moderate, slight or no material impact on the rest of the District's highway network including the SRN or the Studley AQMA.

Scenario 4 - Option F (8,000 dwellings) + 5,000 at a new settlement near Gaydon

1.3.11 The CITEware results for Scenario 4 show that there would be large impacts on several routes including the following key examples:-

- A3400 Shipston Road corridor south of Stratford-upon-Avon;

- A439 Warwick Road corridor, Stratford-upon-Avon;
- A452 Europa Way, Leamington Spa;
- A46 Warwick Bypass.

1.3.12 There would also be very large impacts on several routes e.g.

- M40 between Junction 12 north-east of Gaydon and Junction 15 at Longbridge;
- A452 Banbury Road/Europa Way corridor, Leamington Spa;
- B4100 between Gaydon roundabout and Chesterton Road north of Lighthorne;
- B4451 between Gaydon and Bishop's Itchington.

1.3.13 The results also show a moderate, slight or no material impact on the rest of the District's highway network including the Studley AQMA.

Scenario 5 - Option F (8,000 dwellings) + 2,500 urban extension in Stratford-upon-Avon including an Eastern Relief Road (ERR) option which includes provision of a third river crossing.

1.3.14 The CITEware results for Scenario 5 show that there would be significant localised impacts on the highway network around the ERR in Stratford-upon-Avon.

1.3.15 There would also be a significant impact on the A439 Warwick Road between Marraway Roundabout and A3400 Bridgeway and on other radial routes in the town (e.g. A3400 Shipston Road, A4390 Seven Meadows Road and B4086 Tiddington Road).

1.3.16 The Stratford-upon-Avon detailed assessment results summarised later in this Executive Summary show however that there would be potentially significant network performance benefits in the town with this Scenario.

1.3.17 There are no significant impacts predicted on the SRN or within the Studley AQMA.

1.4 Assessment Results (Stratford-upon-Avon)

1.4.1 Stage 1 of the detailed assessment applied medium and high levels of growth uniformly across the entire modelled area of Stratford-upon-Avon using growth factors for the District from the TEMPRO[3] database.

[3] The TEMPRO program provides projections of growth over time for use in local and regional transport models. It presents projections of growth in planning data and car ownership and resultant growth in trip making under a constant-cost assumption. The data presented is from the Department for Transport's National Trip End Model (NTEM).

1.4.2 An analysis of mean link speeds shows that network capacity constraints become apparent at certain locations within Stratford-upon-Avon as early as 2015.

1.4.3 As more growth is allocated within the model, there is a tendency for these capacity problems to get gradually worse rather than for new issues to arise.

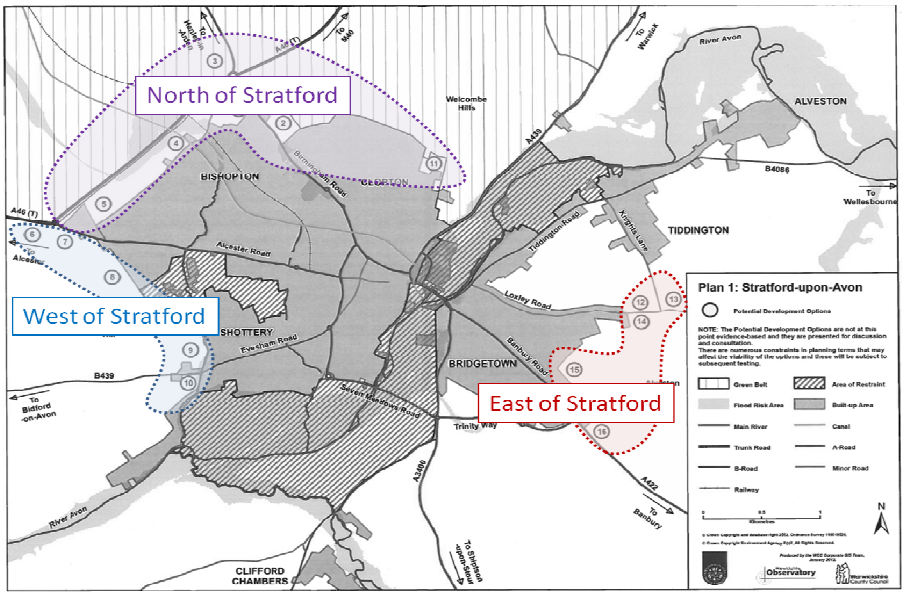
1.4.4 Analysis of the TEMPRO high and medium growth scenarios reveals a number of potential network constraints that are likely to require mitigation to enable future growth to be realised.

1.4.5 The two junctions which appear to consistently constrain growth and experience the most significant levels of congestion irrespective of which growth scenario is applied are as follows:-

- Evesham Place roundabout;
- A422 Banbury Road/A3400 Shipston Road roundabout.

1.4.6 For Stage 2, the results show that without mitigation no particular broad location option in Stratford-upon-Avon (North, East or West shown on **Figure 1.1** below) demonstrates an improvement in network conditions during the 2028 PM peak high growth scenario over and above those experienced in the general 2028 PM peak high growth Scenario in Stage 1.

Figure 1.1 – Stratford-upon-Avon Broad Locations



1.4.7 In summary, the following conditions have been observed:-

- Allocation of growth to the North would have the potential to alleviate some of the conditions on A422 Banbury Road northbound, but would potentially increases congestion on the A422 Alcester Road approach to Wildmoor roundabout.

- Allocation of growth to the East would inevitably exacerbate the congested conditions on A422 Banbury Road northbound, A3400 Bridgeway Gyratory and A4390 Seven Meadows Road.
- Allocation of growth to the West would be most likely to impact upon B439 Evesham Road and A422 Alcester Road, particularly in the AM peak hour due to the increased volume of trips heading towards the town centre.

1.4.8 Stage 3 sought to provide further information on the localised impacts the strategic CITEware scenarios would have in and around Stratford-upon-Avon

1.4.9 The performance of these Scenarios was compared against a 'Reference Case' based on the TEMPRO 2028 general high growth scenario in Stage 1 and the results are summarised below.

Scenario 2 (Wider Dispersal – Preferred Approach)

1.4.10 The CITEware (District-wide) strategic assessment results for Scenarios 1 and 2 were very similar and therefore it was considered that only one of these would require further detailed assessment in S-Paramics.

1.4.11 Scenario 2 was selected for more detailed assessment as it represents the District Council's preferred approach. A summary of the results for this Scenario is provided below.

- Marginally less AM peak congestion than in the 2028 Reference Case;
- Relatively higher impacts at external junctions with trips entering the town from wider District during the AM peak (08:00 – 09:00), i.e.
    - A46 westbound to Bishopton Roundabout;
    - A439 Warwick Road southbound approach to Bridgeway Gyratory;
    - A3400 Shipston Road northbound approach to B4632 Clifford Lane roundabout.
- Relatively poorer performance in the south-east 'quadrant' of the model during the PM peak (17;00 – 18:00), i.e.
    - A3400 Bridgefoot/B4086 Tiddington Road junction at Alveston Manor;
    - A422 Banbury Road/A3400 Shipston Road roundabout.

Scenario 3 - Option F (7,000 dwellings) + 800 at each of the three large rural brownfield sites near Harbury, Southam and Long Marston

1.4.12 The detailed assessment results for this scenario shows a similar level of performance to Scenario 2 (Option F - Wider Dispersal) during the AM and PM peaks.

1.4.13 There are however further reductions in mean link speeds compared to the Reference Case at the A422 Banbury Road northbound approach to the A3400 Shipston Road roundabout.

1.4.14 As with Scenario 2, the network appears unable to accommodate additional trips in PM peak and once again the most significant impacts are in the south-east quadrant of the model.

Scenario 4 - Option F (8,000 dwellings) + 5,000 at a new settlement near Gaydon

1.4.15 The detailed assessment results for Scenario 4 indicate that although there is potential for network conditions in the town centre to improve during the AM peak, the impacts at some outlying junctions are broadly similar to those in the general high growth scenario.

1.4.16 The exceptions to this are the increase in mean link speeds on the A46 westbound approach to Bishopton Roundabout and a minor increase along A422 Banbury Road near Trinity Way with Gaydon-focussed growth.

1.4.17 There are still problems during the PM peak where the network in the south east quadrant of the town cannot accommodate the additional demand.

1.4.18 Trips generated by the Gaydon new settlement option still materialise as departures requiring exit from the town during the PM peak where the network is most heavily constrained.

Scenario 5 - Option F (8,000 dwellings) + 2,500 urban extension in Stratford-upon-Avon including an Eastern Relief Road (ERR) option

1.4.19 The detailed assessment results for Scenario 5 show the following improvements relative to the 2028 high growth Reference Case.

- Marginal improvements in AM peak mean link speeds in the town centre;
- Significant improvements in AM peak mean link speeds on the following routes:-
    - A422 Banbury Road north-westbound approach towards the A3400 Shipston Road roundabout;

- A3400 Shipston Road northbound approach towards the above roundabout;
- A439 Warwick Road southbound approach towards A3400 Bridgeway Gyratory;
- A3400 Bridgeway Gyratory.

- Significant PM peak improvements in south-east quadrant of town but further mitigation required in town centre (e.g. Windsor Street and along Rother Street/Evesham Place corridor).

1.4.20 It should be noted that the benefits referred to above are dependent upon a 'capped' level of growth within the area being realised (i.e. consistent with TEMPRO high growth predictions for 2028) and should be investigated further before any firm conclusions are drawn.

1.4.21 The analysis does however suggest that additional network benefits may be unlocked through the allocation of a large proportion of growth within a specific area, (i.e. on the eastern edge of the town), especially when supported by new infrastructure such as the ERR in close proximity.

1.5 Accessibility Assessment Results

1.5.1 The results show a broadly adequate level of public transport accessibility overall, but a poorer level in some of the villages to the north and west of Stratford-upon-Avon and in outlying areas in the south of the District.

1.5.2 The results suggest that compared to the District average for all types of facility, there is a generally good level of accessibility to Fruit and Vegetable retailers, GPs, employment opportunities and high schools and a relatively lower level to hospitals and town centres reflecting the dispersed pattern of settlements across the District.

1.5.3 The five development scenarios have a generally adequate level of accessibility overall, but Scenarios 1 and 2 (wider dispersal) score relatively poorest compared to the other scenarios.

1.5.4 It should be noted that the accessibility assessment does not cover smaller rural settlements outside the definition of Local Service Villages as these were not included in the CITEware analysis.

1.5.5 Accessibility from these smaller rural settlements is generally very poor as there is little if any conventional public transport available.

1.5.6 Where community transport services are available, it should be noted that these require revenue support which is likely to come under increasing pressure in future. They also rely heavily on dedicated individuals and local support which experience shows is unlikely to be available on a sufficiently reliable basis in all areas of need.

1.5.7 In view of this, from a transport accessibility perspective, it would be inadvisable to promote a wider dispersal policy on the presumption that community minibus schemes would come into existence.

1.6 Transport Interventions

1.6.1 The assessment results show that all five development Scenarios are likely to require transport interventions in Stratford-upon-Avon to mitigate development impacts.

1.6.2 The results also show that further interventions are likely to be required outside Stratford-upon-Avon to mitigate the impacts of Scenarios 3 and 4.

Stratford-upon-Avon Mitigation Testing

1.6.3 The objective of this stage of testing was to establish an overview of the potential performance of the following indicative mitigation strategies:-

- 2028 Reference plus outline Eastern Relief Road (ERR);
- 2028 Reference plus outline Western Relief Road (WRR);
- 2028 Reference plus Town Centre Improvements (TCI).

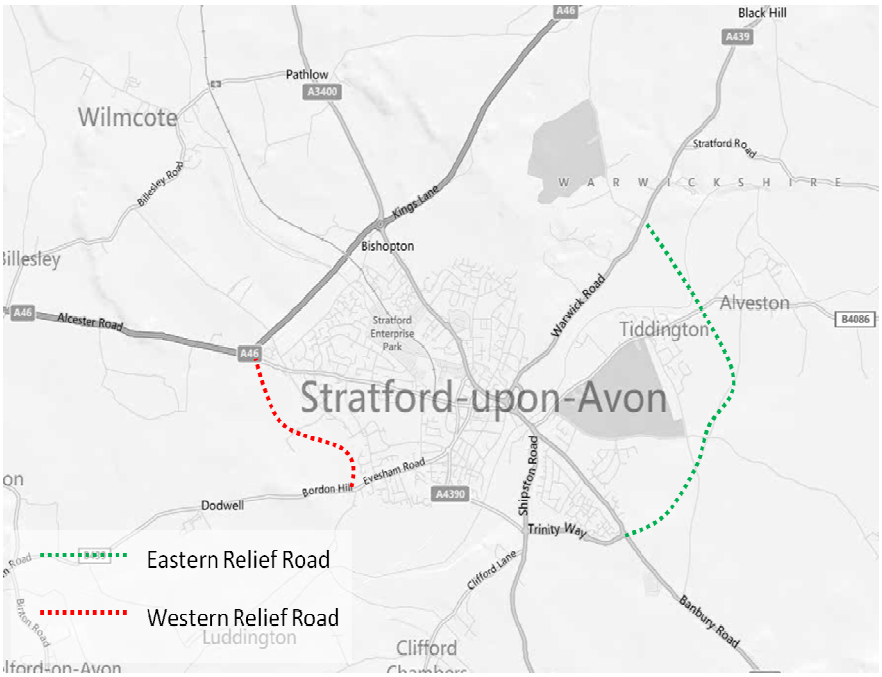
1.6.4 The outcome of these tests has been compared against the 2028 TEMPRO High Growth reference scenario. This represents a 'worst case' growth scenario without a specific focus of development in any one area that could potentially bias the outcome of the testing.

1.6.5 The indicative alignment for the Eastern Relief Road (ERR) including provision of a third river crossing runs east and north from A4390 Trinity Way to the A439 Warwick Road with junctions at Loxley Road and B4086 Tiddington Road, (see **Figure 1.2** overleaf).

1.6.6 The Western Relief Road (WRR) runs between B439 Evesham Road and A422 Alcester Road as also shown on **Figure 1.2** overleaf. It follows the alignment which has been proposed in support of large scale housing development to the west of Shottery.

1.6.7 The scenario containing the 'Town Centre' improvements (TCI) aims to alleviate concerns around those areas identified as being severely impacted upon by future growth within the S-Paramics model.

Figure 1.2 – ERR and WRR Indicative Alignments



1.6.8 The elements included within this scenario which have all been tested as a single package in S-Paramics is as follows:-

- Signalisation/reconfiguration of the B439 Evesham Road/A4390 Evesham Place roundabout;
- Further signalisation of Bridgeway Gyratory;
- Signalisation/reconfiguration of the A422 Banbury Road/A3400 Shipston Road roundabout;
- Signalisation/reconfiguration of the B4086 Tiddington Road/Swan's Nest Lane/A422 Banbury Road junction at Alveston Manor;
- High Street and A3400 Grove Road become northbound only;
- Rother Street becomes southbound only;
- Reconfiguration of the A3400 Birmingham Road/Windsor Street junction.

1.6.9 The rationale behind each element and indicative cost estimates are included in **Appendix J.**

Assessment Results Summary

1.6.10 It has been demonstrated that regardless of where growth occurs or what development scenario is assumed, there would be potentially detrimental impacts on the local highway network within and around Stratford-upon-Avon.

1.6.11 The results show that a Town Centre Improvement (TCI) package in Stratford-upon-Avon and new highway infrastructure in the form of an Eastern Relief Road (ERR) and Western Relief Road (WRR) are likely to provide significant congestion relief in the town.

1.6.12 The greatest benefits are revealed when assessing the performance of the mitigation measures during the PM peak hour as this is the hour when the network is under the greatest level of stress in terms of the number of vehicle demands.

1.6.13 Since all of the tests undertaken thus far demonstrate that the highest levels of stress on the network are to the south east and south of the town, it is reasonable to conclude that implementation of the ERR is likely to unlock the greatest level of benefits.

1.6.14 The TCI option appears to demonstrate the greatest level of improvement of PM peak town centre road network conditions.

1.6.15 The optimum solution is most likely to be the implementation of all three intervention scenarios in one form or another. Whilst this may be very difficult to achieve in practice, it is recommended that at least some elements of the TCI scenario are investigated further due to the potential that these schemes have to complement either the ERR and WRR options should they be brought forward.

1.6.16 An analysis of mean link speeds shows that network capacity constraints become apparent at certain locations within Stratford-upon-Avon as early as 2015.

1.6.17 As more growth is allocated within the model, there is a tendency for these capacity problems to get gradually worse rather than for new issues to arise.

1.6.18 Analysis of the TEMPRO high and medium growth scenarios reveals a number of potential network constraints that are likely to require mitigation to enable future growth to be realised.

1.6.19 The two junctions which appear to consistently constrain growth and experience the most significant levels of congestion irrespective of which growth scenario is applied are as follows:-

- Evesham Place roundabout;
- A422 Banbury Road/A3400 Shipston Road roundabout.

1.6.20 The incremental application of growth suggests that it would be desirable to have all three transport intervention options (ERR, WRR and TCI) in place by 2021 as network performance is poor particularly in the south-east quadrant of the town.

1.6.21 By 2028 at the end of the Core Strategy period, the results suggest that the TCI package would be essential to facilitate growth regardless of where it occurs or what development scenario is assumed.

1.6.22 The ERR would be essential to facilitate growth on the eastern edge of Stratford-upon-Avon and would provide significant additional benefits in the town centre and south-east quadrant of the town.

1.6.23 It is evident from the results that the elements included in the indicative TCI package would still be required alongside the ERR to mitigate conditions in the town centre, particularly on the Windsor Street and Rother Street/Evesham Place corridor during the PM peak period.

Wider District Mitigation Testing

Scenario 3 - Option F. (7,000 dwellings) + 800 at each of three large rural brownfield sites.

1.6.24 The assessment results indicate that various transport interventions are likely to be required to support development at all three large rural brownfield sites as summarised below.

Former Engineer Resources Depot near Long Marston

1.6.25 Improvements are likely to be required at the following locations:-

- A3400 Shipston Road/B4632 Clifford Lane roundabout (south of Stratford-upon-Avon
- B439 Evesham Road/A4390 Evesham Place roundabout (improvements included in TCI package discussed previously);
- A3400 Shipston Road/A422 Banbury Road roundabout (improvements included in TCI package discussed previously).

Former Southam Cement Works south of Long Itchington

1.6.26 Improvements are likely to be required at local junctions (e.g. existing roundabouts on the A423 Southam Bypass) and these would need to be assessed using appropriate junction design software.

1.6.27 There may also be impacts on the M40 Junction 12 and thus appropriate mitigation may be required.

1.6.28 Improvements may also be required on other local routes (e.g. C210 Coventry Street/Coventry Road, Southam, C211 Warwick Road, Southam) subject to further more detailed assessment.

Former Harbury Cement Works north west of Bishops Itchington

1.6.29 Improvements are likely to be required at the existing B4451 priority junction with the B4452 at Deppers Bridge and these would need to be assessed using appropriate junction design software.

1.6.30 Further detailed micro-simulation traffic modelling would be required to identify whether additional improvements would be required at M40 Junction 12 north-east of Gaydon over and above those included in the currently proposed improvement scheme.

1.6.31 There would be very little scope to mitigate significant impacts in Bishop's Itchington (approximately 1,000 additional two-way vehicles movements in the AM and PM) due to physical constraints.

1.6.32 These impacts would create significant congestion and safety problems in the village.

Scenario 4 - Option F (8,000 dwellings) + 5,000 at a new settlement near Gaydon

1.6.33 The County Council has developed proposals for an improvement scheme to address capacity constraints and highway safety issues at M40 Junction 12 associated with existing and committed employment at JLR/AML at Gaydon.

1.6.34 S-Paramics modelling shows that the proposed improvements would provide sufficient highway and junction capacity for up to 2,600 jobs that are included in extant planning permissions and create capacity for a further 2,400 additional new jobs.

1.6.35 It is possible that the scheme could accommodate some additional development traffic generated by a new settlement option near Gaydon as the main impacts associated with JLR/AML occur during the AM pre-peak hour (07:00-08:00).

1.6.36 However, further detailed micro-simulation traffic modelling would be required to identify how much additional development would be feasible in both AM and PM periods at M40 Junctions 12, 13, 14 and 15.

1.6.37 Additional development traffic associated with the new settlement could also potentially reduce the operational life of proposed improvements due to be implemented in 2013 at the Greys Mallory and A452 Europa Way roundabouts and lead to a requirement for more extensive mitigation measures.

1.6.38 Further junction improvements are also likely to be required on other parts of the strategic and local road network as follows:-

- B4100 between Gaydon and Chesterton Road north of Lighthorne;
- B4451 between Gaydon and Bishop's Itchington;

- B4087/B4100 Banbury Road ghost island priority junction south of M40 Junction 13;
- B4087 Newbold Road/B086 Kineton Road priority junction, Wellesbourne;
- A46 Marraway Roundabout;
- A46 Stanks Roundabout.

2 Introduction

2.1 Background

2.1.1 This Strategic Transport Assessment (STA) report contains Warwickshire County Council's response on transport matters in relation to the Stratford-on-Avon District Local Development Framework Draft Core Strategy, February 2012.

2.1.2 Warwickshire County Council is the local Highway Authority for Stratford-on-Avon District and the four other Boroughs and Districts within the county. It seeks to ensure the transport network meets the needs of those who live, work in and visit the county and works in partnership with the Highways Agency which is responsible for motorways and trunk roads.

2.1.3 Stratford-on-Avon District Council has requested that the assessment outlined in this report should identify the strategic transport and accessibility impacts of five alternative development scenarios across the District as a whole using appropriate assessment techniques.

2.1.4 A more detailed assessment has also been undertaken to assess the impact of various growth scenarios on the highway network within and around the town of Stratford-upon-Avon itself.

2.1.5 The County Council has prepared this document to form a key input to the decision making process regarding the levels and distribution of future housing and employment growth within the District over the next 16 years up to 2028. It is recognised however that transport is only one of many important considerations in the planning process.

2.1.6 The approach taken by the County Council in preparing this submission builds on the experience gained from the similar assistance which has been provided to North Warwickshire Borough, Nuneaton and Bedworth Borough, Warwick District and Rugby Borough Councils as part of the preparation of their Core Strategies.

2.1.7 The use of an evidence-based approach such as that contained within this document is also consistent with the expectations of the Planning Inspectorate, who will ultimately determine whether or not the Draft Core Strategy is deemed to be sound.

2.1.8 The document also contains the County Councils formal response on specific local transport issues in the Draft Core Strategy and the Schedule of Infrastructure Projects in **Appendix K.**

2.2 Process and Key Objectives

2.2.1 An iterative, staged approach is being adopted by the County Council in providing its advice to the District Council on the transport implications of its Draft Core Strategy. It is envisaged that further timely input to the process will be made once the preferred option has been submitted and in preparation for the Independent Examination of the plan.

2.2.2 The key objectives of the STA are as follows:-

- To identify the high-level transport and accessibility impacts of proposed broad locations for development;
- To identify the strategic and local transport interventions required to support housing and employment growth in the District;
- To assess the deliverability of these transport interventions in broad terms and inform the preparation of the Infrastructure Delivery Plan.

2.2.3 In parallel with the above process, the County Council, is contributing to the Strategic Housing Land Availability Assessment (SHLAA) by examining the suitability of a number of potential development sites within the area. It is likely that this work will help to:

(i) Identify the key transport infrastructure and services which will be needed to support broad locations for development in the Submission Core Strategy; and

(ii) Inform the position of the County Council and the Highways Agency when planning applications and supporting Transport Assessments (TAs) come forward for development in due course.

2.3 Terminology

2.3.1 A number of terms relating to the planning process and specialist terminology relating to transport planning are used throughout the document. Definitions of these terms are included in **Appendix A.**

3 Portrait of the District

3.1 The District in its Wider Spatial Context

3.1.1 Stratford-on-Avon District is a large, predominantly rural area in south Warwickshire which comprises approximately 250 towns and villages spread over 977 square kilometres, and is one of the largest Districts in England.

3.1.2 The District borders Northamptonshire, Oxfordshire, Gloucestershire and Worcestershire as well as the Metropolitan Borough of Solihull and two other Warwickshire administrative areas, namely Warwick District and Rugby Borough.

3.1.3 As noted in the Draft Core Strategy (February 2012), many neighbouring authorities, for example Northamptonshire and Oxfordshire, have similar issues to Stratford-on-Avon District in terms of tourism pressures and sparse distribution of rural settlements.

3.1.4 The resident population of Stratford-on-Avon District in 2008 was 118,000, with 26,150 living in Stratford-upon-Avon itself (Source: ONS/Warwickshire Observatory).

3.1.5 The resident population has increased by around 5,800 in the period 2003-2008, representing a growth of just over 5%. This is the second largest percentage growth in the County after Warwick District.

3.1.6 The District has the highest proportion of those of retirement age in the County, and the lowest proportion of people of working age. It is also heavily under-represented in the 15-19 and 35-39 age groups, and over-represented in all age groups over 50.

3.1.7 Demographic predictions for the year 2031 suggest that the population of the District will rise to 145,600, representing an increase of 25.4%. The largest growth will be in the older population (65 years or older), which is predicted to increase by 42,000 (90.7%).

3.1.8 Considering the District has the largest proportion of those over retirement age already, this increase will have serious implications for transport provision and other forms of service delivery in the future (Source: ONS/Warwickshire Observatory).

3.1.9 Around 64,300 people are currently considered to be economically active in the District (Source: ONS/Warwickshire Observatory). Applying proportions from the 2001 Census to this figure suggests that approximately 38,580 people live and work within the District, whilst 25,720 live within the District but work elsewhere.

3.1.10 Culture and tourism play a significant role in the employment of the District. Stratford-upon-Avon is world-renowned as the birthplace of William Shakespeare and around 5.5 million tourists visit the District every year (some 3 million to Stratford-upon-Avon itself). Over 17% of jobs in the local economy depend upon their presence (Source: ONS/Warwickshire Observatory).

3.2 Transport Context

Transport Policy

3.2.1 At a national level, transport policy is underpinned by five national transport goals which were set by the previous Government for the development of the UK's future transport policy and infrastructure. These national goals and associated challenges were identified in the Department for Transport's publication 'Delivering a Sustainable Transport System' (DaSTS) in 2008. The five goals are outlined below.

- To reduce transport's emissions of carbon dioxide and other greenhouse gases, with the desired outcome of **tackling climate change**.
- To **support economic competitiveness and growth**, by delivering reliable and efficient transport networks.
- To **promote greater equality of opportunity** for all citizens, with the desired outcome of achieving a fairer society.
- To **contribute to better safety, security and health** and longer life expectancy by reducing the risk of death, injury or illness arising from transport, and by promoting travel modes that are beneficial to health.
- To **improve quality of life** for transport users and non-transport users, and to **promote a healthy natural environment**.

3.2.2 The Local Transport White Paper, 'Creating Growth, Cutting Carbon: Making Sustainable Local Transport Happen' (January 2011) reiterates the Government's vision for a sustainable local transport system that supports the economy and reduces carbon emissions. It explains how the Government is placing localism at the heart of the transport agenda, taking measures to empower local authorities when it comes to tackling these issues in their areas. The White Paper also underlines the Government's direct support to local authorities, including through the Local Sustainable Transport Fund.

3.2.3 The wide ranging nature of the goals contained in both DaSTS and the Local Transport White Paper reflect the important contribution that transport can make in both supporting and acting as a stimulus to achieving a range of objectives, including supporting future growth proposals.

Warwickshire Local Transport Plan 2011-2026

3.2.4 The Warwickshire Local Transport Plan (LTP3) sets out the County Council's proposals to improve transport and accessibility between 2011 and 2026. The Plan, which was submitted to the Department for Transport in March 2011, provides a 15-year strategy for transport up to the year 2026, with a rolling short term Implementation Plan.

3.2.5 The previous Warwickshire Local Transport Plan (2006-11) identified five overarching objectives for transport in the County. These have been reviewed to ensure that they remain relevant within the current policy context for transport. The revised objectives are as follows:-

1. To promote greater equality of opportunity for all citizens in order to promote a fairer, more inclusive society;

2. To seek reliable and efficient transport networks which will help promote full employment and a strong, sustainable local and sub-regional economy;

3. To reduce the impact of transport on people and the (built and natural) environment and improve the journey experience of transport users;

4. To improve the safety, security and health of people by reducing the risk of death, injury or illness arising from transport, and by promoting travel modes that are beneficial to health;

5. To encourage integration of transport, both in terms of policy planning and the physical interchange of modes; and

6. To reduce transport's emissions of carbon dioxide and other greenhouse gases, and address the need to adapt to climate change.

3.2.6 Objective 6 above has been added to support the Government's commitment to tackling climate change as set out in the Climate Change Act 2008, the National Transport Goals and the Local Transport White Paper.

3.2.7 An Air Quality Management Area (AQMA) was declared on the A435 in Studley in 2006 for exceedances of the NO_2 annual mean objective. Following declaration, the County Council assisted the District Council in preparing a draft Air Quality Action Plan (AQAP).

3.2.8 As part of the ongoing Review and Assessment process, monitoring confirmed that a number of locations in Henley-in-Arden and Stratford-upon-Avon were unlikely to meet the annual mean air quality objective for Nitrogen Dioxide.

3.2.9 The geographical extent of the AQMAs for Stratford-upon-Avon and Henley-in-Arden were the subject of detailed public consultations in 2009, following which it was decided to declare the whole of Stratford town and just the affected junction and surrounding area in Henley.

3.2.10 The Stratford AQMA came into effect in January 2010, whilst the one for Henley may be formally declared in future.

Existing Travel Patterns

Overview

3.2.11 Almost half of the 53,678 households in Stratford-on-Avon District have two or more cars, which is among the highest levels in the UK. However, over 6,400 households do not have access to a car and are reliant on other forms of transport. The predominantly rural nature of the District makes it difficult to serve by public transport as there are a large number of small settlements which are widely dispersed.

3.2.12 There is a considerable imbalance between the number of jobs in the District and its working population. Since 1981, an increasing number of residents commute to higher paid employment outside the District, while lower paid jobs are often filled by people coming into the District from adjoining areas. These commuting patterns impose significant pressures on the transport system.

The Highway Network

3.2.13 The highway network within or near the District includes a number of important motorway and trunk roads on the Strategic Road Network (SRN) which carry large volumes of local and longer distance traffic, these being:-

- M40 between London and the West Midlands;
- M42, which forms part of the motorway box around Birmingham and links to the M40, M5, M6 and M6 Toll;
- A46, which links the M1/M69 with the M40 and the M5.

3.2.14 There are a limited number of routes which link the main towns, provide access to the motorway and trunk road network described above or pass through the District, these being:-

- A3400 between the M42 at Solihull and Chipping Norton via Henley-in-Arden, Stratford-upon-Avon and Shipston-on Stour;

- A422 between Stratford-upon-Avon and Banbury, and Alcester and Worcester;
- A429 linking Warwick with Wellesbourne, Moreton-in-Marsh, Stow-on-the-Wold and Cirencester;
- A435 between the M42 Junction 3 and the A435 / A46 Oversley Roundabout near Alcester.

3.2.15 There are currently no County Council proposals for major road schemes or junction improvements in the area.

3.2.16 However, the Stratford Western Relief Road (WRR) is a proposed developer-funded scheme which would be provided as part of a large-scale residential development on land to the west of Shottery, on the western periphery of Stratford-upon-Avon, if that is granted planning permission on appeal.

3.2.17 The WRR would provide a link between the A46/A422 Wildmoor roundabout west of the town with the B439 Evesham Road to the south west.

3.2.18 The proposed scheme would allow an access to be provided into a possible new coach and car park for Anne Hathaway's Cottage, one of the world-renowned sites associated with William Shakespeare, thus potentially reducing the incidence of visitor traffic intrusion in Shottery.

3.2.19 The TA for the proposed development showed that the WRR would be necessary to serve it and would also provide traffic relief in Shottery and the town centre.

3.2.20 Following refusal of planning permission by the District Council in September 2011, the application has been considered by the Planning Inspectorate following an appeal by the developer earlier this year. The outcome of this appeal is expected in due course.

3.2.21 Civil Parking Enforcement (CPE), formerly known as Decriminalised Parking Enforcement (DPE), took effect within the District in October 2004. Its objectives were as follows:-

- Improved traffic flow whereby the increased availability of on-street parking spaces reduces congestion caused by drivers circulating to find a space;
- Improved road safety and network capacity through better enforcement of illegal parking on yellow lines, at road junctions and on narrow streets;
- Improved accessibility for public transport;
- Improved accessibility for people with disabilities who rely on the use of the car, through better parking enforcement; and

- Less parking on footways, making it easier for pedestrians and wheelchair users to use them.

3.2.22 In Stratford-upon-Avon, a number of initiatives have been introduced to complement CPE including bus-based Park and Ride services and active car park management signs as part of the Urban Traffic management and Control System (UTMC) project.

3.2.23 Between 2000 and 2009, survey data from Automatic Traffic Count (ATC) sites on an outer cordon of the town showed that traffic in Stratford-upon-Avon increased by 4.6%. There was, however, a noticeable drop in traffic levels in the town during 2008 which is likely to be attributable to the general economic downturn.

3.2.24 Within the District, 70.4% of people use the car for their journey to work (Source: Census 2001). The respective figure for the journey to school is 33% (Source: WCC School Travel Survey 2010).

Public Transport

3.2.25 The District is served by a number of inter-urban bus services which provide connections between Stratford-upon-Avon and other main market towns, as shown on the current Warwickshire Public Transport Map (April 2012) in **Appendix B.**

3.2.26 Less frequent services connect the main villages and smaller settlements with the urban and local centres. Bus provision is however relatively sparse in the north-western and southern parts of the District.

3.2.27 Community transport has an important role in 'filling the gaps' in the public transport network. These gaps exist where, for example, bus routes are commercially unattractive to operators, or where settlements are dispersed or hard to reach without adequate links to the network.

3.2.28 The community transport sector also provides specialist services for a range of users who find it difficult or impossible to access destinations using conventional public transport.

3.2.29 There are a number of community transport schemes currently operating in the District. These include Community Links, The Shipston Link Community Bus, Southam Links, the Volunteer Community Car Scheme and Back & 4th Transport.

3.2.30 Funding for Community Links is due to come to an end after April 2013. In view of this, the Community Transport Working Group has commissioned a review into public transport provision in the District to examine the feasibility of providing a demand responsive transport service that meets the basic needs of residents in the future.

3.2.31 An analysis of transport services operating in the District indicates that:-

- 12 bus services are operated on a commercial basis;
- 11 are Community Bus Services;
- 6 bus services are partially subsidised by Warwickshire County Council (these are services that in part operate on a commercial basis);
- 26 bus services are fully subsidised by Warwickshire County Council, (including 'Flexibus' services which can accommodate passengers with mobility issues residing off main public transport routes);
- 1 bus service is a Worcestershire contracted service (outside Warwickshire control).

3.2.32 The London Midland Franchise operates rail services on the 'Shakespeare Line' which runs between Stratford-upon-Avon, Henley-in-Arden and Birmingham. There are two trains per hour to Birmingham during weekday peak periods and one train per hour to Birmingham during the off-peak period.

3.2.33 Stratford Parkway station which is due to open in 2013 will contribute to the business case or increasing the frequency of off-peak rail services between Stratford-upon-Avon and Birmingham.

3.2.34 The Chiltern Railways Franchise operates the London Marylebone to Stratford-upon-Avon rail service which calls additionally at Claverdon, Bearley and Wilmcote. The December 2012 timetable shows primarily through services between Stratford-upon-Avon and London with the occasional shuttle service to Leamington Spa with one train every 2-3 hours.

3.2.35 The Great Western Franchise provides rail services on the 'Cotswold Line' between Worcester and London Paddington. These are used by residents in the far south of the District who railhead at Evesham, Honeybourne or Moreton-in-Marsh.

3.2.36 The County Council provides financial support for a bus-based Park and Ride service which operates on a 10-15 minute frequency between its site at Bishopton north west of the town and Stratford-upon-Avon town centre.

3.2.37 A second Park and Ride service which is developer-funded has recently been introduced and operates at a half-hourly frequency between the town centre and the new Rosebird Centre development south of the town.

3.2.38 School travel survey data for Warwickshire shows that 27.5% of journeys to school in the District are made by public transport (Source: WCC School Travel Survey 2010). The journey to work by public transport (bus and rail) accounts for 3% of the modal share (Source: 2001 Census).

3.2.39 The Government's preferred route for HS2 between London and Birmingham passes to the north of Wormleighton in the District before crossing the Oxford Canal. It then passes very close to the village of Ladbroke, before skirting to the west of Southam. A tunnel will be provided under Ufton Wood, followed shortly after by a new bridge over the Grand Union Canal.

Walking and Cycling

3.2.40 The cycle network within the District has been incrementally expanded and improved over the last 10-15 years through investment by the County Council (using LTP funding), Sustrans (as part of the development of the National Cycle Network), and developers.

3.2.41 Key National Cycle Network (NCN) routes include the following:-

- Route 5 - between Banbury and Redditch via Long Marston and Stratford-upon-Avon on the Stratford Greenway;
- Route 41 - between Rugby and Stratford-upon-Avon via Offchurch, Warwick, Charlcote and Loxley;
- Route 48 - between Shipston on Stour and Long Itchington.

3.2.42 Three new cycle routes have been developed by the District Council to encourage leisure and recreational cycling in the area linking historic towns and villages with places of interest, which typically make use of quieter lanes and roads. The three routes are:

- Cotswold and Feldon Cycle Route;
- Shipston-on-Stour to Moreton-in-Marsh Route;
- Shipston-on-Stour to Southam Route.

3.2.43 Within Stratford-upon-Avon, there are a number of on-road cycle lanes, off-road cycle tracks or shared use foot/cycleways and recommended cycle routes.

3.2.44 The combined foot/cycleway along Birmingham Road in Stratford-upon-Avon is due to be extended to provide a connection between the town centre and Stratford Parkway as part of a proposed residential development off Bishopton Lane which has recently been granted planning permission.

3.2.45 The District Council has promoted a cycle route connecting the Arden Forest Industrial Estate with Birmingham Road in Alcester.

3.2.46 Within Stratford-upon-Avon itself, there have been a number of initiatives to improve the local walking environment including the Waterside and Southern Lane Enhancement Scheme which has complemented the redevelopment of the Royal Shakespeare Theatre.

3.2.47 Local footway improvements have also been made in all the District's market towns comprising dropped kerb provision and the upgrading of pedestrian crossing facilities, (including measures to help those with sensory difficulties).

3.2.48 The mode share for journeys to work made on foot and by bike in the District is 9.4% and 2.6% respectively (Source: 2001 Census). For the journey to school, 37% of pupils walk whilst 1.5% cycle (Source: WCC School Travel Survey 2010).

Performance of the Local Transport Network

The Highway Network

3.2.49 In Stratford-upon-Avon itself, most trip attractors such as schools, shops and employment are located north of the river. These generate a significant demand for movement from residential areas south of the river and the rural areas to the south of the town.

3.2.50 The location of these trip attractors also generates a significant demand for cross-town movements north of the river, most of which have to pass through the congested town centre.

3.2.51 The above factors mean that a number of routes and junctions in Stratford-upon-Avon experience significant traffic congestion during commuter and shopping peak periods, tourist/visitor peaks and major special events such as those held at the Long Marston airfield six miles south of the town. These are due to capacity constraints at the following locations:-

- The A3400 Birmingham Road/Guild Street corridor;
- The southern approaches to the A3400 Shipston Road / A4390 Trinity Way/A4390 Seven Meadows Road roundabout;
- The approaches to the A422 Banbury Road/A3400 Shipston Road roundabout;
- The approaches to the A422 Alcester Road/A4390 Grove Road / A4390 Arden Street/C76 Greenhill Street traffic signals;
- The B4086 Tiddington Road approach to Alveston Manor junction;
- The approach to Bridgefoot from A3400 Clopton Bridge;
- On Bridgeway Gyratory, where northbound traffic merges with southbound traffic from A439 Warwick Road; and
- On the approaches to the Evesham Place Roundabout.

3.2.52 A consultant's study which is due to report later in 2012 is investigating possible measures for tackling congestion on the A3400 Birmingham Road/Guild Street corridor referred to above on behalf of the County Council, whilst considering the access and safety requirements of all road users.

3.2.53 The A435 route was formerly part of the trunk road network, and carries a high level of HGV movements between the M42 (Junction 3), the A46 at Alcester and the M5 (Junction 9) at Ashchurch near Tewkesbury.

3.2.54 The section of the A435 between the A46 at Alcester and the A4023 Coventry Highway at Gorcott Hill is a poorly aligned single carriageway which carries approximately 20,000 vehicles per day.

3.2.55 This creates a number of safety and environmental problems, especially in Studley, Coughton, King's Coughton and Mappleborough Green which the route passes through. The formerly proposed Studley bypass scheme was withdrawn from the Highways Agency's programme some time ago, and the previously made Orders revoked effectively terminating the proposal.

3.2.56 The section of the A46 between Stratford-upon-Avon and the Alcester southern bypass requires major improvements to support the role of the corridor in providing a strategic alternative to traffic between the M1 and M5 using the A42/M42. The County Council will continue to promote the need for such improvements which it considers would have congestion and safety benefits.

3.2.57 Since mid-2011, the County Council has been working in partnership with Warwickshire Police and the Highways Agency to develop a possible scheme for addressing congestion and queuing issues on the hard shoulder at M40 Junction 14 south of Leamington Spa and M40 Junction 12 north-east of Gaydon. Serious safety concerns have been raised by Warwickshire Police and road users in relation to both junctions. A scheme to improve conditions at M40 Junction 14 is due to be implemented by the County Council in 2013/14.

3.2.58 M40 Junction 12 is located to the north-east of Gaydon village in Stratford-on-Avon District. Just north of Gaydon are the large Jaguar Land Rover (JLR) and Aston Martin Lagonda (AML) employment sites which are both of sub-regional and national importance.

3.2.59 Travel data supplied by JLR and AML shows that approximately 80% of their employees originate from north of the sites and access them either via M40 Junction 12 north-east of Gaydon or the parallel B4100 route.

3.2.60 The volume and distribution of commuters accessing the site during the AM peak (07:00 – 08:00) is placing significant pressure on the existing road network which is now running significantly over capacity.

Public Transport

3.2.61 The principal constraint to bus operations within the District relates to the dispersed nature of settlements which makes them difficult to serve by public transport.

3.2.62 The ability for community transport schemes to 'fill the gaps' in public transport provision is dependent on the availability of financial support from the County Council and other organisations which is extremely limited. The participation of dedicated local volunteers is also required to operate many of these services.

3.2.63 The County Council is currently progressing the delivery of Stratford Parkway Rail Station which is due to open in 2013. Construction of the station began in October 2012. The station is located adjacent to the existing bus-based Stratford P&R in Bishopton and the two facilities will share the existing car park.

3.2.64 Stratford Parkway is one of several initiatives that form part of the Shakespeare Rail Line Upgrade. It will contribute to the business case for increasing the frequency of rail services between Stratford-upon-Avon and Birmingham.

3.2.65 Reopening of the Stratford-upon-Avon to Long Marston route as a six mile single line link between the Cotswolds and West Midlands rail network is an aspiration of a number of local support groups.

3.2.66 As noted in the LTP, the County Council will consider supporting a proposal for reopening the line if it is promoted by DfT, the rail industry or a third party provided the local benefits outweigh any local environmental disbenefits.

3.2.67 A strategic park and ride facility in the vicinity of M42 Junction 3 is proposed in the Centro Integrated Public Transport Prospectus. A specific location has not been identified at this stage as the scheme is currently regarded as a long term proposal.

Walking and Cycling

3.2.68 The two main pedestrian and cycle routes across the River Avon in Stratford-upon-Avon are of poor quality and become significantly overcrowded particularly during summer weekends when tourist and visitor numbers are usually significant.

3.2.69 Clopton Bridge is a Scheduled Ancient Monument which carries a significant volume of traffic including a large number of HGVs. It has a single narrow cantilevered footway for pedestrians and is not suitable as an on-road cycle route.

3.2.70 The Tramway Bridge between Swan's Nest Lane and Bridgefoot is a narrow pedestrian bridge on which cycling is prohibited.

3.2.71 Lucy's Mill Footbridge lies 600m downstream from the Tramway Bridge which is located on the north-eastern edge of the town centre. The steps at each end of the bridge do not allow access for cyclists, wheelchair users or pushchairs.

3.2.72 Although there are footways provided along Seven Meadows Road Bridge, which lies immediately to the south of Lucy's Mill Footbridge, they are narrow and stop on either side of the bridge itself.

3.2.73 The lack of a cycle-friendly crossing over the river is a significant barrier to cycling in Stratford-upon-Avon, particularly for those living to the east of the river.

3.3 Strengths, Weaknesses, Opportunities and Threats

3.3.1 A summary of the strengths, weaknesses, opportunities and threats pertaining to the District's transport network is set out in **Table 3.1** overleaf.

Strengths	Weaknesses
• Stratford Parkway (currently under construction) will contribute to the business case for increasing the frequency of rail services between Stratford-upon-Avon town and Birmingham and help to reduce car dependency within the area. • There is a 'broadly adequate'[4] level of public transport accessibility overall within the District (although there is a poorer level in some of the villages to the north and west of Stratford-upon-Avon and in outlying areas in the south of the District). • The Shipston Link is a well-established exemplar of community minibus operation in rural South Warwickshire.	• Capacity constraints at a number of locations on the local highway network in Stratford-upon-Avon limits scope for further expansion without appropriate mitigation. • Limited scope for public transport to serve dispersed patterns of small-scale development across the District. • New community transport schemes would be dependent on financial support from the County Council which is extremely limited, and on the availability of dedicated local volunteers which may reduce its ability to "fill the gaps" in the public transport network.
Opportunities	**Threats**
• Stratford Parkway will contribute to the business case for increasing the frequency of rail services between Stratford-upon-Avon town and Birmingham and help to reduce car dependency within the area. • The dispersal of development away from Stratford-upon-Avon across a wide area is unlikely to have a significant negative effect on the existing Air Quality Management Areas in Studley and Henley-in-Arden, however there may be some impacts in Stratford-upon-Avon. • Opportunities for joint working with the Highways Agency, Warwick District Council and Redditch Borough Council to identify appropriate mitigation measures for any cumulative impacts which may arise as a result of proposed housing and employment growth within those areas.	• Limited opportunity to reduce car dependency if the location of new development is too widely dispersed as there would be little if any financial incentive for commercial bus operators to provide new services, or ability for the County Council to subsidise conventional bus services or community transport. • Wider dispersal may have a negative residual impact on congestion and air quality in Stratford-upon-Avon, (i.e. if as is likely employment and shopping trips are attracted in from the surrounding rural hinterland). • Existing capacity constraints and safety problems at M40 Junction 12 and on the B4100 at Gaydon village are likely to significantly constrain future development options at this location without substantial investment in transport infrastructure. • Although tourism within Stratford-upon-Avon brings major economic benefits, it also contributes towards transport and environmental problems. • Traffic impacts on the A435 corridor to the north of Alcester are significant due to high traffic volumes containing a large number of HGVs.

Table 3.1: Strengths, Weaknesses, Opportunities and Threats

[4] The accessibility assessment results discussed later in this report showed that on average approximately 70% of locations tested are within around 20 minutes travel time by public transport to key facilities.

4 Option Assessment

4.1 The Vision for Transport within Stratford-on-Avon District

Introduction

4.1.1 The proposals for transport in relation to the District should, where possible:

1. Contribute to the area being a place where people want to live, work and visit;
2. Support the economy of the main towns and surrounding rural areas, thus stimulating growth and prosperity;
3. Mitigate, where possible, the negative impacts of growth;
4. Help achieve connectivity between new and existing neighbourhoods, community facilities and public spaces; and
5. Ensure that communities can access heath and local services by sustainable means.

Local Imperatives

4.1.2 As set out earlier, the County Council's objectives for taking forward the National Transport Goals at a local level are as follows:

1. To promote greater equality of opportunity for all citizens in order to promote a fairer, more inclusive society;
2. To seek reliable and efficient transport networks which will help promote full employment and a strong, sustainable local and sub-regional economy;
3. To reduce the impact of transport on people and the [built and natural] environment and improve the journey experience of transport users;
4. To improve the safety, security and health of people by reducing the risk of death, injury or illness arising from transport, and by promoting travel modes that are beneficial to health;
5. To encourage integration of transport, both in terms of policy planning and the physical interchange of modes; and
6. To reduce transport's emissions of carbon dioxide and other greenhouse gases, and address the need to adapt to climate change.

4.1.3 When these are combined with the vision for transport in the District as set out above, a number of local imperatives begin to emerge:

1. The need for a sustainable transport system to underpin growth, with a focus on public transport, walking, cycling and targeted highway improvements;
2. The need to ensure that any growth proposals support the economy of the District, and do not adversely impact upon it (particularly in terms of congestion);
3. The need for the impact of any transport improvements on the built and natural environment to be minimised (particularly air quality); and
4. The need to ensure that existing and future residents/visitors to the area can access and use the transport network safely and in an integrated way.

4.2 Future Growth in Stratford-on-Avon District

Introduction

4.2.1 The District Council has provided details of the level of housing and employment growth that could take place over the next 16 years up to 2028. However, no specific sites for future development have been identified at this stage.

4.2.2 For the purposes of strategic modelling, it has been necessary to make some assumptions regarding which broad locations across the District could come forward to deliver this growth.

4.2.3 The strategic highway and transport implications of accommodating growth in these broad locations has been analysed by creating a number of specific development scenarios. These are discussed in the next section.

Development Scenarios and Assumptions

Housing Growth

4.2.4 The total housing figure assumed in the work undertaken to inform the Strategic Transport Assessment (STA) has been based on the District Council's Cabinet resolution in September 2011 to provide 8,000 new dwellings during the period 2008-2028.

4.2.5 At 1st April 2011, approximately 2,400 of these dwellings were accounted for by having been built during the period 2008-2011, being under construction or having planning permission leaving 5,600 dwellings.

4.2.6 The spatial distribution of the above housing total was split by location in accordance with the percentages set out in **Table 4.1** below.

Table 4.1 – Proposed Broad Locations for Development

Location Category	Scenario 1 Option E. Wider Dispersal	Scenario 2 Option F. Wider Dispersal Preferred Approach
Stratford-upon-Avon	15% (840)	10% (560)
Main Rural Centres	20% (1,120)	30% (1,680)
Local Service Villages/other rural areas	55% (3,080)	50% (2,800)
Rural brownfield sites	10% (560)	10% (560)
Total	100% (5,600)	100% (5,600)

Source: Draft Core Strategy, February 2012

4.2.7 Information on residential planning permissions and completions between 1st April 2011 up to the end of March 2012 has since been provided by the District Council.

4.2.8 This accounted for around 400 dwellings, leaving approximately 5,200 further dwellings to be provided within the remaining 16 years of the plan period, so the development totals shown in brackets in the above table are now lower to reflect this.

4.2.9 **Table 4.1** above shows that under Option E, a relatively greater proportion of housing is allocated within Stratford-upon-Avon and Local Service Villages/other rural areas, with a relatively lower proportion in the Main Rural Centres compared to Option F.

4.2.10 For the purposes of this STA, Option E is included in **"Scenario 1"** and Option F in **"Scenario 2".** The following alternative scenarios were also specified by the District Council for the purpose of strategic transport modelling. They are included to provide a context and justification for the Preferred Approach and also to provide additional information for the Examination in Public:-

- **Scenario 3** - Option F (7,000 dwellings) + 800 at each of the three large rural brownfield sites near Harbury, Southam and Long Marston;
- **Scenario 4** - Option F (8,000 dwellings) + 5,000 at a new settlement near Gaydon;
- **Scenario 5** - Option F (8,000 dwellings) + 2,500 urban extension in Stratford-upon-Avon including an Eastern Relief Road (ERR) option which includes provision of a third river crossing.

4.2.11 For Stratford-upon-Avon and the Main Rural Centres, the broad locations for development are based on the Potential Development Options shown on **Plans 1 to 9 in Appendix C** of this report.

4.2.12 For the Local Service Villages, the potential locations for development have been assumed to join existing settlement boundaries.

4.2.13 In the absence of specific sites, once the total number of houses was calculated using the percentages in Table 4.1 above, these were then allocated in equal proportions across all potential development locations within each category.

4.2.14 In the case of the three large rural brownfield sites, for example, each was therefore allocated a third of its total allocation.

4.2.15 The "other rural areas" referred to in the Draft Core Strategy (February 2012) were considered to be too small and widely dispersed to produce meaningful assessment results. For strategic modelling purposes, therefore, 55% of the total housing allocation was assumed in the Local Service Villages in Scenario 1 (Option E), and 50% in Scenario 2 (Option F).

4.2.16 The three large rural brownfield sites were assumed to be at the former Engineer Resources Depot near Long Marston, the former Southam Cement Works south of Long Itchington and the former Harbury Cement Works north west of Bishops Itchington.

4.2.17 No site-specific information was provided by the District Council for the Gaydon new settlement option in Scenario 4. For strategic modelling purposes only, the connecting point where trips load onto the network in the 'CITEware' strategic transport model referred to later in this report was positioned north west of Gaydon village between the B4100 and M40 Junction 12 .

4.2.18 Initially, the journey to work profile adopted in CITEware for the Gaydon option was based on Kineton Ward, but this attracted trips almost exclusively towards Stratford-upon-Avon. The profile was therefore revised to also include Harbury Ward to give a more realistic trip distribution.

4.2.19 The broad location for an urban extension of 2,500 dwellings in Stratford-upon-Avon in Scenario 5 was assumed to between on the eastern edge of the town on either side of Loxley Road.

4.2.20 By their inclusion in the STA, it should not be assumed that any of the broad locations referred to above are the preferred locations for future development within the District.

4.2.21 Without making some assumptions about the location of development, however, it would not be possible to provide any meaningful conclusions regarding the likely impact on the transport network of one growth scenario compared to another.

Employment Growth

4.2.22 The Draft Core Strategy (February 2012) makes provision for an additional 30.5 hectares (net) of employment land over the plan period 2008-2028.

4.2.23 The assumed levels of employment growth included in the STA under each development scenario and at Gaydon Proving Ground (which applies to all scenarios) are set out in **Appendix D**.

4.2.24 The District Council considers it unlikely that there would be two 5 Ha business parks at both 'sites' 3 and 6 in Stratford-upon-Avon, but have recommended that both should be assumed for modelling purposes while this issue remains unresolved.

4.2.25 The assessment also assumes that under Scenario 4, supplementary shopping and local services associated with a potential new settlement near Gaydon would be provided to support the development, along with two primary schools and one secondary school.

Retail Growth

4.2.26 The STA includes the provision of an additional 3,842 sq m gross of non-bulky comparison retail and 7,982 sq m gross of bulky comparison retail over the plan period.

4.2.27 The District Council has specified that that the non-bulky comparison retail should be assumed to be located in Stratford-upon-Avon town centre and the bulky comparison retail located across the wider urban area in the town in all development scenarios.

Significant Redevelopment Areas

4.2.28 The District Council has also specified that a number of significant redevelopment areas within Stratford-upon-Avon should be taken into account in the STA in all development scenarios.

4.2.29 Assumptions for the Bridgeway area are based on visitor and leisure uses, including a replacement Leisure Centre, a possible conference centre, hotel, remodelled surface and multi-storey parking.

4.2.30 For the Western Road area (Canal Quarter) business and commerce uses are assumed to replace existing uses over time, with some housing development alongside the canal (c. 50 dwellings).

4.2.31 For the Rother Street/Grove Road area, a mixed use redevelopment has been assumed that could include retail, offices, hotel, cafes/restaurants, residential (c. 50 dwellings). Some existing uses are likely to remain, e.g. Civic Centre.

4.2.32 The above assumptions are in accordance with the principles established in the Stratford-on-Avon District Local Development Framework Urban Design Framework for Stratford-upon-Avon Supplementary Planning Document, July 2007.

4.2.33 In addition, existing industrial land on Masons Road could come forward for redevelopment, in particular the area just north of the Fire Station. Existing properties here are mostly empty and, together with the former football ground, comprise approximately 5 hectares.

4.2.34 The District Council has advised that a mixed use redevelopment scheme for business uses and residential (c. 75 dwellings) would appear to be appropriate in principle and this has been assumed in the STA.

Committed Developments

4.2.35 Details of all housing completions and committed housing development up to March 2012 were provided by the District Council as noted in paragraphs 4.2.4. to 4.2.5 above.

4.2.36 The District Council has also provided details of completions and commitments for employment land since 2001 in an Industrial Land Schedule which is included in **Appendix E.**

4.2.37 Housing and employment growth in adjacent Districts and Boroughs was accounted for using data from Department for Transport's (DfT's) National Trip End Model (NTEM) which is accessed through the TEMPRO[5] (Trip End Model Presentation Program) database.

Vehicle Trip Rates

4.2.38 Mean vehicle trip rates adopted for committed developments and each of the five development scenarios referred to previously for an average weekday are shown in **Table 4.2** overleaf.

[5] The TEMPRO program provides projections of growth over time for use in local and regional transport models. It presents projections of growth in planning data and car ownership and resultant growth in trip making under a constant-cost assumption. The data presented is from the Department for Transport's National Trip End Model (NTEM).

Table 4.2 – Vehicle Trip Rates (per dwelling unit/100 sqm GFA employment)

Land Use/Location	AM (08:00-09:00)			PM (17:00-18:00)		
	Arrive	Depart	Total	Arrive	Depart	Total
Employment	1.468	0.268	1.736	0.186	0.012	0.198
Housing - Stratford, main rural centres, rural brownfield sites	0.120	0.480	0.600	0.480	0.120	0.600
Housing - local service villages	0.140	0.560	0.700	0.560	0.140	0.700

4.2.39 It should be noted that the trip rates in the above table are for strategic modelling purposes only. Once preferred sites have been identified, more detailed analysis and identification of appropriate trip rates on an individual site basis will be required.

4.3 Strategic Modelling Methodology with CITEware

Introduction

4.3.1 The assessment of broad highway impacts associated with the above five Scenarios has been undertaken using JMP Consultants' CITEware (**C**ensus **I**nformed **T**ransport **E**valuation Soft**ware**) strategic transport assessment model which covers the whole District.

4.3.2 CITEware provides a robust estimate of the likely distribution of development-related vehicle trips using journey to work Census data. Route choice for trips across a computerised representation of the District's highway network is based on a combination of travel time and distance from the trip origin to its destination.

4.3.3 The model includes surveyed traffic flows and observed vehicle speeds derived from DfT congestion indicator NI167 data. It utilises data taken from 2001 Census journey to work data, Ordnance Survey, Royal Mail Codepoint information and the Office of National Statistics and includes bus service data for the whole of Warwickshire plus services 166 (Worcester), 16, X15, X18 and X20 (Centro).

4.3.4 The model uses TEMPRO growth factors from NTEM to estimate background traffic growth in future years. Road capacities are calculated on the basis of formulae in the Design Manual for Roads and Bridges (DMRB) using volume over capacity calculations.

4.3.5 CITEware has been used by a number of local authorities (including the other four Warwickshire Districts/Boroughs and the Highways Agency). The County Council is confident that it provides a suitable tool for the high-level strategic modelling required at this stage of the Core Strategy process. Further details on the CITEware methodology are included in **Appendix F.**

4.3.6 The assessment year adopted for all scenarios assessed was 2028 which is the end year of the period covered by the Core Strategy.

4.3.7 Employment sites completed since 2001 were added into the model to update the journey to work matrix. The new sites modify the pattern of trips in the model in such a way as to reflect an April 2011 baseline, to which the modelled housing and employment sites associated with each development scenario can then be added to produce an accurate reflection of future travel patterns.

4.3.8 Average weekday AM morning peak (08:00 – 09:00) and PM evening peak (17:00 – 18:00) have been adopted as the most suitable time periods in the assessment as they represent the "worst-case" in terms of traffic volumes and congestion on the road network in the District.

4.3.9 The CITEware model calculates the “least cost” route from the origin of the trip to the development location (or vice versa) using a combination of travel time and distance.

4.3.10 The time taken to travel along any given link is informed by DfT NI167 congestion indicator data and is based on the delays/speed of travel experienced during 2010/11.

4.3.11 There is no re-routing of traffic in response to increased levels of congestion for either the baseline traffic flows or the development related traffic flows in 2028. Therefore a sense-check was undertaken when interpreting the initial CITEware output plots to ensure realistic routings.

4.3.12 The logic checking process involved identifying areas where it is known that highway capacity is restricted (e.g. within and around Stratford-upon-Avon town centre) and where there are few options to improve it. It may be expected that a proportion of vehicles would in reality re-route onto less congested routes.

4.3.13 It should also be noted that the outputs from CITEware are considered to be a “worst-case” scenario. The profile of development related trips is based on current mode share and travel time period choice.

4.3.14 The CITEware modelling provides evidence to be used in a strategic sift of scenarios and potential development locations, and highlights where possible highway infrastructure improvements may be required.

4.3.15 A more detailed analysis of impacts and possible highway improvements in Stratford-upon-Avon has also been undertaken. This is discussed in more detail later in this report.

Analysis of CITEware output

4.3.16 Three assessment methodologies have been adopted in the analysis of the CITEware outputs and should be used in combination to help assess the impact of a development scenario on the highway network.

4.3.17 The first methodology involves a simple assessment of the overall absolute increase in two-way traffic flow on all links within the model relating to each development scenario. The outputs for this method are provided on colour-coded plots using the following ranges:-

- 0 - 50 additional two-way vehicle trips (dark green);
- 50 - 100 (light green);
- 100 - 250 (yellow);
- 250 - 500 (orange);
- 500 – 1,000 (red);
- 1,000 and above (purple).

4.3.18 The above ranges are useful for understanding broad changes in traffic flows as a result of new development.

4.3.19 However, an increase of 100 vehicles per hour is only likely to be significant if existing flows are already in the order of 100, but not with flows in the order of 3,000.

4.3.20 The same problem can arise when looking at percentage increases; a 20% increase would not normally be considered significant with existing flows in the order of 100 vehicles, but would be with flows in the order of 3,000.

4.3.21 As traffic flows vary over such a wide range of values, a second methodology has been used to overcome the problems of assessing the significance of absolute or percentage changes in traffic flow.

4.3.22 This methodology is based on the "GEH formula" which is widely used in traffic modelling and produces a statistic which is non-linear and self-scaling; a single acceptance threshold can be used over a fairly wide range of traffic volumes and is calculated as follows:-

$$GEH = \sqrt{\frac{(V2 - V1)^2}{(0.5(V1 + V2))}}$$

Where….

$V1$ = Two-way hourly vehicle flow (without Core Strategy development)

$V2$ = Two-way hourly vehicle flow (with Core Strategy development)

4.3.23 GEH is traditionally used for model calibration purposes to assess how closely link flows produced by the model match surveyed traffic flows. Its use as an acceptance criterion for travel demand forecasting models is recognised in the DMRB, Volume 12, Section 2.

4.3.24 GEH can however also be used more generally to indicate the significance of predicted changes in traffic flow which would arise as a result of the various development scenarios and this methodology has been adopted in the STA.

4.3.25 The GEH results were translated onto colour-coded plots of the network using the following scale:-

- GEH = 0 to 5 - zero to slight impact (green);
- GEH = 5 to 7.5 - moderate impact (yellow);
- GEH = 7.5 to 10 - large impact (orange);
- GEH > 10 - very large impact (red).

4.3.26 To obtain robust GEH figures, baseline traffic plus committed development traffic was evaluated on a ward by ward basis and if the projected traffic level was greater than or equal to the growth predicted using TEMPRO/NTEM then no additional growth was added into the area.

4.3.27 If however projected traffic was lower than the TEMPRO/NTEM figure for the ward, additional base traffic growth was applied across the area to raise it to the forecast level.

4.3.28 In addition to the analysis described above, a third exercise was undertaken to provide an overview of the absolute increase in traffic movements at the following locations:-

- Main urban centres (Stratford-upon-Avon, Warwick and Leamington Spa);
- Main rural centres (Alcester, Bidford-on-Avon, Kineton, Henley-in-Arden, Shipston-on-Stour, Southam and Wellesbourne);
- Selected local service villages (Bishop's Itchington, Harbury and Long Marston);
- On sections of the M40 motorway and A46 trunk road on the Strategic Road Network (SRN);
- Air Quality Management Areas (AQMAs) not covered by the above.

4.3.29 It should be noted that all analysis has been undertaken using two-way traffic flow as is typical for a strategic modelling exercise of this nature.

4.3.30 Trips originating from the development locations will however be "tidal", i.e. during the AM peak a housing development will produce many more trips than it will attract. Conversely, more trips will be attracted to a housing development than will be produced by it during the PM peak. The opposite will be true for an employment development location.

4.3.31 It should be noted that any mitigation measures identified should be able to accommodate the tidal nature of trips associated with each type of development and the inherent baseline traffic conditions.

4.3.32 An analysis of outputs is provided in section 5 of this report. CITEware output plots (**Figures 1 to 20**) are provided in **Appendix G.**

4.4 Accessibility Analysis Methodology with Direct Route

4.4.1 An accessibility analysis was undertaken to assess the ability to reach a range of key destinations and services by public transport from residential locations using 'DirectRoute' software.

4.4.2 DirectRoute is similar to a "slimmed-down" version of the 'Accession' accessibility modelling software which was developed by consultants on behalf of the Department for Transport. The 'DirectRoute' software was developed in house by JMP Consultants.

4.4.3 DirectRoute has been used in the North West Regional DaSTS study and by the Department of Health. Further details relating to its development, how it operates and examples of previous studies are included in **Appendix F.**

4.4.4 The latest version of DirectRoute takes into account commuter desire to use transport interchanges (i.e. choosing to use a combination of public transport routes rather than a single route). The alternative accessibility platform, 'Accession', considers the possibility of unlimited changes which can lead to unrealistic outputs.

4.4.5 An analysis of outputs is provided in section 5.7 of this report. DirectRoute outputs for accessibility by public transport for each broad development location included in the CITEware assessment are provided in **Appendix H.**

4.5 Identification and Costing of Transport Interventions

4.5.1 Identification of key transport interventions was based on an analysis of the modelling outputs by the Project Board referred to in the 'Project Summary' section at the start of this report.

4.5.2 Transport interventions include sustainable transport measures to encourage modal shift away from the private car, key highway network schemes and junction improvements to increase capacity.

4.5.3 Broad approximations of costs have been provided in section 6.7 of this report and these are based on similar mitigation schemes delivered elsewhere in Warwickshire. These costs should be considered as indicative only at this stage.

5 Results of Option Assessment

5.1 Strategic Modelling Output

5.1.1 All assessments carried out as part of this study provide a comparison between NTEM 2028 factored base flows and NTEM 2028 factored base flows plus development traffic flows for each of the five scenarios.

5.1.2 In the CITEware strategic model, it is only possible to deal with TEMPRO growth on a link background flow basis. In other words, for each ward, the increase in flow as a result of new development growth is compared to the TEMPRO forecast increase. If the increase due to new development is greater than or equal to that predicted by TEMPRO, the background flow is left unadjusted so there may be some instances of double counting. If however the increase for the ward is less than that predicted by TEMPRO, a flat increase is added to raise the overall growth level up to the TEMPRO level.

5.1.3 In general, AM and PM peak hour plots are very similar as the distribution for PM trips is a reversal of the AM journey to work data taken from the National Census. There will however be slight difference in trip rates and more significant difference in delays on certain road links (informing route choice) and for this reason PM plots are provided in the Appendices.

5.1.4 The following comments relate to AM and PM period traffic impacts; where there is a significant difference between AM and PM outputs this is noted in the supporting commentary.

5.1.5 Analysis of results covers the following:-

- **Development Traffic Plots** – interpretation of the two-way additional development vehicle trip plots over the road network as a whole;
- **GEH Plots** – interpretation of the GEH plots to ascertain the significance of changes in traffic flow;
- **Comparative Indicators** - interpretation of **Tables 1 and 2** in **Appendix I** showing absolute and percentage increases in development traffic on key routes and locations.
- **Impact on the Strategic Road Network (SRN)** – interpretation of all outputs relevant to the impact on the SRN which is managed by the Highways Agency.

5.2 Strategic Modelling Output – (Wider Dispersal Scenarios)

Scenario 1 - (Option E – Wider Dispersal)

Introduction

5.2.1 This scenario is based on an allocation of 5,200 housing units under Option E in Table 1 of the Draft Core Strategy (February 2012) and 30.5 Ha of employment floorspace.

5.2.2 Under this scenario, Stratford-upon-Avon accounts for 15% of the total housing allocation and 33% of total employment, with the remainder dispersed across the District.

5.2.3 There is also 10 Ha employment at Gaydon Proving Ground assumed over the Core Strategy period.

5.2.4 The assumptions for retail growth and significant redevelopment areas in Stratford-upon-Avon referred to in paragraphs 4.2.26 to 4.2.34 of this report are also included in this scenario.

Development Traffic Plots

5.2.5 Under Scenario 1, the predicted impact is generally very low with most routes across the District shown in dark green (0 – 50 additional two-way vehicle trips) or light green (50 – 100 additional two-way vehicle trips), **(see Figures 1 and 2 in Appendix G).**

5.2.6 The next highest level of impact is on routes shown in yellow on **Figures 1 and 2**, (100 - 250 additional two-way vehicle trips). The routes which fall under this category are as follows:-

- M40 between Junction 12 north-east of Gaydon and Junction 15 Longbridge, (partly within Warwick District);
- A46 between Wildmoor Roundabout and Snitterfield;
- A46 from Marraway to Stanks Roundabout (partly within Warwick District);
- A422 between Ettington and Banbury Road/Shipston Road roundabout, Stratford-upon-Avon;
- A423 Southam Bypass, south of the junction with A425 Daventry Road;
- A425 between Southam and B4455 Fosse Way, (partly within Warwick District);
- A452 Europa Way between Greys Mallory and Harbury Lane, (in Warwick District);

- B4451 Gaydon Road between the B4100 and Deppers Bridge;
- B4632 Campden Road, south of Station Road.

5.2.7 The following routes within Stratford-upon-Avon also fall within this category:-

- A3400 Birmingham Road;
- A3400 Shipston Road;
- A3400 Seven Meadows Road;
- A422 Alcester Road (between West Green Drive and Wildmoor Roundabout);
- A422 Banbury Road;
- A439 Warwick Road;
- A4390 Arden Street;
- B4086 Tiddington Road;
- B4362 Clifford Lane;
- B439 Evesham Road (between Hathaway Lane and Luddington Road);
- D6218 Shottery Road;
- D6215 Hathaway Lane.

5.2.8 The largest increase in two-way vehicle trips (250 – 500) is at A3400 Clopton Bridge/Bridgefoot in Stratford-upon-Avon which is shown in orange on Figures 1 and 2 referred to above. There are already significant capacity problems at this location in 2012.

5.2.9 The significance of these increases is assessed below with reference to GEH plots.

GEH Plots

5.2.10 Under Scenario 1, a slight impact is predicted on most of the highway network as the majority of links are shown in green, as shown on **Figures 3 and 4 in Appendix G.**

5.2.11 A moderate impact is predicted on the following routes which are shown in yellow on the Figures 3 and 4; (all but the last one are in Stratford-upon-Avon):-

- A3400 Birmingham Road;
- A3400 Clopton Bridge/Bridgefoot;

- A3400 Shipston Road (north of Trinity Way);
- A422 Banbury Road;
- A4390 Seven Meadows Road;
- B4632 Clifford Lane;
- B4632 Tiddington Road;
- D6218 Shottery Road - (in reality it is likely that the impact would be spread between this route and the Evesham Road, Hathaway Lane, Church Lane route);
- B4451 Gaydon Road north and south of M40 Junction 12.

5.2.12 Many of the routes referred to above already experience significant capacity problems in peak periods and it is likely that these would be exacerbated under this scenario.

5.2.13 There are also capacity constraints on the B4451 north of Gaydon and on the M40 motorway itself with vehicles queuing in the hard shoulder due to limited exit capacity at Junction 12.

5.2.14 A large impact is predicted on A3400 Shipston Road between B4632 Clifford Lane and A4390 Trinity Way/Seven Meadows Road in Stratford-upon-Avon which is shown in orange on **Figures 3 and 4**. This is likely to exacerbate capacity constraints at this location.

5.2.15 It is likely that the impacts in Stratford-upon-Avon are primarily due to the attraction of the town for a wide variety of trip purposes (e.g. journey to work, retail and leisure trips).

Comparative Impacts

5.2.16 **Tables 1 and 2 in Appendix I** highlight additional development traffic on key routes, within town/village centres and the Studley AQMA in terms of absolute and percentage increase on Base 2028 traffic respectively.

5.2.17 To help illustrate the relative scale of the impacts of each scenario in terms of absolute increase in additional development traffic, **Table 1 in Appendix I** is colour coded using the same scale as the development plots referred to above.

5.2.18 Each scenario in **Table 2 in Appendix I** is also colour-coded in terms of relative percentage impact from green (low percentage increase) to yellow (medium percentage increase) to red (high percentage increase). It also shows the percentage increase on 2012 base traffic in 2028 before the additional development traffic is added in.

5.2.19 Stratford-upon-Avon town centre which is part of an AQMA covering the whole town would experience an additional 7-8% growth in the AM and PM peaks. This equates to approximately 950 additional vehicle movements during each peak period.

5.2.20 Bishop's Itchington would experience an additional 6% growth which equates to approximately 250 additional vehicle movements primarily on the B4451.

5.2.21 There would be an additional 3-4% growth in Southam which equates to approximately 350 more vehicle movements in each peak period.

5.2.22 There would be an additional 2-3% in Wellesbourne which equates to approximately 250 more vehicle movements in each peak period.

5.2.23 There is a 1-2% increase in Leamington Spa which equates to approximately 300 additional vehicle movements in each peak period.

5.2.24 There is a negligible 1% increase in Studley village which is an AQMA with fewer than 50 additional vehicle movements in each peak period.

Impact on SRN

5.2.25 The M40 between Junctions 12 and 15 would experience an additional 1-2% growth in traffic during the AM and PM peaks as shown in **Table 2, Appendix I.** This equates to approximately 100 to 150 additional vehicle movements as shown in **Table 1, Appendix I**.

5.2.26 The A46 Stratford Northern Bypass between Wildmoor roundabout and Marraway roundabout would experience between 8-9% additional growth in traffic. However, this equates to approximately 100 additional vehicle movements during each of the weekday peak hours.

5.2.27 The A46 between M40 Junction 15 at Longbridge and Marraway roundabout would experience 3-4% additional growth which equates to approximately 150 vehicle movements in both peaks.

5.2.28 The A46 Warwick Bypass would experience 3% additional growth which equates to approximately 150 additional vehicle movements in both peaks.

Scenario 1 - Impact Summary

5.2.29 The CITEware results indicate that Scenario 1 would have a slight or no material impact in terms of additional two-way vehicle trips on most of the District's highway network.

5.2.30 Although housing and employment are widely dispersed across the District under this scenario, there would however be moderate impacts in Stratford-upon-Avon and near M40 Junction 12 on the B4451 north of Gaydon where an improvement scheme is already being developed.

5.2.31 There is also a large impact on A3400 Shipston Road between B4632 Clifford Lane and A3490 Seven Meadows Road/Trinity Way south of the town.

5.2.32 As previously noted, this is primarily due the attraction of the town for a wide variety of trip purposes, (e.g. journey to work, retail and leisure trips).

5.2.33 In view of highway and junction capacity constraints in Stratford-upon-Avon, the results suggest that these impacts should be analysed in more detail to examine the need for and scope of possible mitigation measures. This issue is further discussed in the Impact Summary for Scenario 2 below.

5.2.34 There are no significant impacts predicted on the SRN or within the Studley AQMA.

Scenario 2 - (Option F – Wider Dispersal - Preferred Approach)

Introduction

5.2.35 This scenario is based on an allocation of 5,200 housing units under Option F in Table 1 of the Draft Core Strategy (February 2012) and 30.5 Ha of employment floorspace.

5.2.36 Under this scenario, Stratford-upon-Avon accounts for 10% of the total housing allocation, (compared to 15% in Scenario 1), and 33% of total employment with the remainder dispersed across the District.

5.2.37 There is also 10 Ha employment at Gaydon Proving Ground assumed over the Core Strategy period.

5.2.38 The assumptions for retail growth and significant redevelopment areas in Stratford-upon-Avon referred to in paragraphs 4.2.26 to 4.2.34 of this report are also included in this scenario.

Development Traffic Plots

5.2.39 The impacts are very similar to Scenario 1 in terms of there being a very low number of additional two-way vehicle trips on the highway network across the District, with most links shown in dark or light green on **Figures 5 and 6 in Appendix G.**

5.2.40 The links shown in yellow generally match those in Scenario 1, but there is a lower impact on the A46 north of Stratford-upon-Avon, A422 Alcester Road, A439 Warwick Road and B439 Evesham Road in Stratford-upon-Avon which are shown in light green.

5.2.41 The impact on A3400 Clopton Bridge/Bridgefoot in Stratford-upon-Avon is also lower than in Scenario 1.

5.2.42 The significance of these increases is assessed below with reference to GEH plots.

GEH Plots

5.2.43 Under Scenario 2, a slight impact is predicted on most of the highway network as the majority of links are shown in green, as shown on **Figures 7 and 8 in Appendix G.**

5.2.44 There are moderate impacts on the following routes which are shown in yellow:-

- A3400 Birmingham Road (southern section only);
- A3400 Clopton Bridge/Bridgefoot;
- A3400 Shipston Road (north of Trinity Way);
- A4390 Seven Meadows Road;
- A425 between Southam and Leamington Spa (mainly in AM peak);
- B4632 Clifford Lane;
- B4451 Gaydon Road north and south of M40 Junction 14.

5.2.45 As previously noted for Scenario 1, many of the routes referred to above already experience significant capacity constraints in peak periods and it is likely that these would be exacerbated under this scenario.

5.2.46 There are also capacity constraints on the B4451 north of Gaydon and on the M40 motorway itself with vehicles queuing in the hard shoulder due to limited exit capacity at Junction 12.

5.2.47 A large impact is predicted on A3400 Shipston Road between B4632 Clifford Lane and A4390 Trinity Way/Seven Meadows Road in Stratford-upon-Avon which is shown in orange. This is the same level of impact predicted for Scenario 1.

Comparative Indicators

5.2.48 Stratford-upon-Avon town centre would experience an additional 6-7% growth in traffic in the AM and PM peaks as shown in **Table 2, Appendix I.** This equates to approximately 850 additional vehicle movements during each peak period as shown in **Table 1, Appendix I.**

5.2.49 There is a similar rate of growth in Bishop's Itchington at 6% which equates to approximately 250 additional vehicle movements, and 4% growth in Southam which equates to approximately 350 more vehicle movements.

5.2.50 Bidford-on-Avon and Shipston-on-Stour would experience a 3% and 5% increase respectively in both peaks. This equates to approximately 250 additional vehicles movements in both locations in each peak period.

5.2.51 There is a 1-2% increase in Warwick and Leamington Spa town centres outside the District, which equates to an additional 250-300 vehicle movements in each peak period.

5.2.52 There is a 2% increase in Studley village which is an AQMA with fewer than 50 additional vehicle movements in each peak period.

Impact on SRN

5.2.53 The M40 would experience an additional 1-2% growth in traffic during the AM and PM peaks as shown in **Table 2, Appendix I.** This equates to approximately 100 to 150 additional vehicle movements as shown in **Table 1, Appendix I**.

5.2.54 The A46 Stratford Northern Bypass would experience 6% additional growth in traffic. This equates to approximately 100 additional vehicle movements during each peak period.

5.2.55 The A46 between M40 Junction 15 at Longbridge and Marraway roundabout would experience 2% additional growth which equates to approximately 100 vehicle movements in both peaks.

5.2.56 The A46 Warwick Bypass would experience 2% additional growth which equates to approximately 150 additional vehicle movements in both peaks.

Scenario 2 - Impact Summary

5.2.57 The CITEware results indicate that Scenario 2 would have a slight or no material impact in terms of additional two-way vehicle trips on most of the District's highway network. The impacts also appear to be slightly lower than in Scenario 1.

5.2.58 Although housing and employment are more widely dispersed across the District compared to Scenario 1, there would however still be moderate impacts on several already congested routes within Stratford-upon-Avon.

5.2.59 There would also be a large impact on A3400 Shipston Road between B4632 Clifford Lane and A3490 Seven Meadows Road/Trinity Way south of the town.

5.2.60 In view of significant capacity constraints on the highway network in Stratford-upon-Avon, it was considered that the implications of either Scenario 1 or 2 should be analysed in more detail as CITEware provides a strategic-level assessment of potential highway impacts.

5.2.61 Scenario 2 is identified as the District Council's preferred option in the Draft Core Strategy (February 2012). In view of this and the close similarities between Scenarios 1 and 2 in terms of highway impact, only Scenario 2 was taken forward for more detailed assessment as set out later in this report.

5.2.62 There are no significant impacts predicted on the SRN or within the Studley AQMA.

5.3 Strategic Modelling Output – (Focussed Growth Scenarios)

Scenario 3 - Option F (7,000 dwellings) + 800 at each of the three large rural brownfield sites near Harbury, Southam and Long Marston

Introduction

5.3.1 This scenario is based on a reduction in the total number of housing units assumed under wider dispersal Option F, (i.e. from 8,000 to 7,000), plus an additional 800 units and 2 Ha of employment at each of the following large rural brownfield sites:-

- Former Engineer Resources Depot near Long Marston;
- Former Southam Cement Works, south of Long Itchington:
- Former Harbury Cement Works, north west of Bishops Itchington.

5.3.2 There is also 10 Ha employment at Gaydon Proving Ground assumed over the Core Strategy period.

5.3.3 The assumptions for retail growth and significant redevelopment areas in Stratford-upon-Avon referred to in paragraphs 4.2.26 to 4.2.34 of this report are also included in this scenario.

Development Traffic Plots

5.3.4 Most routes across the District experience a very low increase in the number of additional two-way trips (100 or fewer) as shown in dark or light green on **Figures 9 and 10 in Appendix G**.

5.3.5 A number of routes are shown in yellow (between 100 and 250 additional two-way vehicle trips) mainly within and around Stratford-upon-Avon, Warwick, Leamington Spa, Southam, Harbury and Gaydon. This includes the stretch of the M40 between Junctions 13 and 15, the A46 between the M40 Junction15 at Longbridge and the Stanks roundabout and the A46 Stratford Northern Bypass to Sand Barn Lane.

5.3.6 There would however be more significant localised impacts in the villages around each of the three sites and on the routes connecting them to main settlements, (i.e. Stratford-upon-Avon, Leamington Spa and Southam) and at Junction 12 north-east of Gaydon

5.3.7 The settlements most likely to be affected are Bishop's Itchington, Harbury, Southam, Stockton, Long Itchington, Ufton, and Radford Semele.

5.3.8 The above increases are likely to be associated with vehicles routing to high quality full-time employment opportunities, (e.g. Stratford Enterprise Park, Warwick Technology Park, JLR and AML at Gaydon and in Coventry).

5.3.9 The following routes experience an increase of between 250 and 500 additional two-way vehicle trips and are shown in orange:-

- A423 Coventry Road, between Southam and Long Itchington;
- M40 between Junction 12 north-east of Gaydon and Junction 13 south west of Bishop's Tachbrook;
- A3400 between B4632 Clifford Lane and Banbury Road/Shipston Road roundabout, Stratford-upon-Avon;
- A425 Ufton Hill/Southam Road between the B4452 and B4455 Fosse Way;
- A426 Rugby Road, between Southam and Stockton;
- B4632 Campden Road between the County boundary and B4632 Clifford Lane / A3400 Shipston Road roundabout , south of Stratford-upon-Avon;
- B4451 between M40 Junction 12 north-east of Gaydon and Bishop's Itchington;
- C211 Warwick Road, Southam.

5.3.10 The following routes experience an increase of between 500 and 1,000 additional two-way vehicle trips and are shown in red:-

- B4451 Station Road north of Bishop's Itchington;
- B4632 Campden Road south of Station Road, near Lower Quinton.

5.3.11 The significance of these increases is assessed below with reference to GEH plots.

GEH Plots

5.3.12 Under Scenario 3, a slight impact is predicted on most of the highway network as the majority of links are shown in green, as shown on **Figures 11 and 12 in Appendix G.**

5.3.13 There are moderate impacts on the following routes which are shown in yellow:-

- A3400 Birmingham Road (southern section);
- A422 Banbury Road between Ettington and Blue Lane south of Loxley;
- A423 Southam Bypass;

- B4451 between Gaydon and M40 Junction 12;
- B4452 between Deppers Bridge and Butt Lane, Harbury.

5.3.14 There are large impacts on the following routes which are shown in orange.

- A425 Leamington Road, to junction of B4452 west of Southam;
- A425 Ufton Hill/Southam Road between the B4452 and Leamington Spa;
- A3400 Shipston Road (north of Trinity Way), Stratford-upon-Avon;
- A4390 Seven Meadows Road, Stratford-upon-Avon;
- C210 Coventry Street/Coventry Road, Southam;
- C211 Warwick Road, Southam.

5.3.15 There are very large impacts on the following routes which are shown in red:-

- A423 Coventry Road north of Southam;
- A425 Southam Road between Ufton Hill and the B4452;
- A426 Rugby Road north-east of Southam;
- B4451 between M40 Junction 12 north-east of Gaydon and Deppers Bridge north of Bishop's Itchington;
- B4632 Campden Road/Clifford Lane, south of Stratford-upon-Avon
- A3400 Shipston Road, south of A4390 Seven Meadows Road/Trinity Way, Stratford-upon-Avon.

Comparative Indicators

5.3.16 There would be a 22-25% increase in traffic growth in Bishop's Itchington as shown in **Table 2, Appendix I**. This equates to approximately 1,000 additional vehicle movements in each peak period as shown in **Table 1, Appendix I**.

5.3.17 Stratford-upon-Avon would experience 7-8% additional growth which equates to approximately 950 additional vehicle movements during each peak period.

5.3.18 There would also be a 7-8% increase in Southam which equates to approximately 700 more vehicle movements in each peak period.

5.3.19 Harbury would experience 5-6% additional growth which equates to approximately 400 additional vehicles movements in each peak period.

5.3.20 Warwick and Leamington Spa would experience 3% additional growth which equates to an increase of approximately 300 and 550 vehicles respectively in each peak period.

5.3.21 Bidford-on-Avon and Shipston-on-Stour would experience a 4% increase in both peaks. This equates to approximately 250-300 more vehicles in both locations in each peak period.

5.3.22 There is a 1% increase in Studley village which is an AQMA with fewer than 50 additional vehicles in each peak period.

Impact on SRN

5.3.23 The M40 between Junction 12 north-east of Gaydon and Junction 14 would experience an additional 4% growth in traffic during the AM and PM peaks as shown in **Table 2, Appendix I**. This equates to approximately 300 additional vehicle movements as shown in **Table 1, Appendix I**.

5.3.24 The M40 between Junctions 14 and 15 near Longbridge would experience an additional 2% growth in traffic during the AM and PM peaks which equates to approximately 200 additional vehicle movements.

5.3.25 The A46 Stratford Northern Bypass would experience 6% additional growth in traffic. This equates to approximately 100 additional vehicle movements during each peak period.

5.3.26 The A46 between M40 Junction 15 at Longbridge and Marraway roundabout would experience 4% additional growth which equates to approximately 150 vehicle movements in both peaks.

5.3.27 The A46 Warwick Bypass would experience 3% additional growth which equates to approximately 150 additional vehicle movements in both peaks.

Scenario 3 - Impact Summary

5.3.28 The CITEware results indicate that Scenario 3 would have a slight, moderate or no material impact in terms of additional two-way vehicle trips on most of the District's highway network.

5.3.29 There would however be significant localised impacts on the highway network and at junctions in the immediate vicinity of the three rural brownfield sites, in nearby rural settlements and also on the routes connecting each site to Stratford-upon-Avon, Leamington Spa and Southam.

5.3.30 With the exception of Junction 12 north-east of Gaydon, there are no significant impacts predicted on the SRN or within the Studley AQMA.

Scenario 4 - Option F (8,000 dwellings) + 5,000 at a new settlement near Gaydon

Introduction

5.3.31 This scenario is based on Option F, (8,000 dwellings), plus 5,000 at a new settlement near Gaydon.

5.3.32 There is also 10 Ha employment at Gaydon Proving Ground assumed over the Core Strategy period.

5.3.33 The CITEware modelling also assumes retail facilities, two primary schools and one secondary school would be provided to support a development of this size.

5.3.34 There is a level of localised internalisation within the new settlement in the model which means that a proportion of employment trips would be attracted to existing employment at JLR and AML at Gaydon itself.

5.3.35 The assumptions for retail growth and significant redevelopment areas in Stratford-upon-Avon referred to in paragraphs 4.2.26 to 4.2.34 of this report are also included in this scenario.

Development Traffic Plots

5.3.36 Most routes across the District experience a very low increase in the number of additional two-way vehicle trips (100 or fewer) as shown in dark or light green on **Figures 13 and 14 in Appendix G**.

5.3.37 A number of routes are shown in yellow (between 100 and 250 additional two-way vehicle trips) mainly within and around Stratford-upon-Avon, Warwick, Leamington Spa, Southam, Wellesbourne, Kineton and Gaydon. This includes the A46 Stratford Northern Bypass from Alcester Road roundabout to Sand Barn Lane.

5.3.38 The following routes experience an increase of between 250 and 500 additional two-way vehicle trips and are shown in orange:-

- A439 Warwick Road from Marraway to A3400 Bridgeway, Stratford-upon-Avon;
- A452 Europa Way, north of Harbury Lane;
- A46 Warwick Bypass;
- B4087 Newbold Road between Wellesbourne and M40 J13;
- B4100 Banbury Road north of Oakley Wood Road between the B4087 and the A452;
- B4100 Banbury Road, Lighthorne Heath;
- C143 Plough Lane, Bishop's Itchington.

5.3.39 The following routes experience an increase of between 500 and 1,000 additional two-way vehicle trips and are shown in red:-

- A46 between Marraway and M40 Junction 15 at Longbridge;
- A452 Banbury Road/Europa Way between Greys Mallory and Harbury Lane;
- B4451 Gaydon Road between M40 Junction 12 and Bishop's Itchington.

5.3.40 The following routes experience the highest level of increase of more than 1,000 additional two-way vehicles trips and are shown in purple:-

- M40 between Junction 12 north-east of Gaydon and Junction 15 at Longbridge;
- B4451 between M40 Junction 12 and B4100 Gaydon;
- B4100 between Gaydon and Lighthorne Heath.

5.3.41 The significance of these increases is assessed below with reference to GEH plots.

GEH Plots

5.3.42 Under Scenario 4, a slight impact is predicted on most of the highway network as the majority of links are shown in green, as shown on **Figures 15 and 16 in Appendix G.**

5.3.43 There are however moderate impacts on a large number of routes which are shown in yellow:-

- A46 between Bishopton Roundabout and Snitterfield;
- A3400 Birmingham Road (southern section), Stratford–upon-Avon;
- A3400 Shipston Road (north of A4390 Trinity Way), Stratford–upon-Avon;
- A3400 Church Street/Stratford Road, Shipston-on-Stour;
- A422 Banbury Road, between Ettington and Stratford-upon-Avon;
- A423 Southam Bypass, south of A425 Daventry Road;
- A425 Leamington Road, between Southam and Ufton;
- A425 Southam Road between B4455 Fosse Way and Radford Semele;
- A426 Rugby Road , between Southam and Stockton;
- A429 Wellesbourne, between B4086 Stratford Road and Charlecote Road;
- A4390 Seven Meadows Road, Stratford –upon-Avon;

- B4086 Stratford Road, between Wellesbourne and Alveston Manor junction, Stratford-upon-Avon;
- B4451 Gaydon Road south of M40 Junction 12;
- B4452 between Deppers Bridge and Butt Lane, Harbury;
- B4455 Fosse Way, between B4086 and Lighthorne Road, and also between A425 and Welsh Road;
- B4632 Clifford Lane;
- C72 Bridge Street, Wellesbourne;
- C31 between Kineton and Gaydon;
- D6038 Fisher Road/Ladbroke Road, Bishop's Itchington;
- D6039 Middle Road, Harbury.

5.3.44 There are large impacts on the following routes which are shown in orange:-

- A3400 Shipston Road between B4632 Clifford Lane and A4390 Trinity Way/Seven Meadows Road, Stratford-upon-Avon;
- A439 Warwick Road between Hatton Bank Lane to A3400 Bridgeway, Stratford-upon-Avon;
- A452 Europa Way, between D3392 Tachbrook Park Drive and A425 Myton Road, Leamington Spa;
- A46 Warwick Bypass from M40 Junction 15 at Longbridge to Stanks Roundabout, Warwick;
- B4086 Charlecote Road/Warwick Road, Wellesbourne;
- B4455 Fosse Way, between D6039 Middle Road and A425 Southam Road;
- D6054 Bush Heath Lane, Harbury;
- D6353 Moreton Morrell Lane, Lighthorne.

5.3.45 There are very large impacts on the following routes which are shown in red:-

- M40 between Junction 12 north-east of Gaydon and Junction 15 at Longbridge;
- A439 Warwick Road between M40 Junction 15 at Longbridge and Hatton Bank Lane north-east of Stratford-upon-Avon;
- A452 Banbury Road/Europa Way between M40 Junction 13 and D3392 Tachbrook Park Drive, Leamington Spa;
- B4087 Newbold Road between Wellesbourne and M40 Junction 13;
- B4100 between Gaydon roundabout and Chesterton Road north of Lighthorne;
- B4451 between Gaydon and Bishop's Itchington;
- C143 Plough Lane, Bishop's Itchington.

Comparative Indicators

5.3.46 There would be a 9% increase in traffic growth in Stratford-upon-Avon as shown in **Table 2, Appendix I.** This equates to approximately 1,150 additional vehicle movements in each peak period as shown in **Table 1, Appendix I**.

5.3.47 Leamington Spa and Warwick would experience a 6% increase which also equates to approximately 1,100 and 600 additional vehicle movements in each peak period respectively.

5.3.48 Wellesbourne would experience an 8% increase which equates to approximately 850 additional vehicle movements in each peak period.

5.3.49 Bishop's Itchington would experience a 13-15% increase which equates to approximately 600 additional vehicle movements in each peak period.

5.3.50 Southam would experience a 6% increase which equates to approximately 550 additional vehicle movements in each peak period.

5.3.51 Harbury would experience a 6-7% increase which equates to approximately 450 additional vehicle movements in each peak period.

5.3.52 Shipston-on-Stour and Kineton would also experience a 6% and 4% increase respectively which equates to approximately 350 additional vehicle movements in each peak period.

5.3.53 Bidford-upon-Avon would experience an 3% increase which equates to approximately 250 additional vehicle movements in each peak period.

5.3.54 There is a 2% increase in Studley village which is an AQMA with fewer than 50 additional vehicles in each peak period.

Impact on SRN

5.3.55 The M40 between Junction 12 north-east of Gaydon and Junction 14 would experience an additional 23-25% growth in traffic during the AM and PM peaks as shown in **Table 2, Appendix I**. This equates to approximately 2,100 additional vehicle movements during each peak period as shown in **Table 1, Appendix I**.

5.3.56 The M40 between Junctions 14 and 15 at Longbridge would experience an additional 8-10% growth in traffic during the AM and PM peaks which equates to approximately 1,050 additional vehicle movements.

5.3.57 The A46 Stratford Northern Bypass would experience 7% additional growth in traffic. This equates to approximately 100 additional vehicle movements during each peak period.

5.3.58 The A46 between M40 Junction 15 at Longbridge and Marraway would experience 13-14% additional growth which equates to approximately 500 additional vehicle movements in both peaks.

5.3.59 The A46 Warwick Bypass would experience 8-9% additional growth which equates to approximately 450 additional vehicle movements in both peaks.

Scenario 4 - Impact Summary

5.3.60 The CITEware results indicate that Scenario 4 would have significant localised impacts on the highway network and at junctions in the immediate vicinity of the Gaydon new settlement option.

5.3.61 The results also show that there would be significant impacts on the routes connecting the new settlement to Stratford-upon-Avon, Leamington Spa, Bishop's Itchington and Wellesbourne.

5.3.62 There would also be significant impacts on the M40 between Junction 12 north-east of Gaydon and Junction 15 at Longbridge and on the A46 between Marraway and M40 Junction 15.

5.3.63 There are no significant impacts predicted within the Studley AQMA.

5.3.64 The implications of the impacts described above are discussed in section 6 of this report in the context of possible mitigation options.

Scenario 5 - Option F (8,000 dwellings) + 2,500 urban extension in Stratford-upon-Avon including an Eastern Relief Road (ERR) option

Introduction

5.3.65 This scenario is based on Option F, (8,000 dwellings), plus an urban extension of 2,500 dwellings on the eastern edge of Stratford-upon-Avon on either side of Loxley Road.

5.3.66 It also includes an indicative Eastern Relief Road (ERR) linking A422 Banbury Road with A439 Warwick Road, with junctions at B4086 Tiddington Road and Loxley Road.

5.3.67 Employment growth of 5 Ha is assumed at both potential development locations 3 and 6, (shown on **Plan 1 in Appendix C**), plus 10 Ha on the south side of the ERR. There is also 10 Ha employment at Gaydon Proving Ground assumed over the Core Strategy period.

5.3.68 The assumptions for retail growth and significant redevelopment areas in Stratford-upon-Avon referred to in paragraphs 4.2.26 to 4.2.34 of this report are also included in this scenario.

Development Traffic Plots

5.3.69 Most routes across the District experience a very low increase in the number of additional two-way vehicle trips (100 or fewer) as shown in dark or light green on **Figures 17 and 18 in Appendix G.**

5.3.70 The following routes experience an increase of between 100 and 250 additional two-way vehicle trips and are shown in yellow:-

- M40 between Junction 12 north-east of Gaydon and Junction 15 at Longbridge;
- A3400 Church Street/Stratford Road, Shipston-on-Stour;
- B4086 Stratford Road, between Wellesbourne and ERR, Stratford-upon-Avon;
- A422 Banbury Road, between Ettington and Stratford-upon-Avon;
- A423 Southam Bypass south of junction with A425 Daventry Road;
- A425 Leamington Road, between Southam and B4451 Fosse Way;
- A426 Rugby Road , between Southam and Stockton;
- A429 between Stratford Road and Charlecote Road, Wellesbourne;
- A429 between Halford and Ettington;
- A452 Banbury Road/Europa Way between Greys Mallory and Harbury Lane;
- A46 Stratford Northern Bypass;

- B4451 between B4100 at Gaydon and Deppers Bridge;
- B4632 Campden Road/Clifford Lane;
- A46 Warwick Bypass from M40 Junction 15 at Longbridge to Leek Wootton junction:
- C211 Warwick Road, Southam;
- C40 Ingon Lane between A46 and A439 Warwick Road;
- D5327 Park Lane/Snitterfield Lane.

5.3.71 The following routes within Stratford-upon-Avon also fall within this category:-

- A3400 Birmingham Road;
- A3400 Guild Street;
- A4390 Arden Street;
- A4390 Trinity Way;
- D 6167 Masons Road;
- D6173 Timothy's Bridge Road;
- D6209 Church Lane;
- D 6215 Hathaway Lane;
- D6218 Shottery Road.

5.3.72 The following routes experience an increase of between 250 and 500 additional two-way vehicle trips and are shown in orange, (all but the first are in Stratford-upon-Avon):-

- A46 between M40 Junction 15 at Longbridge and Marraway;
- A3400 Shipston Road between B4632 Clifford Lane and A422 Banbury Road;
- A3400 Bridgefoot/Bridgeway;
- A422 Banbury Road north of Rushbrook Road;
- A439 Warwick Road between Marraway and Bridgeway;
- A4390 Trinity Way/Seven Meadows Road;
- The section of the ERR between Loxley Road and A422 Banbury Road would carry up to 500 vehicles in each peak hour.

5.3.73 The following routes experience an increase of between 500 and 1,000 additional two-way vehicle trips and are shown in red:-

- B4086 Tiddington Road between the ERR and Alveston Manor junction;
- The section of the ERR between A439 Warwick Road and Loxley Road would carry up to 1,000 vehicles in each peak hour.

GEH Plots

5.3.74 Under Scenario 5, a slight impact is predicted on most of the highway network as the majority of links are shown in green, as shown on **Figures 19 and 20 in Appendix G.**

5.3.75 There are however moderate impacts on a large number of routes which are shown in yellow on the Figures referred to above:-

- A46 between M40 Junction 15 at Longbridge and Marraway;
- A422 between Ettington and Shennington turn;
- A422 Banbury Road, between Blue Lane south of Loxley and A4390 Trinity Way, Stratford-upon-Avon;
- A425 Southam Road between B4452 and Ufton;
- A426 Rugby Road , between Southam and Stockton;
- A429 between Sherbourne and M40 Junction 15 at Longbridge;
- A429 south of Ettington;
- B4086 Wellesbourne Road, between Loxley Lane and Main Street Alveston (AM);
- C76 Greenhill Street/Wood Street (PM).

5.3.76 The following routes within Stratford-upon-Avon also fall within this category:-

- A3400 Birmingham Road (PM);
- A3400 Guild Street;
- A4390 Grove Road (PM);
- A4390 Trinity Way;
- B439 Evesham Road.
- B4086 between Alveston and ERR (PM);

5.3.77 There are large impacts on the following routes which are shown in orange:-

- A3400 Birmingham Road, between Maybird Shopping Park and Guild Street, Stratford-upon-Avon (AM);
- A3400 Bridgefoot/Bridgeway;
- A422 between New Road and Blue Lane south of Loxley;
- B4632 Clifford Lane;
- A4390 Grove Road, Stratford-upon-Avon (AM);
- B4086 between Alveston and ERR (AM);
- C76 Greenhill Street/Wood Street, Stratford-upon-Avon (AM).

5.3.78 There are very large impacts on the following routes in and around Stratford-upon-Avon which are shown in red:-

- A3400 Shipston Road between B4632 Clifford Lane and A422 Banbury Road;
- A422 between Trinity Way and Banbury Road/Shipston Road roundabout;
- A439 Warwick Road between Marraway and Bridgeway;
- A4390 Seven Meadows Road;
- B4086 between ERR and Alveston Manor and ERR (AM);
- ERR between A439 Warwick Road and Loxley Road.

Comparative Indicators

5.3.79 There would be a 12-13% increase in traffic growth in Stratford-upon-Avon as shown in **Table 2, Appendix I**. This equates to approximately 1,650 additional vehicle movements in each peak period as shown in **Table 1, Appendix I**.

5.3.80 Warwick would experience a 3% increase which also equates to approximately 300 additional vehicle movements in each peak period respectively.

5.3.81 Leamington Spa would experience a 1-2% increase which would equate to approximately the same number of additional vehicle movements as Warwick.

5.3.82 Southam and Wellesbourne would experience an 3-4% increase which equates to approximately 350 additional vehicle movements in each peak period.

5.3.83 Shipston-on-Stour would experience a 5-6% increase which equates to approximately 350 additional vehicle movements in each peak period.

5.3.84 Bidford-upon-Avon would experience a 4% increase which equates to approximately 300 additional vehicle movements in each peak period.

5.3.85 Bishop's Itchington would experience a 6% increase which equates to approximately 250 additional vehicle movements in each peak period.

Impact on SRN

5.3.86 The A46 between M40 J15 at Longbridge and Marraway would experience 8-9% additional growth as shown in **Table 2, Appendix I**. This equates to approximately 300 additional vehicle movements in both peaks as shown in **Table 1, Appendix I**.

5.3.87 The A46 Warwick Bypass would experience 4% additional growth which equates to approximately 200 additional vehicle movements in both peaks.

5.3.88 The impacts on other parts of the SRN are relatively small.

Scenario 5 - Impact Summary

5.3.89 The CITEware results indicate that Scenario 5 would have significant localised impacts on the highway network around the ERR in Stratford-upon-Avon.

5.3.90 There would also be a significant impact on the A439 Warwick Road between Marraway and Bridgeway and on other radial routes (i.e. A3400 Shipston Road, A4390 Seven Meadows Road and B4086 Tiddington Road).

5.3.91 There are no significant impacts predicted on the SRN or within the Studley AQMA.

5.3.92 As the CITEware analysis provides an strategic-level assessment, a more detailed assessment of the likely effects of the ERR on traffic congestion in Stratford-upon-Avon under the development assumptions for Scenario 5 is included later in this report.

5.4 Stratford-upon-Avon Detailed Assessment (Stages 1 and 2)

Introduction

5.4.1 The County Council commissioned Ove Arup and Partners Ltd to undertake a more detailed assessment of the implications of various development scenarios on routes within and around Stratford-upon-Avon and to highlight areas where transport interventions are likely to be required.

5.4.2 The assessment was undertaken using the County Council's 'S-Paramics' micro-simulation traffic model which simulates individual vehicle movements on a representation of the highway network within and around the town including the SRN.

5.4.3 The 2015 model which contains the most up-to-date vehicle demands includes the effects of background traffic growth and all known significant committed developments.

5.4.4 During the development of the 2015 model, it was concluded that the growth accounted for by committed developments within it roughly equated to the level of growth between 2011 and 2015 predicted by the TEMPRO database.

5.4.5 Thus the demands in the 2011 and 2015 models were used to represent the initial reference demands against which further growth scenarios could be assessed.

5.4.6 The assessment was undertaken in five stages as follows:-

- **Stage 1** – to assess the impact of allocating 'threshold' levels of "medium" and "high" growth (i.e. applied incrementally every other year up to 2028) across the entire Stratford-upon-Avon modelled area;
- **Stage 2 –** to assess the impact of focussing growth at each of three possible broad locations in Stratford-upon-Avon (north, east and west) as an alternative to the uniform growth strategy in Stage 1;
- **Stage 3 –** to provide further information on the localised impacts the CITEware Scenarios referred to previously in this report would have within and around Stratford-upon-Avon;
- **Stage 4 –** to identify and assess the likely effectiveness of potential mitigation schemes (transport interventions) derived in response to the outcomes from the previous stages referred to above;
- **Stage 5 –** to test the outcome of a specific growth strategy implemented alongside a specific mitigation measure, (CITEware Scenario 5 in conjunction with an indicative Eastern Relief Road on the eastern edge of Stratford-upon-Avon).

5.4.7 The Arup report[6] containing the full assessment results and assumptions used in the traffic modelling accompanies this STA and is part of the County Council's formal response to the District Council on the implications of various growth scenarios within and around Stratford-upon-Avon.

5.4.8 The key findings from Stages 1 to 3 of the assessment are discussed below. The outcomes from Stages 4 and 5 are summarised in the section 6 of this report.

Methodology

5.4.9 Network performance was assessed by analysing mean link speeds predicted by S-Paramics models for the various assessment years during average weekday AM (08:00-09:00) and PM (17:00-18:00) peak hours.

5.4.10 Mean link speeds during each peak hour period were colour-coded onto GIS plots of the Stratford-upon-Avon road network. These are included in **Appendix A of the Arup report** which accompanies this STA.

5.4.11 The mean speed bands shown on the Arup plots are defined as follows:-

- 0 – 5 mph (red);
- 5 – 10 mph (orange);
- 10 – 15 mph (yellow);
- 15 – 20 mph (grey);
- 20 – 25 mph (lime green);
- 25 – 30 mph (green);
- Above 30 mph (dark green).

5.4.12 The advantage of using mean speed is that it is relatively straightforward to identify potential impacts at the strategic level.

5.4.13 A queued approach to a junction may, for example, highlight a low mean speed on one or more approaching links in one scenario, (e.g. be colour-coded red or orange), and then as conditions deteriorate, the same colour will spread to adjacent links.

5.4.14 A summary of findings for Stages 1 to 3 is set out below.

[6] 211439-19R0052_-_Ove Arup and Partners - Stratford_STA_PARAMICS_modelling_report (October 2012)

Stage 1 – Threshold Testing

Introduction

5.4.15 The purpose of the Stage 1 assessment was to identify the impact of allocating 'threshold' levels of growth across the entire Stratford-upon-Avon area on the existing road network, as well as identifying the potential areas of stress within the network that may either constrain or altogether prohibit growth.

5.4.16 In this context, the term 'threshold' means that growth was applied incrementally every other year from 2015 onwards which is the assessment year represented by the latest version of the County Council's Stratford-upon-Avon S-Paramics model.

5.4.17 Experience suggests that by simply assigning the total expected level of growth envisaged for a particular area at the end of the Core Strategy period, congestion problems which arise are likely to appear insurmountable. It would also be unclear where to focus any possible mitigation strategy.

5.4.18 A 'threshold' or incremental approach was therefore adopted to identify the levels of growth that could potentially be accommodated within the existing road network at various stages between 2011 and 2028.

5.4.19 This approach was used to provide a reference point against which the implications of all further alternative growth scenarios could be compared. It also provided an initial overview of potential areas of stress on the existing road network within the town that may require possible mitigation in future.

Methodology

5.4.20 The forecast growth levels were applied generally across all existing trip origin/destination pairs in the model based on factors covering the whole of Stratford-on-Avon District extracted from the TEMPRO database (V6.2 data set 62).

5.4.21 In order that the impacts of generalised growth could be better understood, two different scenarios were assessed:-

- **Medium Growth** – whereby all light vehicle demand within the model was forecast forwards from 2015 onwards using the Stratford-on-Avon District growth factor from TEMPRO;
- **High Growth** – whereby all light vehicle demand within the model was forecast forwards from 2015 onwards using the Stratford-on-Avon District Growth factor from TEMPRO which has been adjusted by the NTMAF09 dataset.

5.4.22 Analysis of net growth across both AM and PM model periods revealed that the rate of growth was far higher within the high growth scenarios from 2019 onwards. There was little difference between medium and high growth within 2017.

5.4.23 Furthermore, divergence between the medium and high growth scenarios appeared to be greatest after 2021. Therefore, only the medium growth scenarios were assessed in 2017 and 2019. From 2021 onwards both medium and high growth scenarios were assessed.

5.4.24 No highway or sustainable transport mitigation measures were assumed in Stage 1.

Stage 1 – Results Analysis

2011 to 2019

5.4.25 Analysis of AM 2015 network mean speeds shown on **Figure 3 in Appendix A of the Arup report** indicates that they are similar to those in 2011 shown on **Figure 1.**

5.4.26 However, mean speeds are lower at the following locations:-

- Three of the inbound approaches to Evesham Place roundabout, (speeds are lower for longer indicating queue propagation);
- A422 Banbury Road approach to the Shipston Road roundabout, (low mean speeds extend back to the junction with Rushbrook Road);
- B4632 Clifford Lane approach to its junction with A3400 Shipston Road.

5.4.27 Analysis of the AM 2017 and 2019 medium growth mean speeds shown on **Figures 5 and 7** reveals very little difference in network conditions compared to those in 2015.

5.4.28 Analysis of PM 2015 mean speeds shown on **Figure 4** indicates that they are broadly similar to those in 2011 shown on **Figure 2**.

5.4.29 However, mean speeds are lower at the following locations:-

- C77 Rother Street southbound (entire length);
- A422 Banbury Road northbound approach to Clopton Bridge;
- A3400 Clopton Bridge/Bridgefoot;
- A422 Alcester Road approach to Wildmoor roundabout;
- C93 Bishopton Lane approach to Bishopton roundabout;
- All approaches to the A4390 Seven Meadows Road/Trinity Way roundabout.

5.4.30 Analysis of the PM 2017 and 2019 medium growth mean speed plots shown on **Figures 6 and 8** reveals very little difference in network conditions compared to those in 2015.

5.4.31 However, mean speeds are lower at the following locations:-

- C77 Rother Street approach to Evesham Place roundabout where low mean speeds propagate back beyond the junction with Wood Street;
- A422 Alcester Road westbound approach to Wildmoor roundabout.

2019 to 2028

5.4.32 Between 2019 and 2028, mean link speeds deteriorate at the following locations under the AM medium growth scenario as shown on **Figures 7 and 21.**

- B439 Evesham Road and D6218 Shottery Road approaches to Evesham Place roundabout;
- A422 Banbury Road north-westbound towards Clopton Bridge;
- A3400 Bridgeway Gyratory;
- Inbound approaches to the A422 Alcester Road/Masons Road traffic signalised junction.

5.4.33 By 2028, mean speeds under the AM peak high growth scenario have decreased significantly from those experienced in 2019, as shown by an increase in the number of links coloured orange or red on **Figure 23** compared to **Figure 7.**

5.4.34 Between 2019 and 2028, a comparison of **Figures 8 and 22** shows there is a deterioration in mean link speeds within and around the town centre under the PM medium growth scenario as follows:-

- A4390 Grove Road northbound approach to Arden Street/Greenhill Street traffic signalised junction;
- A4390 Grove Road southbound approach to Evesham Place/Rother Street junction;
- Windsor Street and Rother Street southbound;
- A3400 Bridgeway Gyratory propagating back along A422 Banbury Road and beyond its junction with Dale Avenue;
- B4086 Tiddington Road approach to Alveston Manor junction which propagate back onto Loxely Road;
- A422 Alcester Road between Masons Road and A4390 Arden Street/Greenhill Street traffic signalised junction;
- A422 Alcester Road approach to Wildmoor roundabout;

- C93 Bishopton Lane approach to Bishopton roundabout.

5.4.35 By 2028, under the PM peak high growth scenario, a comparison of **Figures 10 and 24** shows that mean speeds within the town centre gradually reduce until they reach a point where the majority are below 5 mph.

5.4.36 Significant impacts are experienced during the PM peak along A3400 Guild Street and also on A3400 Birmingham Road, A422 Alcester Road, A439 Warwick Road and A422 Banbury Road.

5.4.37 Observations of the model in operation reveal that, towards the end of the PM peak modelled hour, congestion within the town centre is so high in 2028 that the model begins to lock up.

5.4.38 It is likely that some average speeds are actually being overestimated due to the fact that the network is at a standstill towards the end of the modelled period and vehicles do not manage to travel the length of many of the links in the town centre.

Stage 1 - Summary

5.4.39 An analysis of mean link speeds shows that network capacity constraints become apparent at certain locations within Stratford-upon-Avon as early as 2015.

5.4.40 As more growth is allocated within the model, there is a tendency for these capacity problems to get gradually worse rather than for new issues to arise.

5.4.41 Analysis of the above high and medium growth scenarios reveals a number of potential network constraints that are likely to require mitigation to enable future growth to be realised particularly from 2021.

5.4.42 There are a number of locations where moderate impacts would occur as follows:-

- A439 Warwick Road southbound back from Bridgeway Gyratory;
- A3400 Bridgeway Gyratory;
- A3490 Arden Street/A3400 Birmingham Road signalised junction;
- A422 Alcester Road/A4390 Grove Road signalised junction;
- A3400 Shipston Road/B4632 Clifford Lane roundabout;
- A4390 Trinity Way/Seven Meadows Road roundabout;
- C93 Bishopton Lane approach to Bishopton roundabout;
- A422 Alcester Road approach to Wildmoor roundabout.

5.4.43 The two junctions which appear to consistently constrain growth and experience the most significant levels of congestion irrespective of which growth scenario is applied are as follows:-

- Evesham Place roundabout;
- A422 Banbury Road/A3400 Shipston Road roundabout.

Stage 2 – Broad Location Testing

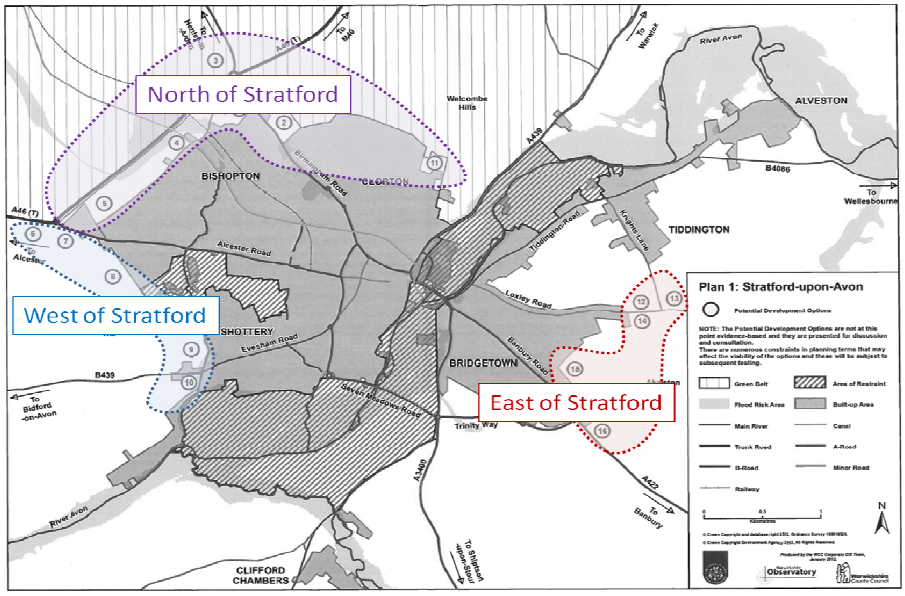
Introduction

5.4.44 Stage 1 indicated that by 2028 the high growth option is not deliverable within the capacity constraints of the highway network within the town. The purpose of Stage 2 was to identify whether allocating growth in a specific area would affect this conclusion.

5.4.45 The Stratford-on-Avon District Draft Core Strategy (February 2012) outlined 16 potential locations, without planning permission, within the boundaries of Stratford upon Avon. These have been grouped into 3 broad locations (North, West and East) as shown in **Figure 5.1** below.

5.4.46 For assessment purposes, locations 3 and 6 North of Stratford were allocated a small proportion of housing; in reality these are likely to be retained for employment use.

Figure 5.1 – Stratford-upon-Avon Broad Locations



5.4.47 Initial testing assumed that 840 dwellings in Stratford-upon-Avon (as defined by Option E in the Draft Core Strategy February 2012) would be allocated across each of the broad locations using the same vehicle trip rates as those used for Stratford-upon-Avon in the CITEware assessment.

5.4.48 The net level of growth contained within each of these options needs to correlate, at least in part, to the TEMPRO growth values that have been tested previously. Thus it was decided that the following tests would be undertaken:-

- 2028 Stratford Medium Growth plus broad location; and
- 2028 Stratford High Growth plus broad location.

5.4.49 No highway or sustainable transport mitigation measures were assumed in Stage 2. In reality, however, growth in the West broad location would need to be allied with the provision of a significant piece of highway infrastructure such as the Stratford Western Relief Road which is currently proposed by the promoter of large-scale housing development at land to the west of Shottery.

5.4.50 In Stage 2, however, it was decided not to include the effects of specific mitigation measures such as the WRR to allow the effects of growth in any one of the three broad locations to be compared directly against the general growth scenarios in Stage 1 where no mitigation was assumed.

5.4.51 The effects of the WRR and other possible highway mitigation options were however analysed in Stage 4 in association with the 2028 high growth scenario from Stage 1.

Stage 2 - Results Analysis

5.4.52 For simplicity, the following section compares the results of focussing growth in each of the three broad locations against the general high growth scenario in 2028 from Stage 1.

5.4.53 Full assessment results comparing performance of the focussed medium growth scenarios against the Stage 1 general medium growth scenarios in 2028 are included in the Arup report.

North Broad Location (2028 High Growth)

5.4.54 The main difference between this scenario **(Figure 25 in Appendix B of the Arup report)** and the general 2028 AM high growth scenario **(Figure 23 in Appendix A of the Arup report)** is that northbound mean speeds along A422 Banbury Road are slightly higher on the section nearest A4390 Trinity Way.

5.4.55 During the 2028 PM peak, mean speeds on the A422 Alcester Road approach to Wildmoor roundabout reduce further when growth is allocated to the north **(Figure 26)** compared to the general high growth scenario **(Figure 24)**.

5.4.56 Critically, however, the inner town network performance is still particularly poor during the 2028 PM peak with average speeds of less than 10 mph on a significant number of links.

East Broad Location (2028 High Growth)

5.4.57 There are very few differences between this scenario **(Figure 29 in Appendix B of the Arup report)** and the general high growth scenario during the 2028 AM peak **(Figure 23 in Appendix A of the Arup report)**.

5.4.58 There are also very few differences between this scenario **(Figure 30)** and the general high growth scenario during the 2028 PM peak **(Figure 24)**.

5.4.59 However, mean link speeds along the Banbury Road northbound reduce further when growth is focussed in the East during the 2028 PM peak, but are marginally higher on A3400 Birmingham Road southbound.

5.4.60 Critically, the inner town network performance is still particularly poor during the 2028 PM peak with average speeds of less than 10 mph on a significant number of links.

West Broad Location (2028 High Growth)

5.4.61 When a proportion of growth is allocated to sites in the West broad location **(Figure 33 in Appendix B of the Arup report)**, 2028 AM mean speeds along A422 Banbury Road are slightly higher in the northbound direction than in the general AM high growth scenario **(Figure 23 in Appendix A of the Arup report)**.

5.4.62 However, speeds on B439 Evesham Road eastbound are lower than in the general AM growth scenario.

5.4.63 There are very few differences between this scenario **(Figure 34)** and the general high growth scenario during the 2028 PM peak **(Figure 24)**.

5.4.64 However, performance of the inner town network remains particularly poor with average speeds of less than 10 mph on a significant number of links.

Stage 2 - Summary

5.4.65 The results show that no particular broad location option, without mitigation, demonstrates an improvement in network conditions during the 2028 PM peak high growth scenario over and above those experienced in the general 2028 PM peak high growth scenario in Stage 1.

5.4.66 In summary, the following conditions have been observed:-

- Allocation of growth to the North would have the potential to alleviate some of the conditions on A422 Banbury Road northbound, but would potentially increases congestion on the A422 Alcester Road approach to Wildmoor roundabout.
- Allocation of growth to the East would inevitably exacerbate the congested conditions on A422 Banbury Road northbound, A3400 Bridgeway Gyratory and A4390 Seven Meadows Road.
- Allocation of growth to the West would be most likely to impact upon B439 Evesham Road and A422 Alcester Road, particularly in the AM peak hour due to the increased volume of trips heading towards the town centre.

5.5 Stratford-upon-Avon Detailed Assessment (Stage 3)

Stage 3 – Strategic Option Testing

Introduction

5.5.1 The purpose of Stage 3 was to provide further information on the localised impacts the strategic CITEware Scenarios 2, 3 and 4 would have within and around Stratford-upon-Avon.

5.5.2 At this stage of the assessment, the overall levels of growth within each scenario referred to above were capped at a level consistent with the TEMPRO 2028 AM and PM peak high growth scenarios adopted in Stages 1 and 2.

5.5.3 This was necessary so that the differences between each scenario and their subsequent network-wide impacts were easily distinguishable and directly comparable with the results for Stages 1 and 2.

5.5.4 Growth within the CITEware model, although informed through analysis of the TEMPRO database, does not necessarily equate to the same levels within the S-Paramics model.

5.5.5 This is partly because the CITEware assessment does not assign all trips associated with the various development options into the S-Paramics model network as several do not enter the area it covers.

5.5.6 Furthermore, the S-Paramics model contains a higher proportion of more clearly defined trip origin and destination (O-D) values when compared to CITEware. Not all of these are subject to growth when translating the CITEware outputs into S-Paramics inputs.

5.5.7 This means that adjustments to the CITEware totals may be required once they have been extracted prior to inclusion within the S-Paramics model to ensure that the assessment is consistent with that which has previously been undertaken in Stages 1 and 2.

5.5.8 The results for each strategic CITEware Scenario are discussed below.

Stage 3 - Results Analysis

Scenario 2 - (Option F – Wider Dispersal - Preferred Approach)

2028 AM Network Performance

5.5.9 A comparison of network performance under Scenario 2 (Option F) shown on **Figure 43 in Appendix D of the Arup report** with the general 2028 AM peak high growth scenario from the Stage 1 assessment **(Figure 23 in Appendix A of the Arup report)** shows the following:-

- Similar performance in the town centre;
- Mean link speeds are higher on the B439 Evesham Road approach to Evesham Place roundabout in Scenario 2;
- Mean link speeds on the A3400 Shipston Road approach to the B4342 Clifford Lane junction are considerably lower in Scenario 2
- Mean link speeds are also lower on the A439 Warwick Road approach to A3400 Bridgeway Gyratory and on the A46 westbound approach to Bishopton roundabout in Scenario 2.

2028 PM Network Performance

5.5.10 A comparison of network performance under Scenario 2 **(Figure 44)** with the general 2028 PM peak high growth scenario **(Figure 24)** shows the following:-

- Slightly better performance in the town centre in Scenario 2 but mean speeds still below 10 mph on the majority of links and lower than 5mph on Rother Street and Evesham Place southbound;

- Mean link speeds are much lower on the B4086 Tiddington Road approach to Alveston Manor junction, on A422 Banbury Road northbound and A4390 Trinity Way westbound in Scenario 2.

Summary (Scenario 2)

5.5.11 Despite the dispersed approach to the allocation of growth across the District, the results predict that a large volume of the newly created trips will still be attracted to Stratford-upon-Avon in Scenario 2 (Option F).

5.5.12 The fact that these trips are coming from further means that there are additional pressures on external junctions during the AM peak. These include the following:-

- A439 Warwick Road approach to A3400 Bridgeway Gyratory;
- A3400 Shipston Road approach to B4632 Clifford Lane roundabout;
- A46 westbound approach to Bishopton roundabout.

5.5.13 The volume of trips likely to be leaving Stratford-upon-Avon during the PM peak is still of sufficient magnitude to cause considerable problems in the town centre, particularly on Rother Street/Evesham Place southbound. Furthermore, conditions have worsened significantly in and around the south east quadrant of the model network compared to the general 2028 high growth scenario derived in Stage 1.

5.5.14 This could be indicative of the pattern and dispersal of growth resulting in 'network failure' in and around the B4086 Tiddington Road/A422 Banbury Road junctions. This means that traffic would be at a standstill for a lengthy period of time.

Scenario 3 - Option F (7,000 dwellings) + 800 at each of the three large rural brownfield sites near Harbury, Southam and Long Marston

2028 AM Network Performance

5.5.15 A comparison of network performance under Scenario 3 (Option F – 7,000 dwellings plus 800 at the three rural brownfield sites near Harbury, Southam and Long Marston) shown on **Figure 45 in Appendix D of the Arup report** with the general AM peak 2028 high growth scenario from the Stage 1 assessment **(Figure 23)** reveals very few differences within the town centre.

5.5.16 However, there are further reductions in mean link speeds at the following locations:-

- A3400 Shipston Road northbound approach to the junction with B4632 Clifford Lane;

- A439 Warwick Road southbound approach towards A3400 Bridgeway Gyratory;
- A46 westbound approach towards A46 Bishopton roundabout;
- A422 northbound approach towards Banbury Road/Shipston Road roundabout.

5.5.17 These impacts are likely to be symptomatic of an increase in the number of trips trying to enter the town from all three rural brownfield sites.

2028 PM Network Performance

5.5.18 A comparison of network performance under Scenario 3 shown on **Figure 46** with the general PM peak 2028 high growth scenario from the Stage 1 assessment **(Figure 24)** reveals the following:-

- Slightly better performance in the town centre than in the 2028 general high growth scenario, but the majority of links with mean speeds still below 10 mph;
- Less congestion on A3400 Birmingham Road southbound and A422 Alcester Road eastbound;
- More significant problems on B4086 Tiddington Road southbound and Loxley Road eastbound;
- More significant problems on the northbound and westbound approaches to the A422 Banbury Road/A3400 Shipston Road roundabout.
- More significant problems on the A3400 Shipston Road southbound approach to the A4390 Seven Meadows Road/Trinity Way roundabout.

Summary (Scenario 3)

5.5.19 The results show that there are comparatively few differences between Scenario 3 and the general high growth option during the AM peak in the town centre.

5.5.20 There are several locations on the outer edges of the network, however, where mean speeds drop due to an increase in the number of trips travelling towards the town from the rural brownfield sites during the AM peak.

5.5.21 The flow of trips into Stratford from these sites manifests in issues at the following locations:-

- A46 Bishopton Roundabout;
- A439 Warwick Road southbound (and A3400 Bridgeway Gyratory);
- A3400 Shipston Road/B4632 Clifford Lane Junction.

5.5.22 During the PM peak, the issues mirror those revealed during the analysis of Scenario 2 (Option F) and the network appears unable to facilitate the additional level of demand for vehicles wishing to exit or cross the town. Severe impacts appear to be experienced in and around the south east quadrant of the model network.

Scenario 4 - Option F (8,000 dwellings) + 5,000 at a new settlement near Gaydon

2028 AM Network Performance

5.5.23 A comparison of network performance under Scenario 4 (Option F plus Gaydon Focus) shown on **Figure 47 in Appendix D of the Arup report** with the general AM peak 2028 high growth scenario from the Stage 1 assessment **(Figure 23)** reveals a number of differences.

5.5.24 The outward nature of the focus on growth dispersed across the District, coupled with the potential attractiveness of a nearby settlement appear to result in potentially improved conditions within the town centre during the AM peak.

5.5.25 There are several instances where AM peak mean link speeds in the town centre with Scenario 4 are at least one band higher than in the general high growth scenario.

5.5.26 There do not appear to be any significant differences however in the outer network conditions when comparing the impacts of Scenario 4 with the general high growth scenario.

5.5.27 The exceptions to this are an increase in mean link speeds along the A46 westbound approach to Bishopton roundabout and a minor increase on A422 Banbury Road northbound near A4390 Trinity Way.

2028 PM Network Performance

5.5.28 A comparison of network performance under Scenario 4 shown on **Figure 48** with the general PM peak 2028 high growth scenario from the Stage 1 assessment **(Figure 24)** reveals a similar pattern of impact to Scenarios 2 and 3.

5.5.29 There are no obvious improvements to conditions within the town centre and, furthermore, there is a significant likelihood that the network within the south east quadrant will simply fail to accommodate all of the additional demand.

Summary (Scenario 4)

5.5.30 Although there is potential for network conditions in the town centre to improve with Scenario 4 during the AM peak, there are still impacts at some outlying junctions.

5.5.31 Furthermore, there are still problems during the PM peak where the network in the south east quadrant of the town cannot accommodate the additional demand.

5.5.32 Trips generated by the Gaydon new settlement option still materialise as departures requiring exit from the town during the PM peak where the network is most heavily constrained.

5.5.33 It should also be noted that the CITEware analysis indicated that there would be significant localised impacts on the highway network and at junctions in the immediate vicinity of the Gaydon new settlement, on the routes connecting it to main settlements and on the SRN. These are discussed further in section 6 of this report.

5.6 Further Work

5.6.1 As previously noted, the level of growth assumed for each of the above strategic scenarios was capped at a level consistent with that adopted for the 2028 general TEMPRO high growth scenario in Stage 1 of the assessment and the broad location analysis in Stage 2.

5.6.2 This approach was recommended to enable the differences between the various scenarios and their subsequent network-wide impacts to be easily distinguishable and for results to be directly comparable with those for Stages 1 and 2.

5.6.3 Due to the varying levels of demand each of the scenarios would generate, it was further suggested that sensitivity testing could be undertaken to assess their impacts in terms of the net growth they predict as it may result in higher of lower impacts in certain areas.

5.6.4 It should be noted, however, that the Stage 1 assessment results showed that network capacity constraints became apparent at certain locations within Stratford-upon-Avon as early as 2015.

5.6.5 In view of this, the results of such sensitivity testing are likely to indicate that network problems still become apparent at a relatively early stage in the Core Strategy period irrespective of which scenario is adopted or growth assumption applied.

5.6.6 It should also be noted that the CITEware and S-Paramics analysis has examined the broad impacts of each development scenario at a strategic level. Detailed operation of junctions has not been considered at this stage.

5.6.7 The effects of modal choice, time period choice (except to an extent within the S-Paramics analysis in Stratford-upon-Avon by application of peak-spreading assumptions), and other measures that influence travel behaviour have also not been considered.

5.6.8 To make a more informed assessment which considers all these points, it is recommended that further traffic modelling is undertaken when there is more certainty over the level and location of growth.

5.7 Accessibility Assessment

Methodology

5.7.1 All potential development locations and scenarios that were tested in CITEware were also modelled using DirectRoute to assess their overall accessibility.

5.7.2 Accessibility was assessed in terms of the ability of residents in those locations to use existing public transport services to access the following destinations:-

- Fresh fruit and vegetable retailers (access to healthy food);
- General Practitioners (GP surgeries);
- Hospitals;
- Employment;
- High Schools.

5.7.3 A further "town centre" category was also added which corresponds to accessing Stratford-upon-Avon, Leamington Spa, Warwick, Solihull, Redditch and Banbury; in general terms getting to any public transport stop within the main shopping area of a town, (which generally offer access to financial services, Citizen's Advice, job centres, pharmacies and other facilities).

5.7.4 Accessibility by public transport was assessed for each destination listed above in the time period 07:00 to 09:00 on a Wednesday, with up to one interchange and 400 metres walk permitted at the start, end and during interchange within the journey.

5.7.5 The above accessibility criteria were chosen to give a neutral travel period which would be representative of many journey types including travel to employment, education and access to retail/banking services and GP appointments.

5.7.6 Development locations and scenarios were individually scored for access to each destination with the score corresponding to 10 minute travel bands up to 60 minutes as follows:-

1. 0-10 minutes;
2. 10-20 minutes;
3. 20-30 minutes;
4. 30-40 minutes;
5. 40-50 minutes;
6. 50-60 minutes;
7. Over 60 minutes;
8. No direct route (1 change allowed).

5.7.7 A travel time of over 60 minutes was given a score of 7, and a failure to reach the destination within the sample time was given an 8. Locations which were unable to access any destinations also received a score of 8.

5.7.8 A threshold assessment was undertaken to analyse and map accessibility to non-specialist hospitals. Transport was modelled from postcode locations to the destination, allowing up to 400m walk at journey start and end and one interchange within the journey (including another 400m walk).

5.7.9 Modelled journeys take the shortest path available, using existing bus and rail services. The walk distance of 400 is a crow-fly measurement, so in some cases the actual on street distance will be further. However, as 400m equates to roughly 5 minutes walk, the times shown should be representative to a maximum margin of error of 2 minutes and in most cases much less (indicating a 20% increase over the maximum walk distance due to obstacles).

Accessibility Analysis – Potential Development Locations

5.7.10 In general, the results for the potential development locations reflect a broadly adequate level of public transport provision overall within Stratford-on-Avon District with an average score of 2.57, (2.38 when hospitals are excluded), reflecting an approximate travel time of between 20-30 minutes to most destinations.

5.7.11 The full output from this stage of the process is provided in **Appendix H.** This includes the individual accessibility scores for each location against each destination and an overall average ranking across all destinations. The lower the rank score, the better the level of accessibility.

5.7.12 The ranking assumes that access to all key services and town centres are of equal importance and thus have equal weighting.

5.7.13 The average rank scores range from 1.17 indicating the highest level of accessibility (5 locations in Stratford-upon-Avon achieve this score) to 8.00 indicating inaccessible locations (11 locations in the local service villages or main rural settlements achieve this score).

5.7.14 **Table 5.1** overleaf shows the number of potential development locations in each accessibility category for each destination. This shows that on average approximately 70% of locations tested are within around 20 minutes travel time of the destinations shown which reflects a broadly adequate level of public transport accessibility.

Table 5.1: Accessibility Summary (Broad Locations)

Travel Time	Fruit and Veg	GPs	Hospitals	Employment	High Schools	Town Centre	Average
1. 0-10 mins;	106	88	13	56	44	2	52
2. 10-20 mins;	8	27	36	44	57	53	38
3. 20-30 mins;	0	0	39	9	8	32	15
4. 30-40 mins;	0	0	11	1	0	14	4
5. 40-50 mins;	0	0	3	1	1	2	1
6. 50-60 mins;	0	0	2	1	2	1	1
7. Over 60 mins;	1	0	5	2	1	7	3
8. No direct route	11	11	17	12	13	15	13

5.7.15 It should be noted, however, that approximately 10% of the development locations tested were either unable to reach the destination within the sample time selected, or were entirely without access to conventional public transport. These are discussed in the next section.

5.7.16 **Table 5.2** below shows the District average accessibility score for each type of facility and the overall average score (2.57) referred to previously.

Table 5.2: Accessibility Summary (Types of Facility)

Fruit and Veg	GPs	Hospitals	Employment	High Schools	Town Centre	Average
1.72	1.83	3.52	2.35	2.46	3.53	2.57

5.7.17 The results suggest that compared to the District average for all types of facility (2.57), there is a generally higher level of accessibility to Fruit and Vegetable retailers, GPs, employment opportunities and high schools and a relatively lower level of accessibility to hospitals and town centres reflecting the dispersed pattern of settlements across the District.

Accessibility Analysis – Scenarios 1 to 5

5.7.18 Each development scenario (1 to 5) from the CITEware analysis was assessed in terms of public transport accessibility using a weighted average score based on total trip production.

5.7.19 The three large rural brownfield sites and Gaydon new settlement option broad location were given a score to reflect the fact that they are large enough to justify an extension or deviation from existing bus routes, with no improvement in service frequency assumed.

5.7.20 **Table 5.3** below shows the public transport accessibility scores and average ranking score for each scenario. The lower the score, the better the level of accessibility. The ranking assumes that access to key services and town centres are of equal importance and thus have equal weighting.

Table 5.3: Public Transport Accessibility (Development Scenarios)

Scenario	Fruit and Veg	GPs	Hospitals	Employment	High Schools	Town Centre	Average Ranking Score
1	1.80	1.88	4.10	2.55	2.78	3.77	**2.81**
2	1.80	1.89	4.12	2.57	2.74	3.78	**2.82**
3	1.64	1.69	4.21	2.25	2.48	3.26	**2.59**
4	1.41	1.45	3.57	2.29	1.88	2.91	**2.25**
5	1.53	1.58	3.07	2.04	2.47	3.17	**2.31**

5.7.21 The above table shows that the wider dispersal options (Scenarios 1 and 2) achieve a slightly lower level of accessibility compared to the average score for the District as a whole (2.57).

5.7.22 The Gaydon new settlement broad location performs comparatively better than the other scenarios as it was assumed to be large enough to justify an extension of existing public transport services and to have its own secondary school.

5.7.23 Several locations in the scenarios tested were unable to access any form of conventional public transport. These locations are shown in **Table 5.4** overleaf.

Table 5.4: Locations with no Public Transport Access

Location with no PT access	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5
	housing units	housing units	housing units	housing units	housing units
Bidford 6	16	24	13	24	24
Bidford 7	24	24	13	24	24
Bidford 8	24	24	13	24	24
Claverdon	65	65	58	65	65
Hampton Lucy	66	66	59	66	66
Priors Marston	66	66	59	66	66
Salford Priors	66	66	59	66	66
Southam 10	24	24	13	24	24
Southam 11	24	24	13	24	24
Studley 10	22	22	11	22	22
Studley 9	22	22	11	22	22
Total	421	429	319	429	429

5.7.24 In view of the small number of housing units allocated in each of the above locations, it is highly unlikely that commercial bus operators or the County Council could justify the additional costs associated with diverting existing services to improve their accessibility.

5.7.25 It is therefore recommended that in seeking to refine the preferred development option put forward by the District Council, a more site specific analysis should be undertaken using DirectRoute to promote development at sites and locations where there is already an adequate level of public transport provision.

Accessibility Analysis – Public Transport to Non-Specialist Hospitals

5.7.26 A mapping exercise has also been undertaken to provide an overview of public transport accessibility to non-specialist hospitals. The assessment includes Warwick and Stratford-upon-Avon hospitals within or close to the District, the Redditch Alexandra and the Hospital of St. Cross in Rugby.

5.7.27 Accessibility in this context relates to the nearest facility and covers patients, visitors and staff. The assessment criteria relates to the time period 07:00 to 09:00 on a Wednesday, with up to one interchange and 400 metres walk permitted at the start, end and during interchange within the journey.

5.7.28 The assessment results are shown on **Figure 21 in Appendix H.** These indicate that that the level of accessibility to hospitals is relatively highest in the eastern part of the District, and relatively lowest in villages to the north of Stratford-upon-Avon, (e.g. Snitterfield, Bearley and Wilmcote).

5.7.29 The results also indicate a relatively low level of accessibility in some outlying areas, (e.g. Ilmington and parts of Shipston-on-Stour approximately 16 km south of Stratford-upon Avon).

5.7.30 A very low level of accessibility is shown for Studley which is approximately 2 km from the Redditch Alexandra Hospital. However, this is likely to be an underestimate, (i.e. if a slightly greater walk distance is assumed in the assessment criteria then a higher level of accessibility would be possible).

Accessibility Summary

5.7.31 In summary, the results show a broadly adequate level of public transport accessibility overall, but a poorer level in some of the villages to the north and west of Stratford-upon-Avon and in outlying areas in the south of the District.

5.7.32 The results suggest that compared to the District average for all types of facility, there is a generally good level of accessibility to Fruit and Vegetable retailers, GPs, employment opportunities and high schools and a relatively lower level to hospitals and town centres reflecting the dispersed pattern of settlements across the District.

5.7.33 The five development scenarios have a generally adequate level of accessibility overall, but Scenarios 1 and 2 (wider dispersal) score relatively poorest compared to the other scenarios.

5.7.34 It should be noted that the accessibility assessment does not cover smaller rural settlements outside the definition of Local Service Villages as these were not included in the CITEware analysis.

5.7.35 Accessibility from these smaller rural settlements is generally very poor as there is little if any conventional public transport available.

5.7.36 Where community transport services are available, it should be noted that these require revenue support which is likely to come under increasing pressure in future. They also rely heavily on dedicated individuals and local support which experience shows is unlikely to be available on a sufficiently reliable basis in all areas of need.

5.7.37 In view of this, from a transport accessibility perspective, it would be inadvisable to promote a wider dispersal policy on the presumption that community minibus schemes would come into existence.

Accessibility – Further Analysis

5.7.38 The County Council is undertaking further accessibility analysis to ascertain the following information:-

- Number of direct buses from home origin to main settlements (07:00 – 09:00);
- Number of direct return buses from main settlements to home origin (16:30 – 18:30).

5.7.39 The home origins referred to in this context are defined as Stratford-upon-Avon, Main Rural Centres and Local Service Villages.

5.7.40 The main settlements (or destinations) referred to in this context are the following employment centres:-

- Banbury;
- Daventry;
- Evesham;
- Solihull;
- Warwick/Leamington Spa;
- Redditch;
- Rugby.

5.7.41 The results of the above analysis will be provided to the District Council in due course.

6 Transport Interventions

6.1 Introduction

6.1.1 Identification of key transport interventions to mitigate the traffic impacts relating to the various scenarios was based on analysis of the CITEware and S-Paramics modelling results.

6.1.2 Transport interventions were identified in terms of provision of sustainable transport to encourage modal shift and schemes to provide additional highway or junction capacity.

6.1.3 They were also identified to mitigate Core Strategy development scenario traffic impacts only. Committed and background growth mitigation has not been considered as this should have already been identified as part of the planning process.

6.1.4 A Community Infrastructure Levy (CIL) type charging scheme will be necessary to ensure that the cumulative impacts of future development can be mitigated (i.e. no single development may trigger the requirement for a mitigation scheme itself, however the combined impacts of several developments may trigger this need and therefore a charging structure is required).

6.1.5 The indicative transport interventions described in this section of the report do not include the requirements for site accesses. The position of these is important and can influence the level and nature of mitigation required.

6.1.6 It should also be noted that mitigation requirements are based on professional opinion following interrogation of the output from the assessment modelling.

6.1.7 To fully understand the impact of the developments and the mitigation requirements, more detailed traffic modelling analysis would be required which would include all committed developments and schemes.

6.1.8 In Stratford-upon-Avon and along the M40 corridor, this more detailed analysis would normally be undertaken using the County Council's S-Paramics micro-simulation traffic models.

6.1.9 These would take account of time period choice and potential modal shift and would test a series of mitigation options for a development scenario. This type of analysis would only be recommended however when there is more certainty over the location and size of specific sites identified for growth.

6.1.10 In other areas where micro-simulation models are not available, development impacts and mitigation options would normally be tested using traditional junction modelling software such as ARCADY, PICADY and LinSig.

6.1.11 The County Council would however require significant development proposals and potential mitigation options to be analysed using micro-simulation modelling in the following circumstances:-

- The trips associated with the proposal would exceed a threshold of 200 trips generated during the AM, PM or Saturday 3 hour peak periods and is situated in an urban area; or
- The development would create a significant alteration to the highway network; or
- The development is located at a point on the network considered to be of strategic importance; or
- The development is located at a point on the network considered to already be significantly constrained.

6.1.12 A number of the mitigation schemes identified may be delivered/partly delivered by developments that are currently in the planning process. Therefore some schemes may not be required/costs reduced if they are delivered by such developments.

6.1.13 The costs identified for each scheme are indicative and are based on professional opinion and experience of similar types of infrastructure delivery. Once more detailed micro-simulation modelling exercises have been undertaken, the nature and costs associated with mitigation strategies may be more accurately assessed.

6.1.14 Although efforts have been made to provide some contingency within the cost estimates, it should be noted that the location of utilities and acquisition of non-highway or non-developer owned land could significantly alter some of the estimated costs.

6.1.15 The mitigation schemes listed include both site-specific and area wide interventions. There will be derived benefits for public transport through the delivery of network interventions that aid the free flow of traffic on the network.

6.1.16 In addition to this a number of sustainable transport schemes are listed which should complement the Travel Plans for each development. The mitigation schemes described are for major capital schemes and do not include minor schemes such as bus shelter provision, footpaths and pedestrian crossing facilities, nor do they include revenue-based schemes secured through S106 such as provision of additional bus services.

6.1.17 Where a new bus service is required to serve a site or cluster of sites a contribution of approximately £800,000 over five years would be required to deliver a 15 minute bus service. At certain sites there may be opportunity to make minor diversions to existing routes subject to the agreement of the operator, but this is much less likely to be feasible under Scenarios 1 and 2 where development is widely dispersed across the District.

6.1.18 Further work would be required to ascertain the actual bus service provision or other potential transport options such as community buses for each individual site. This work should be undertaken once there is more certainty over the exact location of sites and the level of growth adopted.

6.1.19 Where development sites are clustered it may be possible to achieve a critical mass that enables greater mitigation possibilities. This is especially true in the provision of sustainable travel infrastructure. However, this is less likely under Scenarios 1 and 2 for the reasons previously noted.

6.1.20 Although it is common practice to ensure that the highway network experiences “nil-detriment”, (i.e. is no worse off than prior to completion and occupancy of the proposed development), some of the more major mitigation solutions may actually accrue benefits for the wider network. However, it is inevitable that some areas of the network will experience additional congestion issues as a result of all growth levels.

6.1.21 A number of the mitigation proposals should be considered as a prerequisite for certain sites. An Eastern Relief Road (ERR) option, for example, would be required to support large-scale development on the eastern edge of Stratford-upon-Avon.

6.1.22 An ERR connecting A422 Banbury Road and A439 Warwick Road which includes a third river crossing would provide a distributor road for the development itself and also an alternative route for traffic travelling between the north-east and south-west of Stratford-upon-Avon.

6.1.23 It is highly unlikely that the full ERR alignment described above could be funded or delivered without a minimum quantum of development at this location at the scale envisaged in Scenario 5, (i.e. 2,500 dwellings).

6.1.24 A complete ERR could also provide a viable alternative route for many of the 800 HGVs which currently use Clopton Bridge on an average weekday (7am to 7pm). A significant proportion of these travel between M40 Junction 15/A46 at Longbridge and the B4632 Clifford Lane south of the town.

6.1.25 It should also be noted that large scale housing development to the west of Shottery would require provision of a Western Relief Road (WRR). As noted previously, this would be necessary to provide access to the development itself and would also provide traffic relief in Shottery and the town centre.

6.2 Interventions Required to Deliver the Transport Strategy (within Stratford-upon-Avon)

6.2.1 The following local imperatives underpin the transport strategy which the County Council considers necessary to support the objectives of the LDF Core Strategy and the delivery of development through the various scenarios for development provided by the District Council:-

1. The need for a sustainable transport system to underpin growth, with a focus on public transport, walking, cycling and targeted highway improvements;
2. The need to ensure that any growth proposals support the economy of the District, and do not adversely impact upon it (particularly in terms of congestion);
3. The need for the impact of any transport improvements on the built and natural environment to be minimised (particularly air quality); and
4. The need to ensure that existing and future residents/visitors to the area can access and use the transport network safely and in an integrated way.

6.2.2 Section 5 of this report set out the results of the CITEware analysis of highway impacts relating to each development scenario across the whole District.

6.2.3 The results showed that there were a number of ‘large’ or ‘very large’ impacts mainly outside Stratford-upon-Avon in Scenario 3 (rural brownfield sites) and Scenario 4 (new settlement near Gaydon).

6.2.4 All CITEware scenarios were also shown to have a ‘moderate’ and/or ‘large’ impact within or around Stratford-upon-Avon.

6.2.5 Scenarios 1 and 2 (wider dispersal), for example, would have a large impact on the A3400 Shipston Road south of the A4390 Seven Meadows Road/Trinity Way roundabout and moderate impacts elsewhere in the town in both AM and PM peak periods.

6.2.6 Although some distance away from the town, the rural brownfield site near Long Marston in Scenario 3 would generate a significant number of northbound trips which would have a large impact on the A3400 Shipston Road northbound approach to the A4390 Seven Meadows Road/Trinity Way roundabout during the AM peak.

6.2.7 Scenario 4 (new settlement near Gaydon) would have a moderate impact on several routes in the town including B4086 Tiddington Road. There would also be a large impact on A439 Warwick Road during the AM and PM peaks. In both cases, there would be a significant attraction between the new settlement and Stratford-upon-Avon.

6.2.8 S-Paramics analysis confirmed that due to capacity constraints, a number of areas on the highway network in Stratford-upon-Avon are likely to constrain growth at a very early stage in the Core Strategy period wherever that growth is located or whatever level of growth is assumed.

6.2.9 A package of indicative transport interventions was therefore developed and tested using S-Paramics in Stage 4 of the detailed Stratford-upon-Avon assessment. These are discussed in the next section.

Stage 4 – Stratford-upon-Avon Mitigation Testing

Introduction

6.2.10 The objective of this stage of testing was to establish an overview of the potential performance of the following indicative mitigation strategies.

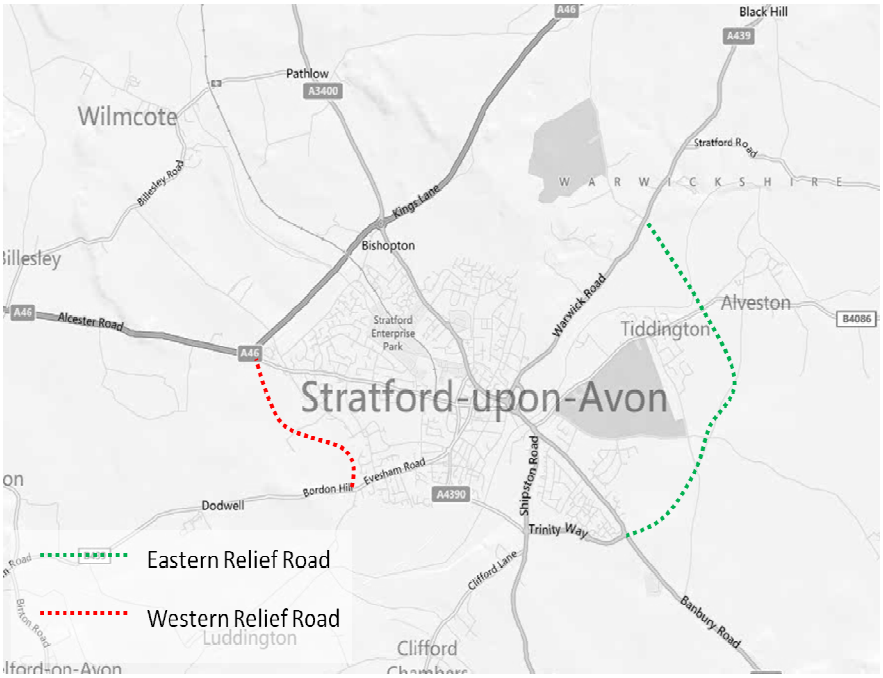
- 2028 Reference plus outline Eastern Relief Road (ERR);
- 2028 Reference plus outline Western Relief Road (WRR);
- 2028 Reference plus Town Centre Improvements (TCI).

6.2.11 The outcome of these tests has been compared against the 2028 TEMPRO High Growth reference scenario. This represents a 'worst case' growth scenario without a specific focus of development in any one area that could potentially bias the outcome of the testing.

6.2.12 The indicative alignment for the Eastern Relief Road (ERR) which includes a third river crossing runs east and north from A4390 Trinity Way to the A439 Warwick Road with junctions at Loxley Road and B4086 Tiddington Road, (see **Figure 6.1** overleaf).

6.2.13 The Western Relief Road (WRR) runs between B439 Evesham Road and A422 Alcester Road as also shown on **Figure 6.1** below. It follows the alignment which has been proposed in support of large scale housing development to the west of Shottery.

Figure 6.1 – ERR and WRR Indicative Alignments



6.2.14 The scenario containing the 'Town Centre' improvements (TCI) aims to alleviate concerns around those areas identified as being severely impacted upon by future growth within the S-Paramics model.

6.2.15 It is anticipated that further detailed analysis would be required to ascertain the likely benefits and feasibility of each individual element of the indicative TCI mitigation scenario. The elements included within this scenario which have all been tested as a single package in S-Paramics is as follows:-

- Signalisation/reconfiguration of the B439 Evesham Road/A4390 Evesham Place roundabout;
- Further signalisation of Bridgeway Gyratory;
- Signalisation/reconfiguration of the A422 Banbury Road/A3400 Shipston Road roundabout;
- Signalisation/reconfiguration of the B4086 Tiddington Road/Swan's Nest Lane/A422 Banbury Road junction near Alveston Manor;
- High Street and A3400 Grove Road become northbound only;
- Rother Street becomes southbound only;

- Reconfiguration of the A3400 Birmingham Road/Windsor Street junction.

6.2.16 The above elements suggest that a number of junctions could potentially be reconfigured, and in many cases possibly converted to traffic signal control particularly where the dominant traffic flow through the existing junction (normally a roundabout) makes it difficult for vehicles from the other approaches to enter the junction safely.

6.2.17 The rationale behind each element including indicative costs is included in **Appendix J**.

6.2.18 Although the above measures have been tested in S-Paramics, they would require a more detailed feasibility assessment before they could be taken forward to detailed design.

Stage 4 – Results Analysis

6.2.19 The first stage of the assessment reviewed three specific indicators so that the effect of each of the schemes on the overall level of network performance could be quantified.

6.2.20 The indicators used were as follows:-

- **Mean delay** - calculated as the average journey time, in seconds, experienced by all vehicle types when travelling through the model network;
- **Total number of vehicles** - total number of vehicles that enter the model network within the simulation period;
- **Mean speed** - calculated as the cumulative average speed for all vehicles within the network, irrespective of the route the vehicles take through the model.

6.2.21 The full set of assessment results is included in Section 9 of the Arup report which accompanies this submission. A summary of these is provided below.

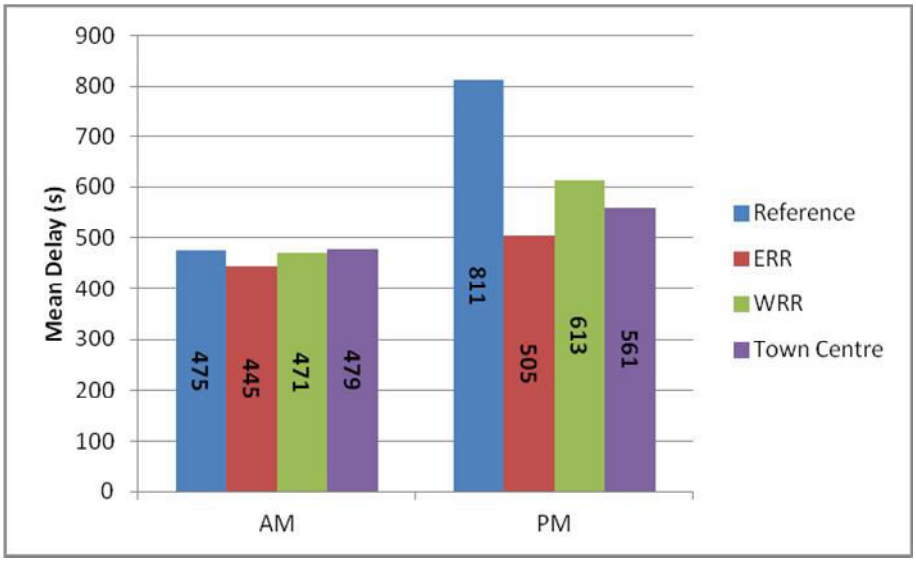
Mean Delay

6.2.22 All three scenarios (ERR, WRR and TCI) have the potential to improve congestion within the Stratford-upon-Avon road network.

6.2.23 The greatest benefits are revealed when assessing the performance of the mitigation measures during the PM peak hour as this is the hour when the network is under the greatest level of stress in terms of the number of vehicle demands.

6.2.24 **Figure 6.2** below shows that the ERR option (red bar) performs significantly better in terms of reducing mean vehicle delays than any other option during both AM and PM peak hours relative to the reference case (blue bar).

Figure 6.2 – Mean Delay



6.2.25 The WRR (green bar) and the TCI (purple bar) options demonstrate an overall reduction in mean delay within the PM peak but little change in the AM.

6.2.26 The ERR has the potential to provide additional capacity adjacent to areas of road network likely to come under the highest levels of stress (i.e. A422 Banbury Road/A3400 Shipston Road, A4390 Evesham Place/B439 Evesham Road).

Total Number of Vehicles

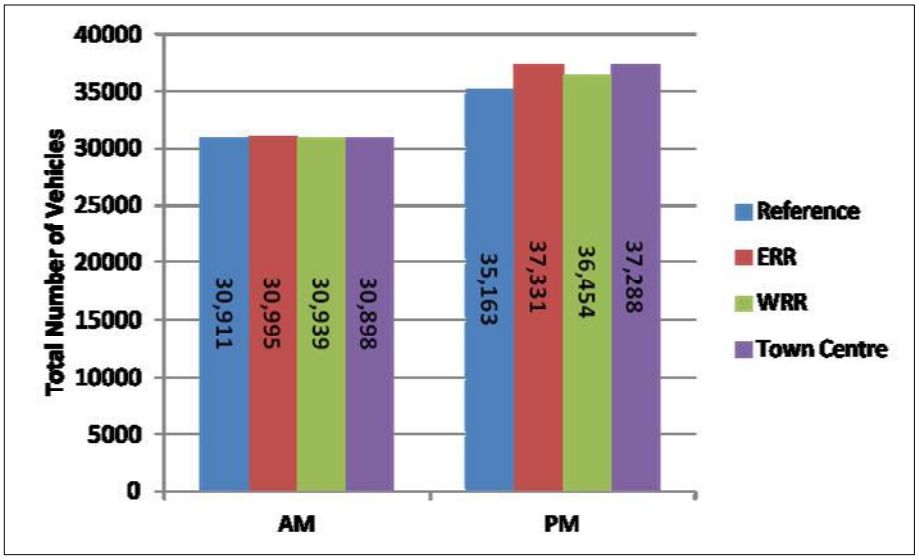
6.2.27 **Figure 6.3** overleaf shows that there is very little difference between any of the scenarios during the AM peak with a similar number of vehicles entering the network.

6.2.28 All three scenarios demonstrate provision of relief within the PM peak hour as each is able to accommodate greater levels of demand than the Reference Case (blue bar).

6.2.29 The ERR (red bar) and TCI (purple bar) schemes appear to result in greater levels of demand being assigned within the model network than the WRR (green bar).

6.2.30 This indicates that, although all three provide relief, the ERR and TCI are more likely to exert a greater influence on the town centre conditions than the WRR.

Figure 6.3 – Total Number of Vehicles



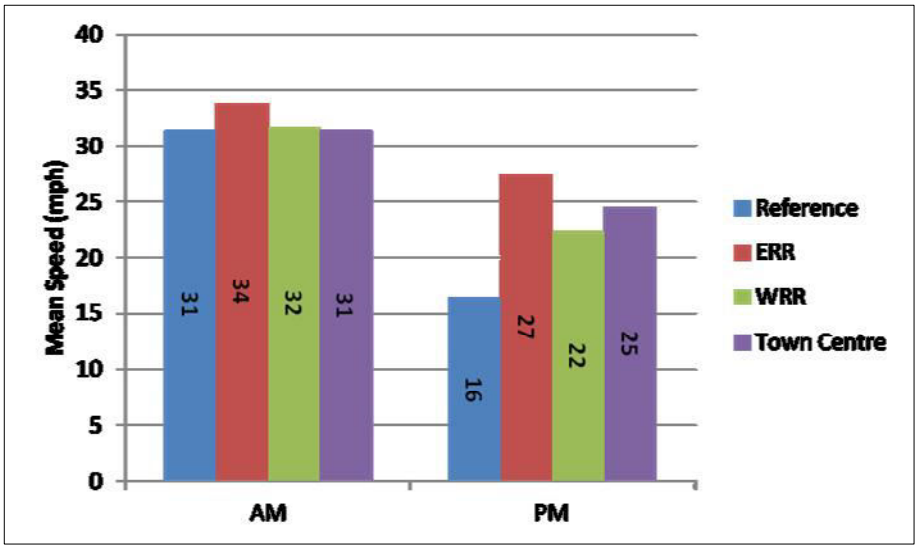
Mean Speed

6.2.31 **Figure 6.4** below shows that during the AM peak hour, the ERR (red bar) results in the largest increase in mean speed whilst there appears to be little difference between the other scenarios.

6.2.32 During the PM peak, implementing each of the scenarios results in an increase in mean speeds relative to the reference case (blue bar).

6.2.33 Again, the ERR (red bar) results in the greatest improvement in conditions. Similarly, the TCI (purple bar) scheme results in a larger increase in speed than the WRR (green bar).

Figure 6.4 – Mean Speed



6.2.34 An analysis of network mean speed plots also shows the following for each mitigation scenario:-

Eastern Relief Road

6.2.35 **Figure 49 in Appendix E of the Arup report** shows that the ERR would significantly improve AM peak inbound mean speeds in the south-eastern quadrant of the town, on Bridgeway Gyratory and in the town centre compared to the 2028 High Growth scenario shown on **Figure 23, Appendix A of the Arup report**.

6.2.36 Similar improvements are apparent during the PM peak as illustrated by comparing **Figures 50 and 24**. There are however still problems in the town centre particularly on the following routes

- Rother Street southbound;
- A4390 Trinity Way westbound approach to the A3400 Shipston Road/A4390 Seven Meadows Road roundabout;
- A422 Alcester Road westbound approach to Wildmoor roundabout.

6.2.37 More detailed analysis of such effects will be required at a later stage should a decision be made to proceed with such a scheme.

Western Relief Road

6.2.38 **Figure 51 in Appendix E of the Arup report** shows that there are very few differences in the performance of the network with the WRR in place when compared to the 2028 high growth Reference case during the AM peak shown on **Figure 23**.

6.2.39 During the PM peak, **Figure 52** shows an improvement of the conditions within the town centre with the WRR in place when compared to the 2028 high growth Reference case during the PM peak shown on **Figure 24**.

6.2.40 In particular, the number of instances where mean speeds drop below 5 mph is reduced considerably. There also appears to be an improvement in the average speeds along A422 Alcester Road eastbound, A3400 Birmingham Road southbound and A439 Warwick Road southbound towards A3400 Bridgeway Gyratory.

6.2.41 Mean speeds on A422 Banbury Road appear to reduce however when compared to the Reference Case.

Town Centre Improvements

6.2.42 **Figure 53 in Appendix E of the Arup report** shows that there is an increase in AM peak mean speeds on the eastbound approaches to the Evesham Place roundabout compared to the 2028 high growth Reference Case during the AM peak shown on **Figure 23**.

6.2.43 AM peak hour mean speeds on A422 Banbury Road northbound appear to have increased but this is accompanied by a reduction in speed along B4086 Tiddington Road towards Alveston Manor with little change in the conditions along A3400 Shipston Road.

6.2.44 AM peak hour mean speeds along Clopton Bridge westbound have increased substantially which indicates that there is now additional capacity along this link that may not be fully realised by the adjacent signal arrangement.

6.2.45 It is recommended that further investigation of the indicative signal arrangement between B4086 Tiddington Road, A3400 Shipston Road and A422 Banbury Road should be undertaken to see if such a scheme is deliverable and whether additional improvements are achievable.

6.2.46 The TCI option appears to demonstrate the greatest level of improvement of PM peak town centre road network conditions of any of the three scenarios as shown by comparing **Figures 54 and 24**.

6.2.47 There also appears to be an increase in mean speeds along A422 Banbury Road northbound, A439 Warwick Road southbound and A3400 Birmingham Road southbound.

6.2.48 However, there is a reduction in mean speeds along A422 Alcester Road eastbound, B439 Evesham Road, D6218 Shottery Road eastbound and A4390 Seven Meadows Road northbound.

6.2.49 This is because the TCI schemes appear to throttle traffic at points just outside of the town centre which allows greater movement within the town centre itself.

6.2.50 The Arup report recommends that a more detailed investigation should be undertaken to ascertain the potential benefit that could be realised by the implementation of the TCI improvements tested within this initial modelling exercise.

Stage 4 – Summary

6.2.51 Whilst no single scenario (ERR, WRR or TCI) delivers a solution to the problems likely to occur within Stratford-upon-Avon when future growth is applied, all of them demonstrate that they have the potential to unlock additional benefits and extend the operational life of the existing highway network in the town.

6.2.52 The greatest benefits are revealed when assessing the performance of the mitigation measures during the PM peak hour as this is the hour when the network is under the greatest level of stress in terms of the number of vehicle demands.

6.2.53 Since all of the tests undertaken thus far demonstrate that the highest levels of stress on the network are to the south east and south of the town, it is reasonable to conclude that implementation of the ERR is likely to unlock the greatest level of benefits.

6.2.54 The TCI option appears to demonstrate the greatest level of improvement of PM peak town centre road network conditions.

6.2.55 The optimum solution is most likely to be the implementation of all three intervention scenarios in one form or another. Whilst this may be very difficult to achieve in practice, it is recommended that at least some elements of the TCI scenario are investigated further due to the potential that these schemes have to complement either the ERR and WRR options should they be brought forward.

6.2.56 An analysis of mean link speeds shows that network capacity constraints become apparent at certain locations within Stratford-upon-Avon as early as 2015.

6.2.57 As more growth is allocated within the model, there is a tendency for these capacity problems to get gradually worse rather than for new issues to arise.

6.2.58 Analysis of the TEMPRO high and medium growth scenarios reveals a number of potential network constraints that are likely to require mitigation to enable future growth to be realised.

6.2.59 The two junctions which appear to consistently constrain growth and experience the most significant levels of congestion irrespective of which growth scenario is applied are as follows:-

- Evesham Place roundabout;
- A422 Banbury Road/A3400 Shipston Road roundabout.

6.2.60 The incremental application of growth suggests that it would be desirable to have all three transport intervention options (ERR, WRR and TCI) in place by 2021 as network performance is poor particularly in the south-east quadrant of the town.

6.2.61 By 2028 at the end of the Core Strategy period, the results suggest that the TCI package would be essential to facilitate growth regardless of where it occurs or what development scenario is assumed.

6.2.62 The ERR has been subject to further analysis in CITEware Scenario 5 in conjunction with Option F, 8,000 dwellings across the District plus large-scale residential development on the eastern edge of Stratford-upon-Avon. This is discussed below.

Stage 5 – Specific Scenario Testing (Stratford-upon-Avon Mitigation Testing)

6.2.63 The objective of Stage 5 is to test the impact of Option F (8,000 dwellings across Stratford-on-Avon District), plus large-scale residential development on the eastern edge of Stratford-upon-Avon (2,500 dwellings) alongside the provision of the ERR referred to in the previous section.

6.2.64 As the level of growth predicted through TEMPRO was lower than in CITEware Scenario 5, it was necessary to reduce the overall level of traffic within the model to maintain a consistent level of growth for all scenarios.

Stage 5 - Results Analysis

Network Performance Indicators (comparison with Scenario 5)

6.2.65 Scenario 5 (Stratford eastern urban extension plus ERR) was also evaluated against the network performance indicators referred to previously (mean delay, total number of vehicles entering the model network and mean speed).

6.2.66 The following scenarios were assessed:-

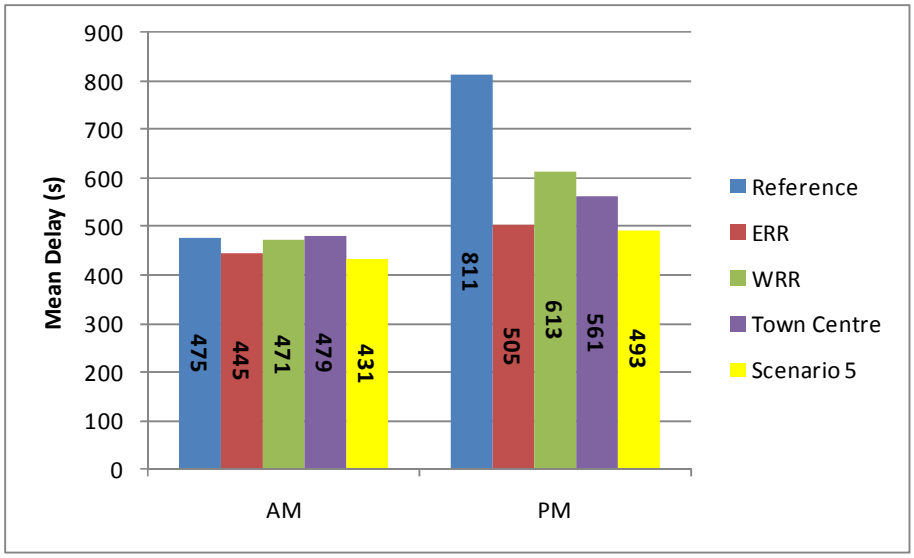
- 2028 TEMPRO High Growth Reference Case;
- 2028 Reference plus outline Eastern Relief Road (ERR);
- 2028 Reference plus outline Western Relief Road (WRR);
- 2028 Reference plus Town Centre Improvements (TCI);
- Scenario 5 - Stratford Eastern Urban Extension plus ERR.

6.2.67 The full set of assessment results is included in Section 11 of the Arup report which accompanies this submission. A summary of these is provided below.

Mean Delay

6.2.68 **Figure 6.5** below reveals there is further potential in Scenario 5 (yellow bar) to reduce the level of delay on the network within both AM and PM model periods.

Figure 6.5 – Mean Delay (including Scenario 5)



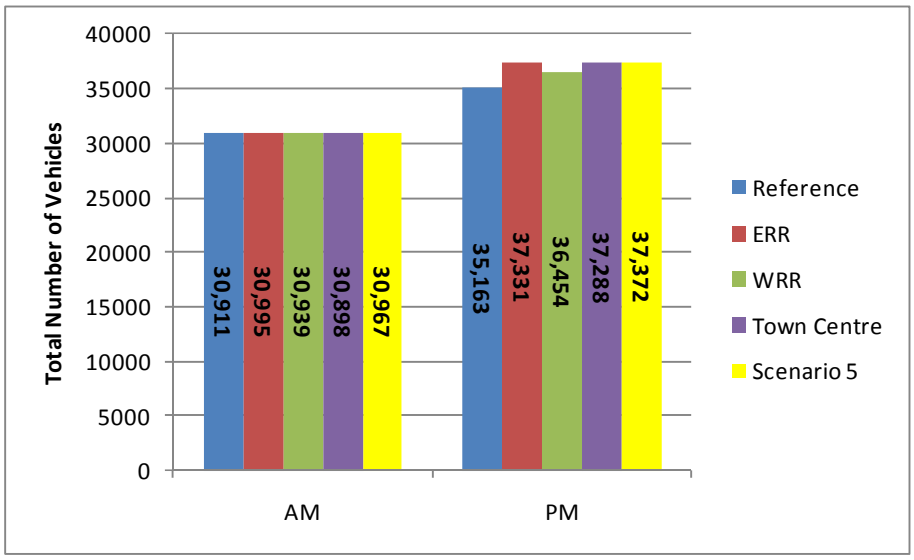
6.2.69 Whilst the reduction described above is comparable to the original ERR option (red bar) within the PM period there is a slightly larger saving achieved within the AM period when considering the outputs from the original ERR Scenario test.

Total Number of Vehicles

6.2.70 **Figure 6.6** overleaf shows that there is little difference in the number of vehicles released during the AM period, indicating that the majority of trips are released onto the network.

6.2.71 During the PM period Scenario 5 performs comparably to the earlier ERR and Town Centre Improvement (TCI) options.

Figure 6.6 – Total Number of Vehicles (including Scenario 5)

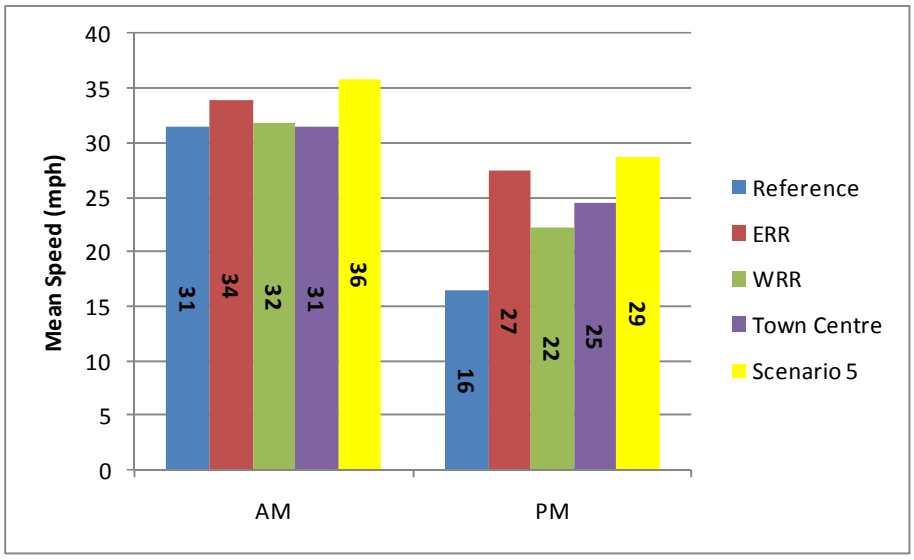


Mean Speed

6.2.72 The Stage 4 analysis has already shown that the ERR was the mitigation option most likely to unlock higher network mean speeds.

6.2.73 It is apparent from **Figure 6.7** below that further improvements in mean speed are achievable when coupling the ERR with a more focussed growth strategy in the form of the Eastern Urban Extension.

Figure 6.7 – Mean Speed (including Scenario 5)



6.2.74 An analysis of network mean speed plots also shows the following for Scenario 5 compared to the 2028 Reference Case high growth scenario:-

2028 AM Network Performance

6.2.75 There are a number of differences between network performance under this scenario (**Figure 55 in Appendix G of the Arup report**) and that for the general 2028 high growth scenario (**Figure 23 in Appendix A of the Arup report**).

6.2.76 There is a significant improvement in mean speed on the following routes:-

- A422 Banbury Road/A3400 Shipston Road roundabout (westbound and northbound approaches);
- A3400 Clopton Bridge north-westbound;
- A3400 Bridgeway Gyratory;
- A439 Warwick Road southbound.

6.2.77 There is however a deterioration in mean speeds on the A3400 Shipston Road northbound approach to its junction with B4632 Clifford Lane.

2028 PM Network Performance

6.2.78 There are a number of differences between network performance under this scenario (**Figure 56 in Appendix G of the Arup report**) and that for the general 2028 high growth scenario (**Figure 24 in Appendix A of the Arup report**).

6.2.79 There is a significant improvement in mean speed on the following routes:-

- A422 Banbury Road/A3400 Shipston Road roundabout (all approaches);
- A3400 Clopton Bridge north-westbound;
- A3400 Bridgeway Gyratory;
- A439 Warwick Road southbound;
- B4086 Tiddington Road;
- B439 Evesham Road eastbound;
- D6218 Shottery Road eastbound;
- Several routes in and around the town centre.

6.2.80 C77 Rother Street, Evesham Place and Windsor Street areas still appear to experience very low mean speeds indicating further mitigation is likely to be required within these areas.

6.2.81 There is also a deterioration in mean speeds on the following routes

- A3400 Shipston Road northbound approach to its junction with B4632 Clifford Lane;
- A4390 Trinity Way westbound approach and A3400 Shipston Road southbound approaches to the A4390 Seven Meadows Road roundabout.

Stage 5 – Summary

6.2.82 The results summarised above show that Scenario 5 would lead to an increase in mean speeds across significant sections of the network when compared to the original 2028 general high growth Reference Case network conditions.

6.2.83 Furthermore, the propensity for the network to lock up in the south east of the town is removed entirely by the implementation of the ERR despite the fact that an additional 2,500 dwellings are allocated within that area.

6.2.84 With the exception of impacts within the Windsor Street/Rother Street/Evesham Place corridor and at the A3400 Shipston Road/B4632 Clifford Lane roundabout, the focussed growth and mitigation strategy in Scenario 5 appears to largely maintain, and in some instances improve, overall network performance.

6.2.85 Analysis of the network performance indicators also reveals that focussing a significant proportion of growth within the Eastern Urban Extension will have the potential to draw traffic growth away from the town centre.

6.2.86 This means that despite the relatively stable number of total vehicles being released onto the network, Scenario 5 growth plus the ERR results in lower levels of mean delay and higher average speeds during both the AM and PM periods.

6.2.87 It should be noted that these benefits are dependent upon a ‘capped’ level of growth within the area being realised and should be investigated further before any firm conclusions are drawn.

6.2.88 The analysis does however suggest that additional network benefits may be unlocked through the allocation of a large proportion of growth within a specific area, especially when supported by new infrastructure such as the ERR, in close proximity.

6.2.89 The ERR would be essential to facilitate growth on the eastern edge of Stratford-upon-Avon and would provide significant additional benefits in the town centre and south-east quadrant of the town.

6.2.90 It is evident from the results that the elements included in the indicative TCI package would still be required alongside the ERR to mitigate conditions in the town centre, particularly on the Windsor Street and Rother Street/Evesham Place corridor during the PM peak period.

6.3 Interventions Required to Deliver the Transport Strategy (outside Stratford-upon-Avon)

Scenario 3 – Scenario F (7,000) plus three large Rural Brownfield Sites near Harbury, Southam and Long Marston

6.3.1 The CITEware results indicate that the main impacts under Scenario 3 would be localised on the highway network and at junctions in the immediate vicinity of the three rural brownfield sites and in nearby rural settlements.

6.3.2 There would also be a significant impact on the routes connecting each site to Stratford-upon-Avon, Leamington Spa and Southam and at M40 Junction 12 north-east of Gaydon on the SRN (no material impacts are predicted within the Studley AQMA).

6.3.3 The potential to mitigate the impacts is discussed below within the context of each site.

Former Engineer Resources Depot near Long Marston

6.3.4 The most significant impacts would be experienced on the B4632 route linking the site with Stratford-upon-Avon.

6.3.5 Improvements are likely to be required at the A3400 Shipston Road/B4632 Clifford Lane roundabout, A4390 Evesham Place roundabout and A3400 Shipston Road/A422 Banbury Road roundabout.

6.3.6 Indicative scheme options for the last two junctions referred to above are included in the Town Centre Improvements (TCI) package. Further assessment work would be required to identify appropriate improvements at the A3400 Shipston Road/B4632 Clifford Lane roundabout.

Former Southam Cement Works south of Long Itchington

6.3.7 The most significant impacts would be experienced on the A423 Coventry Road north of Southam, the A426 Rugby Road north-east of Southam and a short section of the A425 Southam Road between Ufton Hill and the B4452.

6.3.8 The A423 route is a former trunk road and is likely to have sufficient capacity to accommodate the additional traffic, as should the A425 and A426. The A426 comprises very long straight sections of route and is now subject to a 50 mph speed limit.

6.3.9 There may also be impacts on the M40 Junction 12 north-east of Gaydon and thus appropriate mitigation may be required.

Former Harbury Cement Works north west of Bishops Itchington

6.3.10 The most significant impacts would be on the B4451 between M40 Junction 12 north-east of Gaydon and Deppers Bridge north of Bishop's Itchington and on Junction 12 itself.

6.3.11 There would be a very large predicted increase in vehicle trips in Bishop's Itchington itself.

6.3.12 Although there is some frontage development in the centre of the village, there is very little scope to mitigate this increase which would create significant congestion and safety problems.

6.3.13 The existing B4451 priority junction with the B4452 at Deppers Bridge would require improvements and these would need to be assessed using appropriate junction design software.

6.3.14 Further detailed micro-simulation traffic modelling would be required to identify whether additional improvements are necessary at M40 Junction 12 north-east of Gaydon over and above those included in the currently proposed improvement scheme.

Scenario 4 – Scenario F plus Gaydon New Settlement Option

6.3.15 The CITEware results indicated that Scenario 4 would have very large impacts on the highway network in the immediate vicinity of the Gaydon new settlement option, on the routes connecting it to main towns and villages and also on the SRN.

6.3.16 The next section outlines indicative transport interventions likely to be required to address some of these very large impacts and also identifies where the level of impact would not be considered acceptable on highway safety grounds, (i.e. where it would not be feasible to mitigate effectively).

Localised Impacts

6.3.17 The County Council has developed proposals for an improvement scheme to address capacity constraints and highway safety issues at M40 Junction 12 associated with existing and committed employment at JLR/AML at Gaydon.

6.3.18 S-Paramics modelling shows that the proposed improvements would provide sufficient highway and junction capacity for up to 2,600 jobs that are included in extant planning permissions and create capacity for a further 2,400 additional new jobs.

6.3.19 It is possible that the scheme could accommodate some additional development traffic generated by a new settlement option near Gaydon under Scenario 4 as the main impacts associated with JLR/AML occur during the AM pre-peak hour (07:00-08:00).

6.3.20 However, further detailed micro-simulation traffic modelling would be required to identify how much additional development would be feasible at a new settlement option nearby in both AM and PM periods.

B4451 between Gaydon and Bishop's Itchington

6.3.21 **Figures 15 and 16 in Appendix G** show that there would be a very large impact on the B4451 between Gaydon and Bishop's Itchington, with 500 to 1,000 additional vehicles two-way in the AM and PM peak periods (GEH > 10).

6.3.22 A significant proportion of the above increase appears to be routing via C143 Plough Lane and Chesterton Road to access the B4455 Fosse Way.

6.3.23 There is a very large impact on C143 Plough Lane which is already traffic calmed. The additional traffic would be undesirable on safety grounds as there are highway boundary constraints on both sides of the road.

6.3.24 It would therefore appear to be more appropriate to sign vehicles travelling between B4455 Fosse Way and the new settlement via the B4100 where there are already proposals to dual the section between the Gaydon roundabout and JLR site accesses.

B4100 between Gaydon and Chesterton Road north of Lighthorne

6.3.25 **Figures 15 and 16** show a very large increase in additional vehicle trips on the B4100 route between Gaydon roundabout and C96 Chesterton Road north of Lighthorne.

6.3.26 The feasibility of accommodating additional traffic on this route, including those trips which would otherwise use C413 Plough Lane to access B4455 Fosse Way referred to above, would require further detailed micro-simulation traffic modelling should the new settlement option be pursued.

6.3.27 This is because it is highly likely that further mitigation measures would be required on the B4100 beyond those already referred to in the previous section.

Non-SRN Impacts

A452 Banbury Road/Europa Way

6.3.28 **Figures 15 and 16** show that there would be a very large impact on A452 Banbury Road/Europa Way between M40 Junction 13 and D3392 Tachbrook Park Drive, Leamington Spa.

6.3.29 An improvement scheme to address existing capacity and safety problems at the Greys Mallory and Europa Way roundabouts on the A452 corridor is due to be implemented in 2013, (see SRN Impacts for M40 Junction 14 later in this section)**.**

6.3.30 These additional trips plus development pressures in Warwick District could potentially reduce the operational life of the above improvements and lead to a requirement for more extensive mitigation measures.

6.3.31 Should proposals for a new settlement option at Gaydon be pursued further, it is therefore recommended that a combined assessment of its likely impacts be undertaken alongside those for the Warwick District Core Strategy.

B4087 Newbold Road between Wellesbourne and M40 Junction 13

6.3.32 **Figures 15 and 16** show that there would be a very large impact on the B4087 Newbold Road between B4100 Banbury Road and Wellesbourne with 250 to 500 additional vehicles two-way in the AM and PM peak periods (GEH > 10).

6.3.33 The increase referred to above would impact upon the existing B4087/B4100 Banbury Road ghost island priority junction and it is likely that an improvement scheme would be required at this location.

6.3.34 Improvement options could include a roundabout which would potentially provide safety benefits at M40 Junction 13 by slowing down northbound traffic approaching it from the B4100.

6.3.35 Alternatively, traffic signals may be appropriate at this junction if an option for possible signalisation at M40 Junction 13 is put forward in future within the context of the emerging Warwick District Core Strategy.

6.3.36 The CITEware results show that there is also likely to be an impact on the existing priority junction at B4087 Newbold Road and B4086 Kineton Road, Wellesbourne.

6.3.37 Site observations indicate that there is existing queuing on the B4087 arm at this junction during peak periods.

6.3.38 It is therefore recommended that a PICADY assessment would need to be undertaken to assess the need for and scope for possible mitigation measures at this junction should proposals for a new settlement option at Gaydon be pursued further.

Bishop's Itchington

6.3.39 There is a predicted increase of 100-250 additional vehicles two-way through Bishop's Itchington itself.

6.3.40 Although there is some frontage development in the centre of the village, it is unlikely that this level of increase would create significant capacity or safety problems.

SRN Impacts

6.3.41 The CITEware results show that there would be a very large impact on the M40 between Junction 12 north of Gaydon and Junction 15 at Longbridge. The implications of Scenario 4 on these junctions and those which lie between them are considered below.

M40 – Junction 12 (north-east of Gaydon)

6.3.42 M40 Junction 12 is an all movements junction which experiences significant capacity and safety problems during the AM period between 07:00-08:00.

6.3.43 Junction capacity at the southbound off-slip priority junction is inadequate and queues stretch back onto the hard shoulder of the motorway.

6.3.44 As traffic volumes increase during the peak, exit blocking is also experienced at Gaydon roundabout and then on the Junction 12 off-slips compounding the problem. This can result in queuing on the southbound hard shoulder of up to 2km.

6.3.45 **Figure 13 in Appendix G** indicates that a large number of vehicle trips from the new settlement option near Gaydon would use the M40 Junction 12 northbound on-slip during the AM peak (08:00-09:00).

6.3.46 Although this period does not directly correspond with the current localised peak period (07:00-08:00), there will be some overlap and therefore further more detailed micro-simulation modelling would be required to assess the likely impact.

6.3.47 **Figure 14 in Appendix G** also shows that a large number of vehicle trips from the new settlement would use the southbound off-slips during the PM peak.

6.3.48 The proposed improvement scheme referred to previously would provide additional capacity but further detailed micro-simulation modelling would also be required to assess the likely impact.

M40 – Junction 13

6.3.49 At M40 Junction 13, there is an off-slip for northbound traffic leaving the motorway and an on-slip for southbound traffic joining it. These slip roads are however very short due to the proximity of the B4087 over-bridge approximately 0.5 km south-east of Junction 13.

6.3.50 **Figure 13 in Appendix G** indicates that a very large number of vehicle trips from a new settlement option near Gaydon are likely to exit the M40 at the Junction 13 northbound off-slip for access onto the B4087 towards Wellesbourne and the A452 towards Warwick and Leamington Spa.

6.3.51 The above increase in vehicle movements could potentially create capacity and safety issues at Junction 13 with the potential for traffic to queue back onto the motorway.

6.3.52 If the new settlement option near Gaydon is to be pursued, a more detailed analysis of existing capacity constraints and identification of possible mitigation options would need to be undertaken using the County Council's S-Paramics models of the M40 between Junctions 12 and 14.

6.3.53 This analysis would also need to consider the effects of further possible development to the south of Warwick and Leamington Spa which may arise in future.

M40 – Junction 14

6.3.54 At M40 Junction 14, there is an on-slip for northbound traffic joining the motorway and an off-slip for southbound traffic leaving it.

6.3.55 However, the distance between Junctions 14 and 15 is very short and this creates merging problems when vehicles wishing to exit the motorway at J15 are moving into the inside lane at the same time as vehicles are entering from the northbound on-slip at Junction 14.

6.3.56 **Figure 13 in Appendix G** indicates that a very large number of northbound vehicle trips from a new settlement option near Gaydon are likely to travel through exit the M40 at Junction 15 which could potentially exacerbate the above problem during the AM peak.

6.3.57 There are also capacity and safety problems on the southbound off-slip at M40 Junction 14. Between 07:20 and 08:50 AM, traffic queues back along the southbound off-slip onto the hard shoulder of the M40 due to capacity constraints at the Greys Mallory and Heathcote roundabouts on A452 Europa Way and an early peak movement related to JLR/AML commuters.

6.3.58 An improvement scheme to address existing capacity and safety problems at this location has been developed for both roundabouts and is due to be implemented in 2013/14.

6.3.59 As noted previously, however, there will be a large number of additional vehicle trips heading north into Warwick and Leamington Spa on A425 Banbury Road and A452 Europa Way respectively from the new settlement option at Gaydon.

6.3.60 These additional trips plus development pressures in Warwick District which may arise in future could potentially reduce the operational life of the above improvements and lead to a requirement for more extensive mitigation measures.

6.3.61 Should proposals for a new settlement option at Gaydon be pursued further, it is therefore recommended that a combined assessment of its likely impacts be undertaken alongside those for the Warwick District Core Strategy in partnership with the Highways Agency.

M40 – Junction 15 (Longbridge)

6.3.62 M40 Junction 15 (Longbridge) is a strategic junction where it meets the A46 and A429 south of Warwick.

6.3.63 A major improvement to this junction was recently implemented which provides a bypass for the A46 to avoid the roundabout with the M40 and A429. The circulatory carriageway of the roundabout has also been widened from three to four lanes.

6.3.64 **Figures 13 and 14** referred to previously indicate that a very large number of vehicle trips generated by Scenario 4 would pass through the junction to/from the A46 north to Warwick and A46 south to Stratford-upon-Avon.

6.3.65 The impact of this additional traffic on the junction which is partially signalised would need to be assessed in more detail should the proposals for a new settlement near Gaydon be pursued.

A46 Marraway Roundabout

6.3.66 This roundabout provides access to Stratford–upon-Avon via the A439 Warwick Road.

6.3.67 **Figures 13 and 14** referred to previously indicate that a very large number of vehicle trips generated by Scenario 4 would pass through this junction via A439 Warwick Road to/from Stratford-upon-Avon.

6.3.68 This junction is therefore likely to require mitigation measures which could include improved lane markings and signing, (to encourage use of both lanes on the northbound approaches from the A46 and A439), and possibly an enlarged circulatory carriageway on the roundabout itself.

6.3.69 The impact on this roundabout and scope for mitigation should therefore be considered in more detail using the County Council's S-Paramics micro-simulation traffic model should the new settlement option near Gaydon be pursued further.

6.3.70 It is worth pointing out that in an attempt to increase usage of Stratford Park and Ride at Bishopton, the County Council arranged for signing on the A46 southbound approach to the roundabout to be changed approximately five years ago.

6.3.71 The revised signing directs "local traffic" onto the A439 Warwick Road and Stratford-upon-Avon traffic including P&R onto the A46 south. It is likely therefore that a proportion of trips generated by Scenario 4 may therefore take the latter option and access Stratford-upon-Avon via A46 southbound and A3400 Birmingham Road.

A46 Stanks Roundabout

6.3.72 This roundabout provides access to Warwick via A425 Birmingham Road and Solihull via the A4177.

6.3.73 **Figures 13 and 14** referred to previously indicate that a large number of vehicle trips generated by Scenario 4 would pass through this junction to to/from Warwick.

6.3.74 The junction is due to be improved as part of committed expansion proposals at the Opus 40 (IBM) employment site off the A425 Birmingham Road in Warwick.

6.3.75 It is recommended therefore that the additional impact on this roundabout (committed scheme) should be assessed in S-Paramics should the new settlement option near Gaydon be pursued further.

A46 Bishopton Roundabout

6.3.76 The Stratford-upon-Avon detailed assessment results showed that Scenarios 2 and 3 would have an impact on the A46 westbound approach to Bishopton Roundabout.

6.3.77 It is recommended therefore that the impact on this roundabout should be investigated in more detail using the Stratford-upon-Avon S-Paramics model should either of these Scenarios be pursued.

6.4 Other Modal Shift Mitigation Strategies (not included in transport interventions)

6.4.1 Encouraging modal shift is a key strategy aimed at reducing the impact of the proposed growth within the District on the highway network. An approach combining "sticks and carrots" to influence modal shift is recommended. Options to complement "Travel Plans" (a package of tailored measures developed by schools or employers to encourage parents or staff to use alternatives to single-occupancy car use) could include:-

Sticks

- Preferential business rates for those employers that can demonstrate significant shifts in employee travel behaviour.
- Parking tariffs for employee parking.

Carrots

- Subsidised employee bus shuttles from all rail stations to build on the success of the National Grid shuttle bus.
- Subsidised commuter bus shuttles to all rail stations.

- Long distance virtual P&Rs and staff bus schemes.
- Area wide car share databases.
- Further investment in Smarter Choices.

6.4.2 Smarter Choices are 'soft' measures that seek to influence people's travel behaviour away from car use towards more sustainable modes of transport. They are aimed at helping people to choose to reduce their car use while enhancing the attractiveness of more sustainable alternatives, such as walking, cycling and public transport. Examples of such measures include:-

- Workplace and School Travel Plans;
- Personalised travel planning;
- Travel awareness campaigns;
- Public transport information and marketing;
- Car clubs;
- Car sharing schemes;
- Teleworking, teleconferencing and home shopping

6.4.3 'Smarter Choices' measures have an integral role in complementing 'hard' infrastructure improvements, which alone are unlikely to generate significant behaviour change.

6.4.4 Information, promotion, marketing and other supporting measures are key to successful schemes aimed at increasing use of sustainable transport and reducing single-occupancy car journeys through improving knowledge, perceptions and choice of alternative modes of transport. Research by Sustrans shows that lack of information about alternative modes such as cycling and public transport, and motivation to try them, are key barriers to change.

6.4.5 The DfT published the results of a major study to examine whether large-scale programmes of Smarter Choices initiatives or 'soft' transport policy measures could potentially deliver substantial reductions in car use.

6.4.6 The final study report[7] suggested that, within approximately 10 years, smarter choices measures have the potential to reduce national traffic levels by about 11% with reductions of up to 21% of peak period urban traffic under a 'high-intensity' scenario.

6.4.7 The report also pointed out that the success of the above measures would be dependent upon supportive measures including the re-allocation of road capacity and other measures to improve public transport service levels, parking control, traffic calming, pedestrianisation, cycle networks, congestion charging or other traffic restraint, other use of transport prices and fares, speed regulation, or stronger legal enforcement measures.

6.4.8 Each measure should work on the three principles of (i) 'inform'; (ii) 'enable'; and (iii) 'promote' with resources and interventions tailored to the individual needs of the target audience and proximity to the development(s).

6.4.9 Example activities for each of the three principles include, but are not limited to:-

- Inform - provide route maps, timetable information, travel advice;
- Enable - 'taster' public transport tickets, travel training services, marketing offers;
- Promote - destination advertising, discount (e.g. 2 for 1 via rail) promotions, public transport launch events.

[7] Smarter Choices – Changing the Way We Travel – Final report of the research project: The influence of soft factor interventions on travel demand', July 2004 http://www.dft.gov.uk/publications/smarter-choices-changing-the-way-we-travel-main-document/#

6.5 Initial Assessment of Deliverability

6.5.1 The initial assessment contained in this report suggests that it would be possible to mitigate the impact of each scenario to varying degrees, with the exception of the rural brownfield site option for Harbury Cement Works in Scenario 3 where the results show an unacceptable level of traffic increase in Bishop's Itchington.

6.5.2 There would also be potentially significant challenges in terms of developing and securing funding for an effective mitigation strategy for the M40 and surrounding routes in the case of Scenario 4.

6.6 Managing Risk

6.6.1 The County Council has sought to identify and manage risk during the STA process and will continue to do so as the Core Strategy is further progressed. Examples of the current and proposed approach are set out below:-

- Early discussions with District Council officers regarding the LDF Draft Core Strategy and timely submissions on transport issues throughout its development;
- Opportunities for joint working with the Highways Agency, Warwick District Council and Redditch Borough Council to identify appropriate mitigation measures for any cumulative impacts which may arise as a result of proposed housing and employment growth within those areas;
- To seek agreement with the respective developers and the Highways Agency regarding the use of appropriate S-Paramics models covering appropriate areas within and around the District to include agreement on vehicle trip rates/distribution and public transport assumptions;
- Carrying out timely discussions with other organisations regarding potential transport interventions and measures;
- Working in partnership with the District Council to deliver a comprehensive cycle network;
- Commenting and advising on the technical work in support of proposals for major infrastructure delivery;
- Possibility of undertaking work on key measures to help support the transport network of the towns and the LDF housing and employment growth. This may include the assessment of public transport improvements and the design of key mitigation infrastructure.
- Advising developers on measures to encourage modal shift.

6.6.2 It is envisaged that further detailed work will be undertaken in conjunction with developers, public transport providers and authorities and the Highways Agency to develop a comprehensive Transport Infrastructure Delivery Plan prior to the LDF Core Strategy Examination in Public to further reduce any remaining elements of risk.

6.7 Funding

6.7.1 The indicative package of Town Centre Improvements (TCI) identified in section 6.2 of this report for Stratford-upon-Avon have undergone a preliminary cost assessment.

6.7.2 The total indicative cost for the TCI measures is estimated to be £3.75m at 2012 prices although this may be subject to change as individual scheme elements are further developed.

6.7.3 The evidence presented in this report indicates that all five development are likely to require transport interventions in Stratford-upon-Avon to mitigate their impact.

6.7.4 It is anticipated therefore that funding for TCI measures could be secured through a District-wide Community Infrastructure Levy (CIL) type charging scheme.

6.7.5 This approach would be necessary to ensure that the cumulative impacts of future developments can be mitigated (i.e. no single development may trigger the requirement for a mitigation scheme itself, however the combined impacts of several developments may trigger this need and therefore a charging structure is required).

6.7.6 It is anticipated that the total cost of providing an Eastern Relief Road (ERR) option along the indicative alignment outlined in this report is likely to be in the order of £44m at 2012 prices.

6.7.7 It is highly unlikely that the full ERR alignment could be funded or delivered without a minimum quantum of development at this location at the scale envisaged in Scenario 5, (i.e. 2,500 dwellings).

6.7.8 It is envisaged that a significant element of the ERR could potentially be funded by the promoter of such development in order to provide access to the surrounding highway network. This would potentially reduce the cost of the scheme.

6.7.9 The section of route thus provided would need to be designed to an appropriate standard and on a suitable alignment so that it could form part of a wider ERR scheme to provide traffic relief in the town centre.

6.7.10 A potential funding opportunity could be through major scheme funding for the remaining section which would include a new river crossing. It is highly unlikely however that such a scheme could be included in the forthcoming tranche (2015-2019) as it would need to be worked up in more detail.

6.7.11 The Western Relief Road (WRR) is due to be provided by the promoter of large scale housing development to the west of Shottery. As noted previously, this would be necessary to provide access to the development itself and would also provide traffic relief in Shottery and the town centre.

6.7.12 Following refusal of planning permission by the District Council in September 2011, the application has been considered by the Planning Inspectorate following an appeal by the developer earlier this year. The outcome of this appeal is currently expected towards the end of 2012.

6.7.13 It should be noted that the costs referred to above are based on current prices and reflect experience of broadly similar transport improvement schemes elsewhere in Warwickshire. No detailed cost estimates have been produced at this stage. Although an element of contingency is included in the cost estimates, the existence of utility services and purchasing of third-party land can substantially increase costs.

6.7.14 Where mitigation measures have not yet been identified, (e.g. for possible route or junction improvements outside Stratford-upon-Avon associated with Scenarios 3 and 4), it is anticipated that funding would need to be secured through S106/S278 agreements.

7 Conclusions and Further Work

7.1 Conclusions

7.1.1 This STA report has identified the high-level transport and accessibility impacts of proposed broad locations for development and outlined a set of indicative transport interventions required to support them with broad cost estimates for delivery.

7.1.2 It has been demonstrated that regardless of where growth occurs or what development scenario is assumed, there would be potentially detrimental impacts on the local highway network within and around Stratford-upon-Avon.

7.1.3 The results show that a Town Centre Improvement (TCI) package in Stratford-upon-Avon and new highway infrastructure in the form of an Eastern Relief Road (ERR) including provision of a third river crossing and a Western Relief Road (WRR) to the west of Shottery are likely to provide significant congestion relief in the town.

7.1.4 The greatest benefits are revealed when assessing the performance of the mitigation measures during the PM peak hour as this is the hour when the network is under the greatest level of stress in terms of the number of vehicle demands.

7.1.5 Since all of the tests undertaken thus far demonstrate that the highest levels of stress on the network are to the south east and south of the town, it is reasonable to conclude that implementation of the ERR is likely to unlock the greatest level of benefits.

7.1.6 The TCI option appears to demonstrate the greatest level of improvement of PM peak town centre road network conditions.

7.1.7 The optimum solution is most likely to be the implementation of all three intervention scenarios in one form or another. Whilst this may be very difficult to achieve in practice, it is recommended that at least some elements of the TCI scenario are investigated further due to the potential that these schemes have to complement either the ERR and WRR options should they be brought forward.

7.1.8 An analysis of mean link speeds shows that network capacity constraints become apparent at certain locations within Stratford-upon-Avon as early as 2015.

7.1.9 As more growth is allocated within the model, there is a tendency for these capacity problems to get gradually worse rather than for new issues to arise.

7.1.10 Analysis of the TEMPRO high and medium growth scenarios reveals a number of potential network constraints that are likely to require mitigation to enable future growth to be realised.

7.1.11 The two junctions which appear to consistently constrain growth and experience the most significant levels of congestion irrespective of which growth scenario is applied are as follows:-

- Evesham Place roundabout;
- A422 Banbury Road/A3400 Shipston Road roundabout.

7.1.12 The incremental application of growth suggests that it would be desirable to have all three transport intervention options (ERR, WRR and TCI) in place by 2021 as network performance is poor particularly in the south-east quadrant of the town.

7.1.13 By 2028 at the end of the Core Strategy period, the results suggest that the TCI package would be essential to facilitate growth regardless of where it occurs or what development scenario is assumed.

7.1.14 The ERR would be essential to facilitate growth on the eastern edge of Stratford-upon-Avon and would provide significant additional benefits in the town centre and south-east quadrant of the town.

7.1.15 It is evident from the results that the elements included in the indicative TCI package would still be required alongside the ERR to mitigate conditions in the town centre, particularly on the Windsor Street and Rother Street/Evesham Place corridor during the PM peak period.

7.1.16 Scenario 3 (Option F - 7,000 dwellings + 800 at each of the three rural brownfield sites) would have significant localised impacts in the vicinity of each site and also on routes connecting them to main settlements.

7.1.17 It has been shown that there would be very little scope to mitigate the potentially significant impacts of development in Bishop's Itchington associated with development at the former Harbury Cement Works in Scenario 3 due to physical constraints in the village.

7.1.18 Scenario 4 (Option F 8,000 dwellings + new settlement in the vicinity of Gaydon) is likely to require further mitigation over and above that already proposed at M40 Junction 12 north-east of Gaydon, subject to the results of further assessment work which would need to be undertaken if this option is pursued.

7.1.19 The results indicate that Scenario 4 is also likely to have a detrimental impact on other junctions (i.e. Junctions 13, 14 and 15 of the M40), on the A46 (e.g. Stanks and Marraway Roundabouts) and on the local road network (e.g. A452 Banbury Road/Europa Way roundabout).

7.1.20 In summary, the results of the accessibility assessment show a broadly adequate level of public transport accessibility overall, but a poorer level in some of the villages to the north and west of Stratford-upon-Avon and in outlying areas in the south of the District.

7.1.21 The five development scenarios have a generally adequate level of accessibility overall, but Scenarios 1 and 2 (wider dispersal) score relatively poorest compared to the other scenarios.

7.1.22 It should be noted that the accessibility assessment does not cover smaller rural settlements outside the definition of Local Service Villages as these were not included in the CITEware analysis.

7.1.23 Accessibility from these smaller rural settlements is generally very poor as there is little if any conventional public transport available.

7.1.24 Where community transport services are available, it should be noted that these require revenue support which is likely to come under increasing pressure in future. They also rely heavily on dedicated individuals and local support which experience shows is unlikely to be available on a sufficiently reliable basis in all areas of need.

7.1.25 In view of this, from a transport accessibility perspective, it would be inadvisable to promote a wider dispersal policy on the presumption that community minibus schemes would come into existence.

7.2 Further Work

Accessibility Analysis

7.2.1 The County Council is undertaking further accessibility analysis to ascertain the following information:-

- Number of direct buses from home origin to main settlements (07:00 – 09:00);
- Number of direct return buses from main settlements to home origin (16:30 – 18:30).

7.2.2 The home origins referred to in this context are defined as Stratford-upon-Avon, Main Rural Centres and Local Service Villages.

7.2.3 The main settlements (or destinations) referred to in this context are the following employment centres:-

- Banbury;
- Daventry;
- Evesham;
- Solihull;
- Warwick/Leamington Spa;
- Redditch;
- Rugby.

7.2.4 The results of the above analysis will be provided to the District Council in due course.

Transport Interventions (Stratford-upon-Avon)

7.2.5 It is recommended that the indicative Town Centre Improvements (TCI) for Stratford-upon-Avon are investigated further due to the potential that these schemes have to complement either the Eastern Relief Road (ERR) and Western Relief Road (WRR) options should they be brought forward.

7.2.6 As noted previously, the assessment results show that the ERR would provide significant benefits in the town centre and in the south-west quadrant of the town during the PM peak.

7.2.7 There would also be additional benefits if the ERR was provided in conjunction with large-scale development to the east of the town and it would be essential to facilitate growth in this area.

7.2.8 It should be noted that these benefits are dependent upon a 'capped' level of growth within the area being realised and should be investigated further before any firm conclusions are drawn.

7.2.9 The analysis does however suggest that additional network benefits may be unlocked through the allocation of a large proportion of growth within a specific area, especially when supported by new infrastructure such as the ERR, in close proximity.

7.2.10 The Stratford-upon-Avon detailed assessment results showed that Scenarios 2 and 3 would have an impact on the A46 westbound approach to Bishopton Roundabout.

7.2.11 It is recommended therefore that the impact on this roundabout should be investigated in more detail using the Stratford-upon-Avon S-Paramics model should either of these Scenarios be pursued.

Transport Interventions (Wider District)

7.2.12 Scenario 3 (Option F (7,000 dwellings) + 800 at each of the three large rural brownfield sites near Harbury, Southam and Long Marston) would have significant localised impacts and on routes connecting them to main settlements.

7.2.13 Further work (possibly including Congestion Reference Flow (CRF) analysis to ascertain highway link capacity constraints) would be required to identify appropriate transport interventions to mitigate these impacts if they are to be brought forward for development.

7.2.14 Further detailed micro-simulation traffic modelling would also be required to identify whether additional improvements are necessary at M40 Junction 12 north-east of Gaydon over and above those included in the currently proposed improvement scheme.

7.2.15 The County Council has developed proposals for an improvement scheme to address capacity constraints and highway safety issues at M40 Junction 12 associated with existing and committed employment at JLR/AML at Gaydon.

7.2.16 As noted previously in this report, the proposed improvements would provide sufficient highway and junction capacity for up to 2,600 jobs that are included in extant planning permissions and create capacity for a further 2,400 additional new jobs.

7.2.17 It is possible that the scheme could accommodate some additional development traffic generated by **Scenario 4 (Option F (8,000 dwellings) + 5,000 at a new settlement near Gaydon)** as the main impacts associated with JLR/AML occur during the AM pre-peak hour (07:00-08:00).

7.2.18 However, further detailed micro-simulation traffic modelling would be required to identify how much additional development would be feasible in both AM and PM periods at M40 Junctions 12, 13, 14 and 15.

7.2.19 Additional development traffic associated with a new settlement plus development pressures in Warwick District could also potentially reduce the operational life of proposed improvements due to be implemented in 2013 at the Greys Mallory and A452 Europa Way roundabouts and lead to a requirement for more extensive mitigation measures.

7.2.20 Further junction improvements are also likely to be required on other parts of the strategic and local road network as follows (subject to further detailed assessment):-

- B4100 between Gaydon and Chesterton Road north of Lighthorne;
- B4451 between Gaydon and Bishop's Itchington;
- B4087/B4100 Banbury Road ghost island priority junction south of M40 Junction 13;
- B4087 Newbold Road/B086 Kineton Road priority junction, Wellesbourne;
- A46 Marraway Roundabout;
- A46 Stanks Roundabout.

7.2.21 Should proposals for a new settlement option at Gaydon be pursued further, it is therefore recommended that a combined assessment of its likely impacts be undertaken alongside those for the Warwick District Core Strategy in partnership with the Highways Agency.

Public Transport Studies

7.2.22 Further work would be required to ascertain the actual bus service provision or other potential transport options such as rail services and community buses for each individual site once these are identified. This work should be undertaken once there is more certainty over the exact location of sites and the level of growth adopted.

7.2.23 Where development sites are clustered it may be possible to achieve a critical mass that enables greater mitigation possibilities. This is especially true in the provision of sustainable travel infrastructure. However, this is less likely under Scenarios 1 and 2 for the reasons previously noted.

Costing and Feasibility Assessment of Transport Interventions

7.2.24 Initial estimates covering the mitigation requirements for the five development Scenarios have been provided within this document.

7.2.25 Once there is more certainty over the locations of sites and levels of growth more detailed testing of mitigation requirements can be undertaken. This will inform the actual mitigation requirements.

7.2.26 When the actual mitigation requirements are defined, further work on the costing and feasibility of the transport interventions can be undertaken.

7.2.27 Where substantial mitigation requirements are proposed with significant construction of infrastructure, it may be appropriate to undertake preliminary feasibility studies on individual schemes.

Detailed Modelling of Preferred Option using S-Paramics

7.2.28 The effects of modal choice, time period choice (except to an extent within the S-Paramics analysis in Stratford-upon-Avon by application of peak-spreading assumptions), and other measures that influence travel behaviour have not been considered in the traffic modelling undertaken thus far.

7.2.29 To make a more informed assessment which considers all these points, it is recommended that further traffic modelling is undertaken when there is more certainty over the level and location of growth.

Appendices

Appendix A - Glossary and Abbreviations

Annual Average Daily Traffic (AADT) - is the total volume of vehicle traffic of a highway or road for a year divided by 365 days

Accession - An alternative software for analysing accessibility to goods and services.

Air Quality Action Plan (AQAP) - A document which sets out the actions needed to address known air quality problems within an Air Quality Management Area.

Air Quality Management Area (AQMA) - A geographical area which is declared by a Local Authority where air quality has deteriorated below a set of defined National and European standards.

CITEware - see Appendix F

Committed Development - A development site that has been granted planning permission.

Community Infrastructure Levy (CIL) - A new levy that local authorities in England and Wales can choose to charge on new developments in their area. The money can be used to support development by funding infrastructure that the council, local community and neighbourhoods want - for example new or safer road schemes, park improvements or a new health centre. The system is very simple. It applies to most new buildings and charges are based on the size and type of the new development.

Congestion Reference Flow (CRF) - The CRF of a link is an estimate of the Annual Average Daily Traffic (AADT) flow at which the carriageway is likely to be congested at peak periods on an average day. For the purposes of calculating the CRF, 'congestion' is defined as a situation when the hourly traffic demand exceeds the maximum sustainable hourly throughput of the link. At this point the effect on traffic is likely to be one or more of the following: flow breaks down with speeds varying considerably, average speeds drop significantly, the sustainable throughput is reduced and queues are likely to form. This critical flow level can vary from day to day and from site to site and must be considered as an average. The CRF is a measure of the performance of a road link between junctions."

si a

Department for Transport (DfT) - An arm of National Government that sets policy for aviation, roads, rail and shipping. It is also responsible for a number of Executive Agencies including the Highways Agency.

DfT Design Manual for Roads and Bridges (DMRB) - A series of 15 volumes that provide official standards, advice notes and other documents relating to the design, assessment and operation of trunk roads, including motorways in the United Kingdom.

DfT National Transport Model (NTM) - The NTM is a disaggregated multi-modal model of land-based transport in Great Britain (GB). It comprises six modes - car driver, car passenger, rail, bus, walk and cycle. The NTM combines a wealth of information taken from a range of sources and produces forecasts of road traffic growth, vehicle tailpipe emissions , congestion and journey times.

DfT NI167 - DfT National indicator data for calculation of morning peak speeds and congestion. In its raw format, satellite navigation logs from in-car systems can be used to calculate speeds and journey times across any given time period and route.

Development Plan Documents (DPD) - Development Plan Documents outline the key development goals of the local development framework. Development plan documents taken together are broadly equivalent to the old-style local plans.

DirectRoute – See Appendix B

Enterprise Zone (EZ) - A specific geographical area that has been designated by Government, where businesses are entitled to receive various types of financial aid. These include tax benefits, special financing and other incentives designed to encourage businesses to establish and maintain a presence within the specified zone.

DoH - Department of Health

Examination in Public (EiP) - formal examination in the public arena by the planning inspectorate in relation to the the draft submission of the Borough Plan. This will take into account evidence from all interested parties and will cover all elements of the plan including roads, education, environment and utilities.

GEH - The GEH Statistic is a formula used in traffic engineering, traffic forecasting, and traffic modelling to compare two sets of traffic volumes. Using the GEH Statistic avoids some pitfalls that occur when using simple percentages to compare two sets of volumes. This is because the traffic volumes in real-world transportation systems vary over a wide range. For example, the mainline of a motorway might carry 5000 vehicles per hour, while one of the on-ramps leading to the freeway might carry only 50 vehicles per hour (in that situation it would not be possible to select a single percentage of variation that is acceptable for both volumes). The GEH statistic reduces this problem; because the GEH statistic is non-linear, a single acceptance threshold based on GEH can be used over a fairly wide range of traffic volumes. The use of GEH as an acceptance criterion for travel demand forecasting models is

recognised in the UK Highways Agency's Design Manual for Roads and Bridges (DMRB), Volume 12, Section 2

Ha - Hectares of land

Highways Agency (HA) - An Executive Agency of Government responsible for managing the motorway and trunk road network within England.

Infrastructure Delivery Plan (IDP) - A key element of the Development Plan which sets out the infrastructure that is essential to allow the spatial proposals contained within the Core Strategy to come forward.

Local Development Framework (LDF) - The Local Development Framework sets out the spatial planning strategy for an area, and is produced by the relevant Local Planning Authority. These have replaced the previous system of county level structure plans, district level local plans and unitary development plans for unitary authorities.

Local Transport Plan (LTP) - Local transport plans, which typically consist of a strategy element and a local implementation plan for transport, are an important part of transport planning in England. Strategic transport authorities (county councils, unitary authorities, passenger transport authorities and London Borough councils), are expected to prepare them as forward-looking plans covering a number of years (typically five years), and present them to the Department for Transport (DfT).

Modal Shift – the change in user choice between modes of travel, usually towards a more sustainable mode. e.g. using cycles instead of cars.

NTM - See DfT NTM.

Office of National Statistics (ONS) - independent body charged with the collection and publication of statistics related to the economy, population and society of the United Kingdom at national and local levels.

PT - Public Transport.

Regional Growth Fund (RGF) - A £1.4bn fund operating across England from 2011 to 2014 which supports projects and programmes that lever private sector investment, creating economic growth and sustainable employment. It aims particularly to help those areas and communities currently dependent on the public sector to make the transition to sustainable private sector-led growth and prosperity.

S106 agreement - A legal agreement between a Local Planning Authority and an applicant/developer, as set out in S106 of the Town and Country Planning Act 1990 (as amended by Planning and Compensation Act 1991 Section 12). Planning Obligations are used following the granting of planning permission (normally major developments) to secure community infrastructure to meet the needs of residents in new developments and/or to mitigate the impact of new developments upon existing community facilities.

S-PARAMICS - A micro-simulation traffic modelling software tool which can be used to test the performance of transport networks and the impact of improvement schemes.

Smarter Choices - Smarter choices are techniques for influencing people's travel behaviour towards more sustainable options such as encouraging school, workplace and individualised travel planning. They also seek to improve public transport and marketing services such as travel awareness campaigns, setting up websites for car share schemes, supporting car clubs and encouraging teleworking.

Strategic Housing Land Availability Assessment (SHLAA) - An assessment of land availability for housing over a 15 year period, which is carried out by Local Planning Authorities and their partners to inform future spatial planning documents.

Supplementary Planning Document (SPD) - provides detailed guidance on how a specific aspect of the local planning authorities planning policy will be applied. This may be in the form of an SPD that sets out a methodology to secure contributions from developers for transport schemes in the district or borough in accordance with the transport strategy of the Local Plan and the Local Transport Plan for Warwickshire.

Strategic Road Network (SRN) - The motorway and trunk road network, which is the responsibility of the Highways Agency.

Transport Assessments (TAs) - A comprehensive and systematic process that sets out transport issues relating to a proposed development. It identifies what measures will be taken to deal with the anticipated transport impacts of the scheme and to improve accessibility and safety for all modes of travel, particularly for alternatives to the car such as walking, cycling and public transport.

Virtual Park and Ride (VPR) -Delivery of a park and ride facility whereby developers donate the land and fund the principal infrastructure. The facility is then served either by the bus services funded by the developers in respect of their sites and/or passing commercial services.

Warwickshire Observatory - the home for information and intelligence about Warwickshire and its people. Provides a centre of excellence in research, data collection and analysis, supporting evidence-based policy-making across the public sector in Warwickshire.

Warwickshire
PUBLIC TRANSPORT MAP
April 2012

Warwickshire County Council — Working for Warwickshire

INDEX TO PLACES SERVED

KEY

Bus route (operates at least every two hours Mondays-Saturdays)	580
Irregular services	214
Bus route terminus	24
Route operates in direction of arrow	
Railway line and station	

SCALE

0 2 4 6 Miles
0 2 4 6 8 10 Kms.

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Plan 1: Stratford-upon-Avon

Potential Development Options

NOTE: The Potential Development Options are not at this point evidence-based and they are presented for discussion and consultation.
There are numerous constraints in planning terms that may affect the viability of the options and these will be subject to subsequent testing.

Green Belt
Area of Restraint
Flood Risk Area
Built-up Area
Main River
Canal
Trunk Road
A-Road
B-Road
Minor Road
Railway

0 0.5 1
Kilometres

N

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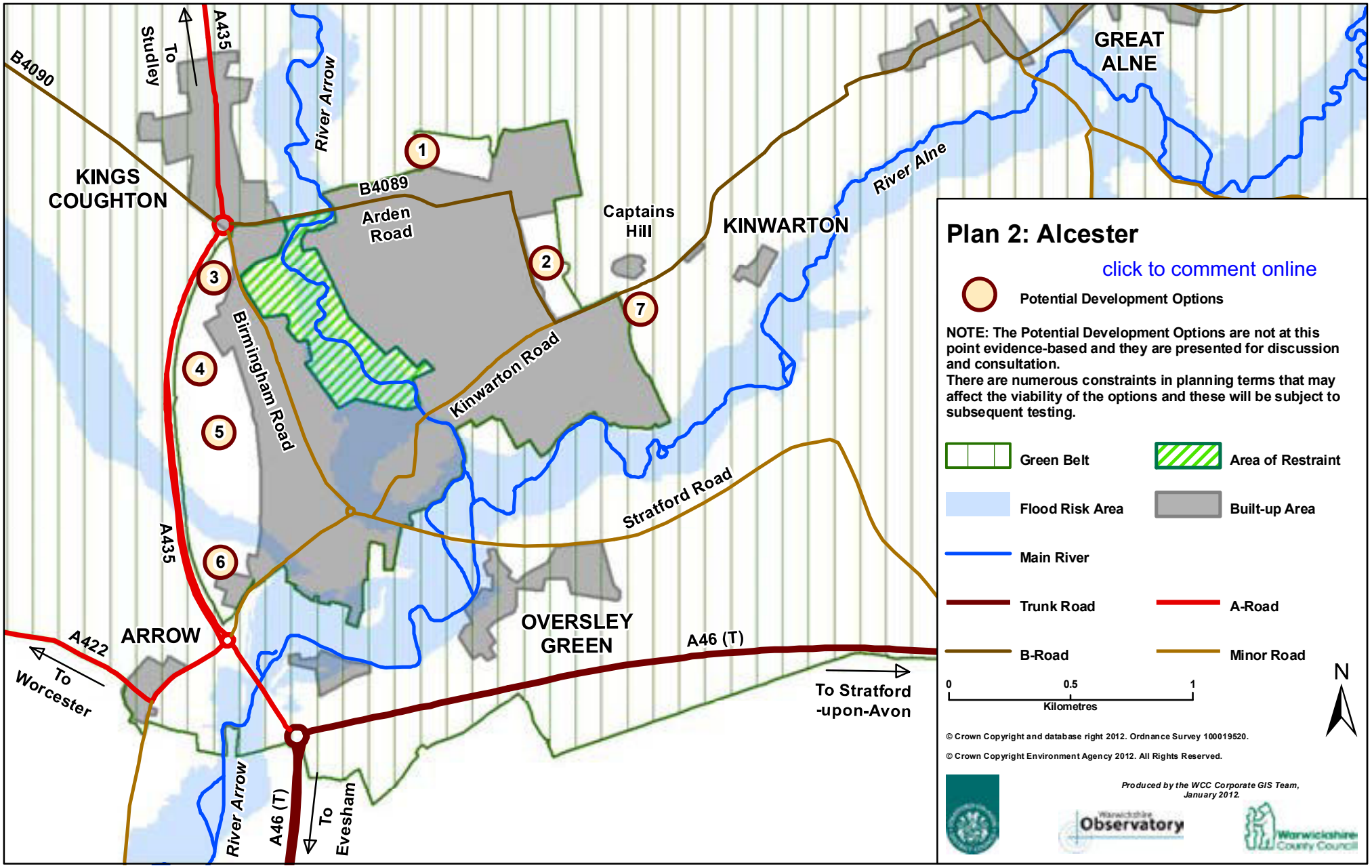
Warwickshire Observatory
Warwickshire County Council

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16

BISHOPTON
CLOPTON
SHOTTERY
BRIDGETOWN
TIDDINGTON
ALVESTON
CLIFFORD CHAMBERS
Bordon Hill
Alveston Hill
Welcombe Hills

A46 (T)
To Henley-in-Arden
To M40
To Warwick
To Alcester
To Bidford-on-Avon
To Wellesbourne
To Banbury
To Shipston-upon-Stour
A439
A3400
A422
B439
B4086
Birmingham Road
Alcester Road
Evesham Road
Seven Meadows Road
Trinity Way
Banbury Road
Loxley Road
Tiddington Road
Knights Lane
River Avon


B4090
To Studley
A435
River Arrow
GREAT ALNE
River Alne
KINGS COUGHTON
B4089
Arden Road
Captains Hill
KINWARTON
1
2
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4
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6
7
Birmingham Road
Kinwarton Road
Stratford Road
A435
A422
ARROW
OVERSLEY GREEN
A46 (T)
To Worcester
To Stratford -upon-Avon
River Arrow
A46 (T)
To Evesham
Plan 2: Alcester
click to comment online
Potential Development Options
NOTE: The Potential Development Options are not at this point evidence-based and they are presented for discussion and consultation.
There are numerous constraints in planning terms that may affect the viability of the options and these will be subject to subsequent testing.
Green Belt
Area of Restraint
Flood Risk Area
Built-up Area
Main River
Trunk Road
A-Road
B-Road
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N
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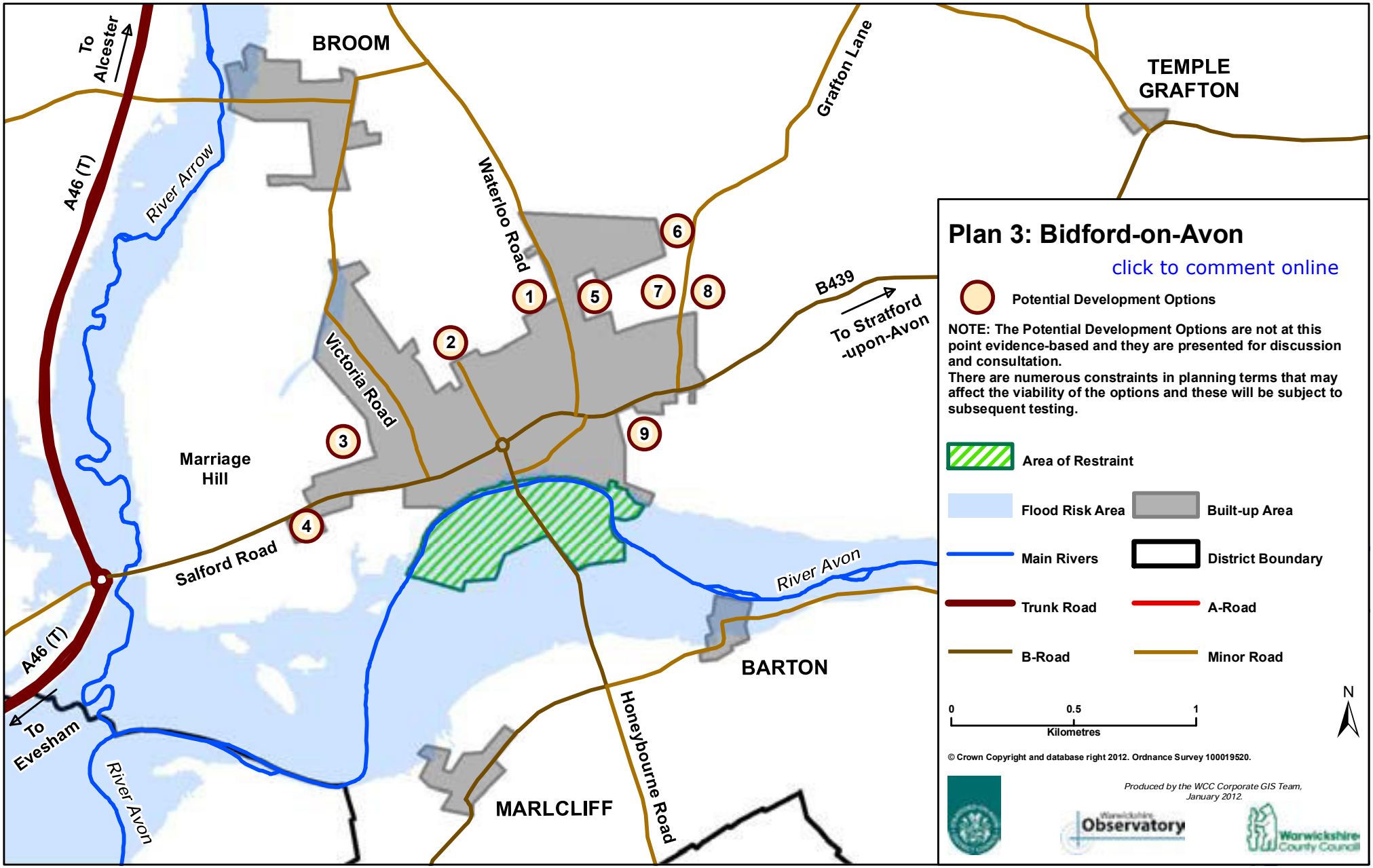
Warwickshire Observatory
Warwickshire County Council


BROOM
TEMPLE GRAFTON
To Alcester
A46 (T)
River Arrow
Waterloo Road
Grafton Lane
B439
To Stratford -upon-Avon
Victoria Road
Marriage Hill
Salford Road
River Avon
BARTON
MARLCLIFF
Honeybourne Road
To Evesham
1
2
3
4
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6
7
8
9
Plan 3: Bidford-on-Avon
click to comment online
Potential Development Options
NOTE: The Potential Development Options are not at this point evidence-based and they are presented for discussion and consultation.
There are numerous constraints in planning terms that may affect the viability of the options and these will be subject to subsequent testing.
Area of Restraint
Flood Risk Area
Built-up Area
Main Rivers
District Boundary
Trunk Road
A-Road
B-Road
Minor Road
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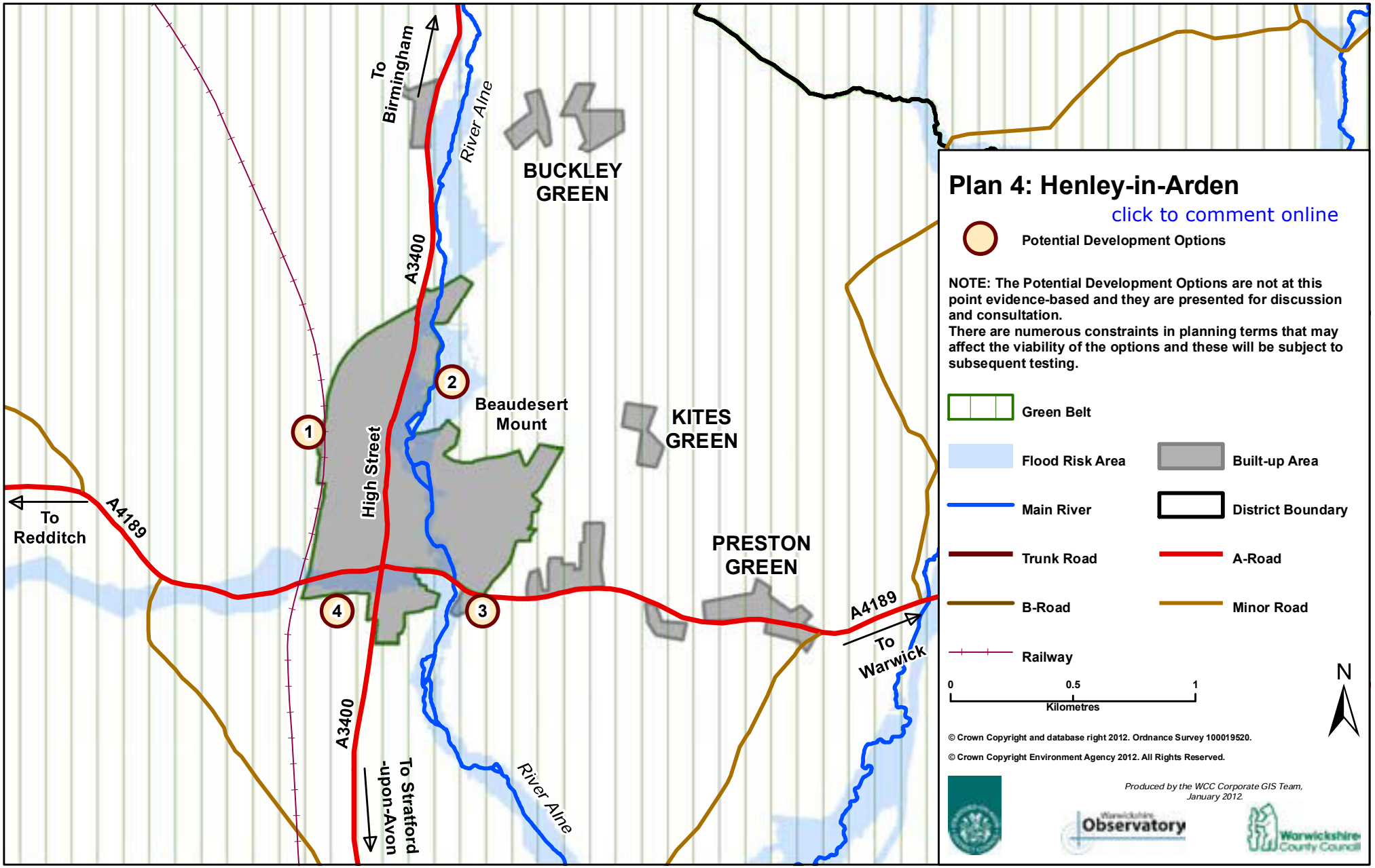
Warwickshire Observatory
Warwickshire County Council



Plan 4: Henley-in-Arden

click to comment online

Potential Development Options

NOTE: The Potential Development Options are not at this point evidence-based and they are presented for discussion and consultation.
There are numerous constraints in planning terms that may affect the viability of the options and these will be subject to subsequent testing.

- Green Belt
- Flood Risk Area
- Built-up Area
- Main River
- District Boundary
- Trunk Road
- A-Road
- B-Road
- Minor Road
- Railway

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Kilometres

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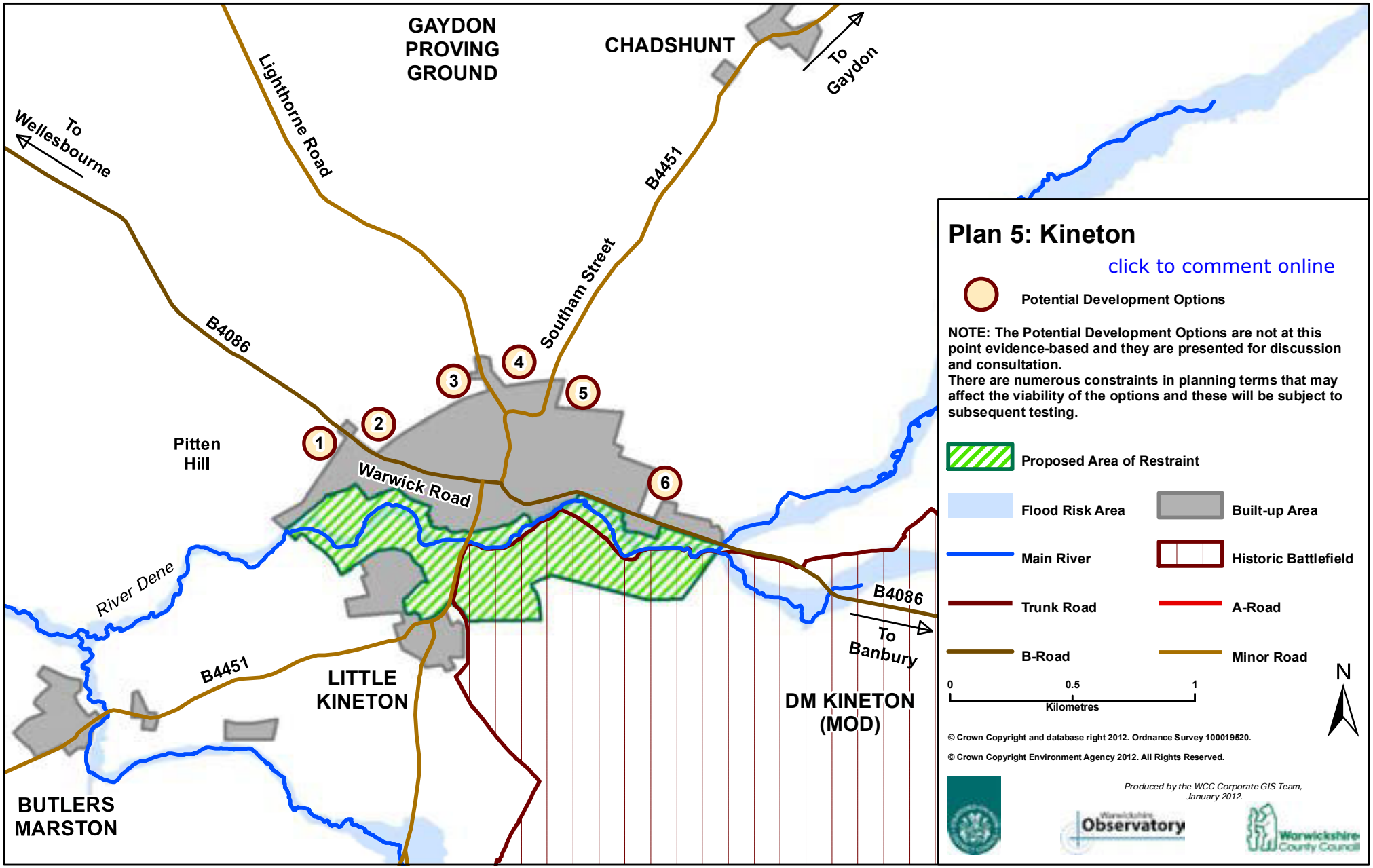
Warwickshire County Council


GAYDON
PROVING
GROUND
CHADSHUNT
To
Gaydon
Lighthorne Road
To
Wellesbourne
B4451
Southam Street
B4086
1
2
3
4
5
6
Pitten
Hill
Warwick Road
River Dene
B4451
LITTLE
KINETON
B4086
To
Banbury
DM KINETON
(MOD)
BUTLERS
MARSTON
Plan 5: Kineton
click to comment online
Potential Development Options
NOTE: The Potential Development Options are not at this point evidence-based and they are presented for discussion and consultation.
There are numerous constraints in planning terms that may affect the viability of the options and these will be subject to subsequent testing.
Proposed Area of Restraint
Flood Risk Area
Built-up Area
Main River
Historic Battlefield
Trunk Road
A-Road
B-Road
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Tredington Hill
Whaddon Hill
Hansen Hill
Fosse Way
A429
Darlingscote Road
Campden Road
To Stratford-upon-Avon
A3400
River Stour
Stratford Road
London Road
B4035
To Banbury
BARCHESTON
WILLINGTON
A3400
To Oxford
River Stour
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5
6
7
8
Plan 6: Shipston-on-Stour
click to comment online
Potential Development Options
NOTE: The Potential Development Options are not at this point evidence-based and they are presented for discussion and consultation.
There are numerous constraints in planning terms that may affect the viability of the options and these will be subject to subsequent testing.
Area of Restraint
Flood Risk Area
Built-up Area
Main River
Trunk Road
A-Road
B-Road
Minor Road
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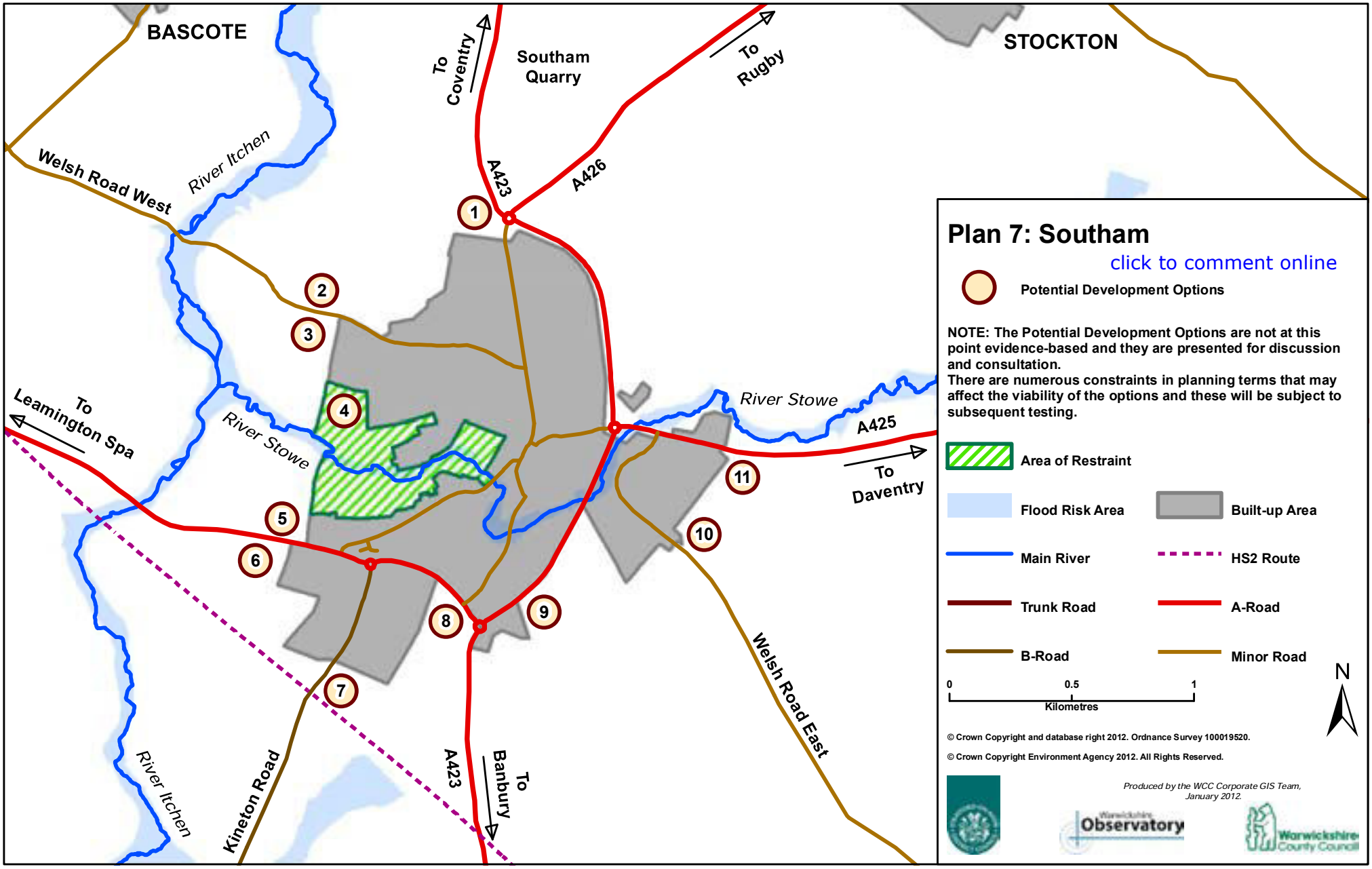
BASCOTE
STOCKTON
Southam Quarry
To Coventry
To Rugby
A423
A426
Welsh Road West
River Itchen
River Stowe
A425
To Leamington Spa
To Daventry
Welsh Road East
Kineton Road
To Banbury
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11
Plan 7: Southam
click to comment online
Potential Development Options
NOTE: The Potential Development Options are not at this point evidence-based and they are presented for discussion and consultation.
There are numerous constraints in planning terms that may affect the viability of the options and these will be subject to subsequent testing.
Area of Restraint
Flood Risk Area
Built-up Area
Main River
HS2 Route
Trunk Road
A-Road
B-Road
Minor Road
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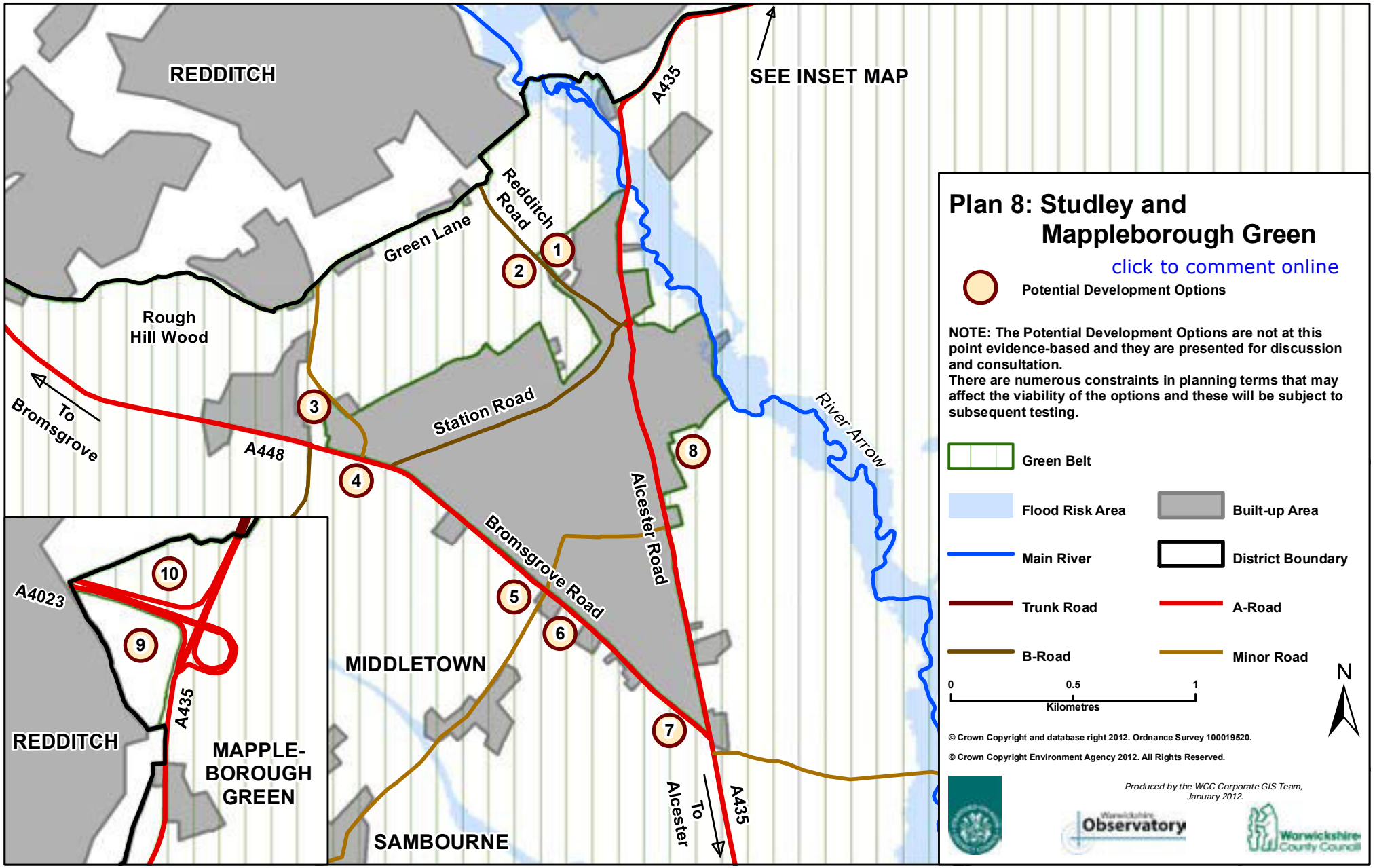
REDDITCH
SEE INSET MAP
A435
Redditch Road
Green Lane
Rough Hill Wood
To Bromsgrove
A448
Station Road
River Arrow
Alcester Road
Bromsgrove Road
MIDDLETOWN
SAMBOURNE
To Alcester
A435
A4023
A435
REDDITCH
MAPPLE-BOROUGH GREEN
1
2
3
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7
8
9
10
Plan 8: Studley and Mappleborough Green
click to comment online
Potential Development Options
NOTE: The Potential Development Options are not at this point evidence-based and they are presented for discussion and consultation.
There are numerous constraints in planning terms that may affect the viability of the options and these will be subject to subsequent testing.
Green Belt
Flood Risk Area
Built-up Area
Main River
District Boundary
Trunk Road
A-Road
B-Road
Minor Road
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Kilometres
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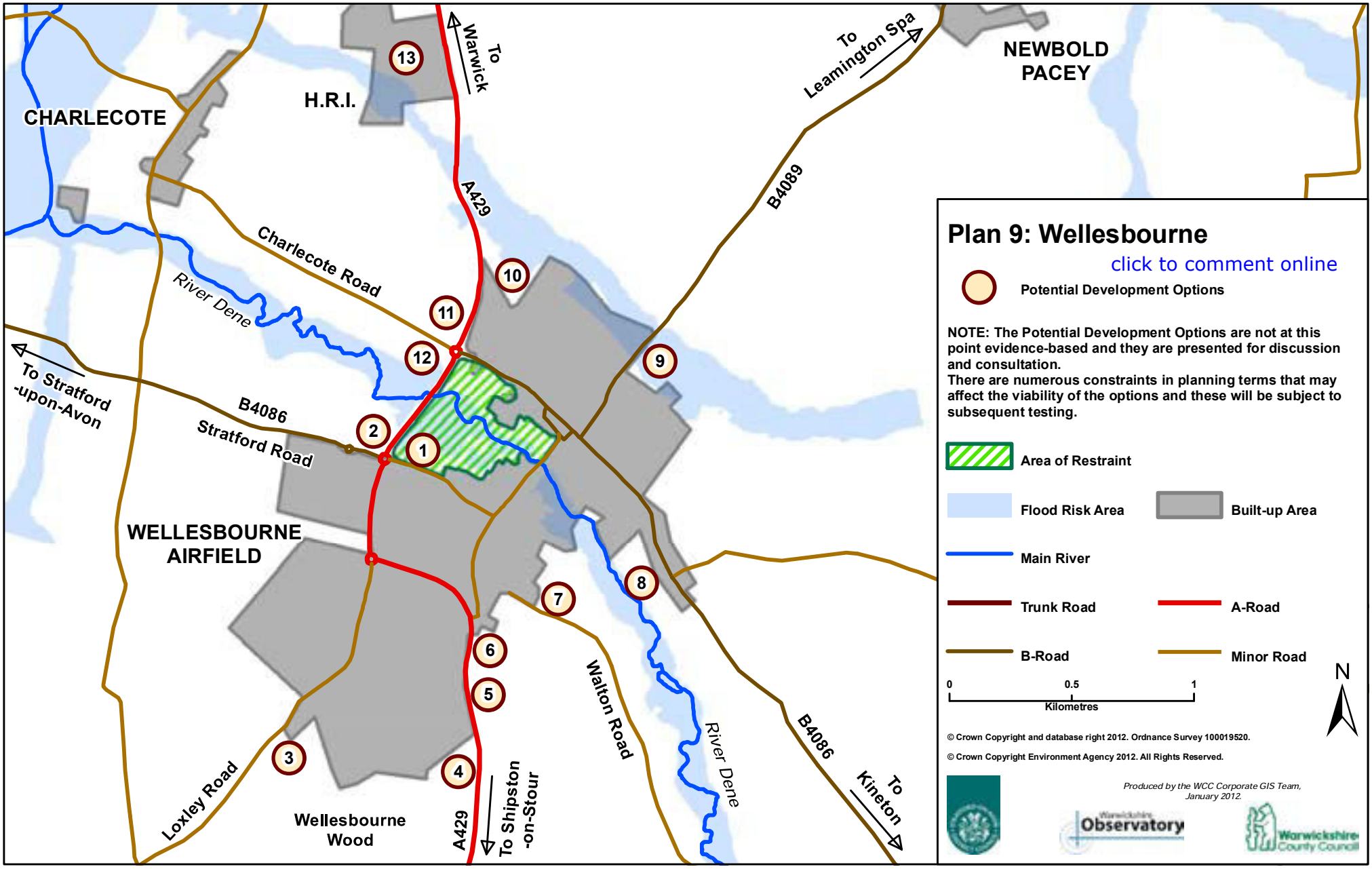
Warwickshire County Council


CHARLECOTE
H.R.I.
NEWBOLD PACEY
To Warwick
To Leamington Spa
A429
B4089
Charlecote Road
River Dene
To Stratford -upon-Avon
B4086
Stratford Road
WELLESBOURNE AIRFIELD
Walton Road
River Dene
B4086
To Kineton
Loxley Road
Wellesbourne Wood
A429
To Shipston -on-Stour
13
10
11
12
9
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7
6
5
3
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Plan 9: Wellesbourne
click to comment online
Potential Development Options
NOTE: The Potential Development Options are not at this point evidence-based and they are presented for discussion and consultation.
There are numerous constraints in planning terms that may affect the viability of the options and these will be subject to subsequent testing.
Area of Restraint
Flood Risk Area
Built-up Area
Main River
Trunk Road
A-Road
B-Road
Minor Road
0
0.5
1
Kilometres
N
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Produced by the WCC Corporate GIS Team, January 2012.
Warwickshire Observatory
Warwickshire County Council

Appendix D - STA Employment Growth Assumptions

Scenario / Settlement	DCS 'site' no.	Employment allocation for strategic transport modelling purposes	Also a housing 'site' (Yes/No)
All Scenarios			
Stratford-upon-Avon	3	5 ha	No
Stratford-upon-Avon	6	5 ha	No
Alcester	1	5 ha	No
Bidford	4	1 ha	No
Bidford	6	1 ha	Yes
Henley	1	0.5 ha	Yes
Kineton	1	1 ha	No
Shipston	4 (Norgren)	1 ha (1/5 of site)	Yes, (NB:- already an employment site)
Southam	7/8/9	5 ha across these 3 'sites'	8 and 9 also housing 'sites'
Studley	1	1 ha	Yes
Wellesbourne	13 (HRI)	5 ha	No, (NB:- already an employment site)
TOTAL		**30.5 ha**	
Gaydon Proving Ground	n/a	Extant planning permission	No
		Add another 10 ha over plan period	
Scenario 3			
Long Marston Depot		2 ha	n/a
Harbury Cement Works & environs		2 ha	n/a
Southam Cement Works & environs		2 ha	n/a
Scenario 4			
Supplementary shopping & services associated with Gaydon development	n/a	0.3 ha	Yes
2 primary schools	n/a	n/a	Yes
1 secondary school	n/a	n/a	Yes
Scenario 5	3	5 ha	n/a
	6	5 ha	
	n/a	Plus 10 ha on south side of ERR	

Provision of Industrial Land in Stratford-on-Avon District since 2001 – as at 1 April 2011

SITE LOCATION	LOCAL PLAN REF.	AREA (HA.)	USE CLASS	CATEGORY			STATUS				PROGRESS			Five Year Portfolio
				Brownfield Similar Use	Brownfield Different Use	Green-Field	Outline p.p	Detailed p.p. Not Started	Detailed p.p. U/C + Built	Commit-ment	Built 1.4.01 - 31.3.11	Under Const. 31.3.11	Not Started 31.3.11	
Stratford-upon-Avon:														
Local Plan Proposals														
Cattle Market	SUA.I	0.4	B1a/b		0.4			0.4					0.4	0.4
Arden Street	SUA.J	0.2	B1a/b		0.2					0.2			0.2	
Banbury Road (1)	SUA.V	1.2	B1a/b		1.2			1.2					1.2	1.2
Other sites														
Timothy's Bridge Road (1)		5.0	B1/2			5.0			5.0		5.0			
Birmingham Road		0.7	B1a	0.7			0.7						0.7	0.7
Banbury Road (2)		3.6	B1a/b		3.6			1.6	2.0		2.0		1.6	1.6
Timothy's Bridge Road (2)		0.4	B1a	0.4					0.4		0.4			
Masons Road		1.2	B2		1.2				1.2		1.2			
Maybrook Road		1.1	B1/2/8		1.1				1.1		1.1			
Timothy's Bridge Road (3)		0.9	B1a/2/8		0.9				0.9		0.9			
Remainder of District:														
Local Plan Proposals														
High Street, Henley	HEN.D	0.4	B1a	0.4					0.4		0.4			
Darlingscote Road, Shipston	SHIP.B	3.2	B1/2/8			3.2	0.4	0.7	1.2	0.9	0.6		2.6	2.6
Loxley Rd,Wellesbourne(1)	WEL.C	3.6	B1/2/8		3.6				0.8	2.8	0.8		2.8	
Napton Brickworks	CTY.F	3.0	B1		3.0					3.0			3.0	
Other sites														
Ryon Hill		3.7	B1a/b	0.6	3.1				3.7		3.7			
Wellesbourne Airfield		8.5	B1/2/8		4.5	4.0		2.7	5.8		5.8		2.7	2.7
Arden Road, Alcester		3.5	B1			3.5			3.5		3.0	0.5		0.5
Kineton Road, Southam (1)		0.9	B1/8			0.9			0.9		0.9			
Loxley Road,Wellesbourne(2)		2.2	B1/2/8		2.2				2.2		2.2			
Kineton Road, Southam (2)		4.4	B1/2/8			4.4		2.4	2.0		2.0		2.4	2.4
Brookhampton Lane, Kineton		0.7	B1			0.7			0.7		0.7			

SITE LOCATION	LOCAL PLAN REF.	AREA (HA.)	USE CLASS	CATEGORY Brownfield Similar Use	Brownfield Different Use	Green-Field	STATUS Outline p.p	Detailed p.p. Not Started	U/C + Built	Commit-ment	PROGRESS Built 1.4.01 - 31.3.11	Under Const. 31.3.11	Not Started 31.3.11	Five Year Portfolio
Needle Industries,Studley		0.7	B1/2/8		0.7			0.7					0.7	
Former station, Kineton		0.5	B1		0.5				0.5		0.5			
Goods Yard, Long Marston		0.8	B1/2		0.8				0.8		0.8			
Chestnut Farm, Sambourne		0.9	B1a		0.9				0.9		0.9			
Kineton Road, Southam (3)		0.3	B1/2/8			0.3			0.3		0.3			
Gaydon Proving Ground		35.3	B1/2		35.3			15.5	19.7		19.7	0.6	14.9	1.5
Goldicote, Alderminster		0.2	B1/2/8		0.2				0.2		0.2			
Alcester Lodge, nr. Alcester		1.0	B1		0.5	0.5			1.0		1.0			
Glebe Farm, Sambourne		0.4	B1			0.4		0.4					0.4	
Lower Barn Farm, Haselor		0.6	B8			0.6			0.6		0.6			
Langley Farm, Bishopton		0.4	B1/8		0.4				0.4		0.4			
College Farm, Bearley		0.5	B1			0.5		0.5					0.5	0.5
Hill Farm, Stockton		0.7	B1			0.7			0.7		0.7			
Harwoods House, Ashorne		0.9	B1a			0.9			0.9		0.9			
Bearley Airfield		0.5	B8		0.5				0.5		0.5			
New Enclosure Fm,Combrook		0.4	B1			0.4		0.4					0.4	0.4
New Farm, Blackwell		0.9	B1			0.9			0.9		0.9			
Atherstone Airfield		1.3	B2/8		1.3				1.3		1.3			
Wincot Lands, Quinton		0.4	B1/2/8		0.4				0.4		0.4			
Welsh Road East, Southam		2.1	B1/2		2.1			2.1					2.1	
Wootton Park Fm, W.Wawen		0.8	B1a			0.8			0.8		0.8			
New House Farm, W.Wawen		0.6	B1			0.6			0.6		0.6			
Long Marston Storage Depot		30.0	B8	30.0					30.0		30.0			
Harp Farm, Southam		0.6	B1/2/8			0.6			0.6		0.6			
Ford Farm, Southam		0.6	B1/8			0.6			0.6		0.6			
Blackhill, Snitterfield		1.0	B1/2/8			1.0			1.0		1.0			
Poolhead Lane, Earlswood		2.0	B1/B8			2.0			2.0			2.0		2.0
Haydon Way Farm, Coughton		1.1	B1a/B8			1.1		1.1					1.1	1.1
TOTAL PROVISION		**134.2**		**32.1**	**68.6**	**33.6**	**1.1**	**29.7**	**96.5**	**6.9**	**93.4**	**3.1**	**37.7**	**17.6**

SITE LOCATION	LOCAL PLAN REF.	AREA (HA.)	USE CLASS	CATEGORY Brownfield Similar Use	Brownfield Different Use	Green-Field	STATUS Outline p.p	Detailed p.p. Not Started	Detailed p.p. U/C + Built	Commit-ment	PROGRESS Built 1.4.01 - 31.3.11	Under Const. 31.3.11	Not Started 31.3.11	Five Year Portfolio
Net losses:														
High Street, Henley		-1.1	B2		-1.1				-1.1		-1.1			n/a
Birmingham Rd, Stratford		-5.7	B2		-5.7			-0.5	-5.2		-5.2		-0.5	n/a
Tilemans Lane, Shipston		-3.9	B2		-3.9				-3.9		-3.9			n/a
Arden St. etc, Stratford	SUA.K	-0.6	B1		-0.6					-0.6			-0.6	n/a
Regal Road, Stratford	SUA.L	-2.4	B2/B8		-2.4				-2.4		-2.4			n/a
Bleachfield Street, Alcester	ALC.B	-0.7	B2		-0.7				-0.7		-0.7			n/a
High Street, Henley	HEN.D	-0.9	B2		-0.9				-0.9		-0.9			n/a
Tilemans Lane, Shipston	SHIP.C	-1.0	B1		-1.0				-1.0			-1.0		n/a
Wattons Lane, Southam	SOU.C	-0.6	B1/B2		-0.6				-0.6		-0.6			n/a
Alcester Road, Stratford		-0.5	B1a		-0.5				-0.5		-0.5			n/a
Aintree Road, Stratford		-0.4	B1a		-0.4				-0.4		-0.4			n/a
Scholars Lane, Stratford		-0.2	B1a		-0.2				-0.2			-0.2		n/a
Birmingham Road, Stratford		-0.6	B8		-0.6				-0.6			-0.6		n/a
NET LOSSES TOTAL		**-18.6**			**-18.6**			**-0.5**	**-17.5**	**-0.6**	**-15.7**	**-1.8**	**-1.1**	**n/a**

Notes to assist interpretation of table:

The total supply of additional industrial land in the District from 1 April 2001 to 31 March 2011 is 134.2 hectares. The category, status and progress sections of the table each assess the situation for individual sites and the overall supply. Therefore, the sum of all the figures in each section (apart from the five year portfolio) also equates to 134.2 hectares.

The five year portfolio figures are based on whether there is a realistic prospect of a site being implemented during the period April 2011 to March 2016.

Notes relating to table:

1. Industrial land is defined as falling within Use Classes B1, B2 and B8
2. Industrial element of mixed-use sites is estimated until a detailed scheme is approved
3. Minimum size of site included is 0.4 hectares although individual plots within sites can be smaller. There are also small remnants of larger sites shown.
4. Under 'brownfield' category of site - similar use means redevelopment within Class B or comparable type of use
   - different use means redevelopment/conversion to Class B from another Use Class

CITEware

Introduction

The conceptual basis of the strategic modelling technique used in CITEware was developed by JMP for Warwickshire County Council and the Highways Agency in order to provide a robust strategic modelling tool to allow WCC to measure the impact of planned developments on the strategic road network.

The concept of a model utilising journey time and distance to predict strategic journey routing has been evolved over time to incorporate a number of routing behaviour rules, and a finer grade of initial distribution has been achieved, however the basis remains the same; A distribution of likely trips to and from a destination using census data, and route choice determined by a combination of travel time and distance to the destination.

The current model is based in Microsoft Access, and runs using data taken from GIS and other sources. For displaying the results it is best to use a GIS to match up the output results (in spreadsheet format) with a GIS representation of the road network.

The model uses Tempro growth factors to estimate background traffic growth in future years, and road capacities are calculated on the basis of DMRB formulae where volume over capacity calculations are done.

Modelling

Trip distribution

Trip distribution is based on 2001 census journey-to-work information. A given site has its trip generation allocated to wards in the proportions found in census data, and this is then allocated across the road network, so that all roads where it is feasible that trips may load onto are given a 'packet' of trips which will then be routed to their destination (in the case of inbound trips; for outbound trips the packet travels in the opposite direction).

To ensure maximum accuracy in reflecting current and future travel patterns, developments since 2001 have been added into the model as if they were part of the journey to work information, with the origin/destination data based on existing travel patterns. For example a employment site added from 2003 would have travel patterns reflecting the existing employment travel patterns for the ward, and the new housing sites would also be drawn slightly more to the ward due to the additional employment. Trips both originating and terminating in a new site are flagged to only be counted once (so you don't get duplication from a housing outbound trip being also counted as an additional employment inbound trip).

Any other future planned developments for inclusion in the modelled scenarios (other potential sites which will produce trips to/from a modelled development) are compared on a distance and size basis to the existing travel patterns and inserted as equivalent gravity-draws to the existing wards. In effect this estimates what the travel pattern would be if the planning assumptions were in place by treating them as being in competition with the wards already present for a proportion of trips.

The potential pitfall using this methodology is that when a planning assumption is both large and very close to a modelled development, it could potentially be estimated to have an even larger proportion of trips than in reality. Although the large size and proximity of a planning assumption might well make journeys between it and a modelled development desirable, clearly in reality the number of jobs available and other considerations would not allow an overwhelming proportion of trips to travel a very short distance to another site, even if it were very large. There is also a facility to cap the maximum draw to an individual planning assumption to avoid this.

Large sites in proximity to one another can also be treated as part of a single development (from a modelling point of view), or not used as planning assumptions for each other so as not to distort the

travel patterns. For the purposes of the model any sites that are closer than 1km to one another will sometimes model better if treated as a single development unless the draw is capped.

Decision-making at junctions

Once a development location has been determined, the destinations are taken as the wards that the census data Indicates people will travel from/to. The model splits the population travelling to/from the development in the proportions taken from the census data, modified by any planning assumptions that are present in the modelled scenario.

Each destination is given a proportional draw, and the population is loaded onto a simplified version of the road network:

Junctions are simplified to a t-junction or crossroads. This enables every junction to have a calculated probability of journeys heading down the possible routes leading from it.

The probability is based on distance and time values calculated using Accessions car modelling, and both distance and time are taken into account:

Originally, the probability of using a link was determined by the ratio between the values of:

$$\frac{1}{D}$$

With D being the distance to the destination ward.

However, after consideration and testing another factor was tried:

$$\frac{1}{V}$$

With V being the average speed a vehicle has taking a particular route

This has some advantages, as it considered other factors than the shortest route, but we were unconvinced that this was a satisfactory methodology, as sometimes it would favour a faster route that nonetheless was longer and unlikely to be favoured in reality.

Having time be a factor was, however, something that was a sound idea that made the model reflect reality more closely, so after trying various factors, we arrived at:

$$\frac{1}{T \times D}$$

With T being the time to the destination and D being the distance to the destination ward

This is an effective predictor of travel as it factors in both the time taken for a given route as well as the distance involved, as it was considered that both the speed of a given route, as well as the perceived distance of travel would be factors in choosing a particular route.

At every possible junction, available routes are evaluated. Routes that are ‘time-negative’ I.E they take you further away from the destination, are discounted. All other routes are compared and trips are allocated proportionately. Dead ends are treated as only useful if a destination is located on them – otherwise the routing simply avoids them.

Results

Results are given as link flows and GEH figures (the GEH formula gets its name from Geoffrey E. Havers, who invented it in the 1970s as a way of comparing existing and modelled traffic figures).

To obtain accurate GEH figures, baseline traffic plus committed development traffic is evaluated on a ward by ward basis and if the projected traffic level is greater than or equal to the growth predicted using the TEMPRO/NTEM system then no additional growth is added into the area. If projected traffic

is lower than the TEMPRO/NTEM figure for the ward, additional base traffic growth is applied across the area to raise it to the forecast level in order to accurately calculate GEH figures.

The additional base traffic does not factor into link flow results, and it does not cause automatic changes to modelled link speeds, as the model is intended to be a strategic level tool that does not require iterative calculation of traffic routing.

Development

Datasets used

The basic datasets that were used in the model development are as follows:

- road network derived from Stategis layer
- Journey-to-Work dataset from 2001 census
- Ward boundaries
- Postcode locations

Strategic transport assessment using DirectRoute

Development of 'DirectRoute'

Using a system similar to Accession's general data organisation, DirectRoute was developed in-house by JMP to address the needs of its' public transport team. As the calculation methodology was refined and different approaches were used, the system was developed to allow calculation of travel times to any destination from all available services.

As the number of possible routings is considerably reduced from the multitude of options in Accession, it is possible to refine the valid time periods and days somewhat more flexibly than in Accession. The time periods are not predefined, and multiple days can be selected if desired. It would, for example, be possible to calculate travel times between 0700 and 0843 for Mondays and Tuesdays only

Output features include the ability to quickly produce a report of bus route numbers that can be used to reach the destination, and the ability to generate a detailed demographic report. For use in mapping software, isochrones are generated to display travel times.

DirectRoute was originally set up using data from Local authorities' public transport records. However, for ease of use, the ability to import data from an Accession repository has now been built in as well as being able to import CIF data.

DirectRoute features:

- Capable of processing large numbers of sites quickly
- Limited interchange makes results more easily interpretable than accession results
- Because the model illustrates a 'worst case' scenario, it reflects the experience of newcomers to public transport more accurately than a multi interchange model
- Metadata provides auditable results
- GIS illustration of results can give flexibility in display of results

Methodology used for this project

Each of the identified sites was modelled to examine available public transport using DirectRoute. The outputs are Isochrones for each proposed development site, illustrating existing public transport provision. The following travel destinations as required by WDC and WCC were included on the mapping to give context: Healthcare, fresh food retailers and employment centres

Data used

- Network information provided by Warwickshire CC that will be the likely level of future transport provision
- Travel destinations extracted from LTP accessibility assessment work. These were data checked and sorted into separate files for hospitals, GPs, jobs and fresh food retailers

Examples of DirectRoute usage

North West Regional DaSTS Study: Accessibility and deprivation (2009 – 2010):

This regional study examined the relationship between accessibility, deprivation and regeneration. It involved research and literature review, stakeholder interviews, market research, accessibility and data analyses, together with 8 case studies. With regard to access to employment for people who were unemployed.

It found that access to transport was not a key barrier, as other factors played a much greater part. Also, it highlighted that travel horizons for unemployed people were constrained; people saw a maximum travel time to work to be 40 minutes, with a maximum cost of £15 per week. Transport access considerations were of secondary importance, with the main issue being travel time and cost.

This enabled us to study localised problems with getting people to the studied sites.

West Midlands Standard for Access to Healthy Food (2009)

We worked with a multi-agency steering group led by the Department of Health for the West Midlands to develop a new standard for measuring access to healthy food for the region. As part of wider strategies to embed health outcomes within local planning policies, the project was commissioned to develop a standard that moved the focus away from measuring access to 'fresh' food as had been done during LTP towards measuring access to 'healthy' food.

The research was conducted by undertaking a literature review, a data review, on-street market research in ten towns in the West Midlands, conducting eight focus groups with people from hard to reach demographics, and stakeholder discussions. An accessibility mapping exercise was conducted using DirectRoute to define the process for measuring access against the new standard.

The research programme was managed by JMP, with Quality Fieldwork Service Services assisting with the on-street market research. One of the key outcomes of the study was the need for sustainable travel and physical activity to be facilitated and encouraged by all sectors to achieve shared priorities.

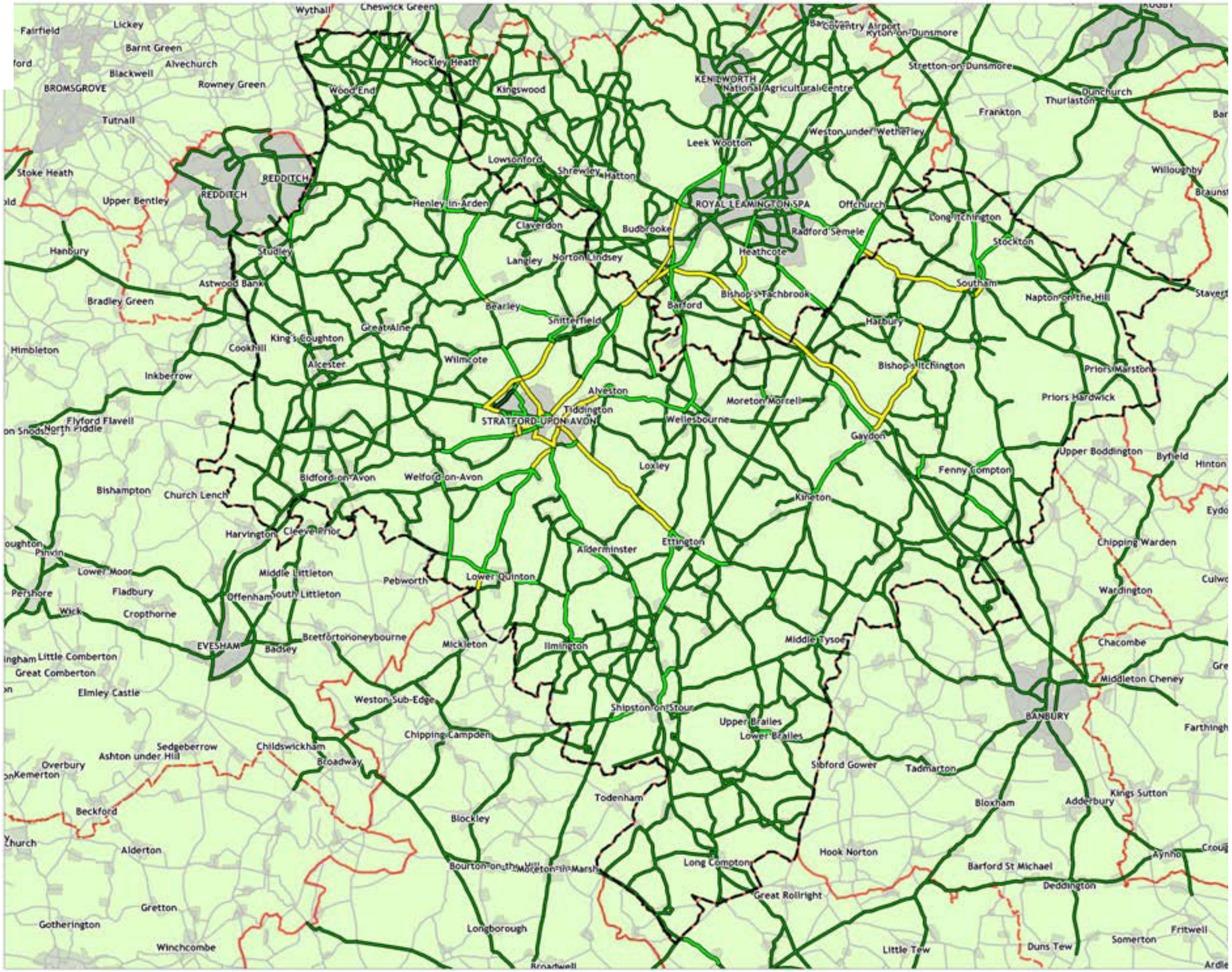
Right Care Right Here: Development of Travel & Access Strategy (2010)

JMP undertook a study utilising both Accession and DirectRoute to provide a best and worst case scenario for future access to major healthcare sites within two PCT areas within the west midlands.

From the mapping we were able to provide demographic analysis of projected changes, and comparison of potential futures sites.

By providing a number of time staggered models changing access over the course of the day and week were assessed.

Figure 1: Scenario 1 AM 0800-0900 flow



Project Title:
Stratford-on-Avon District STA

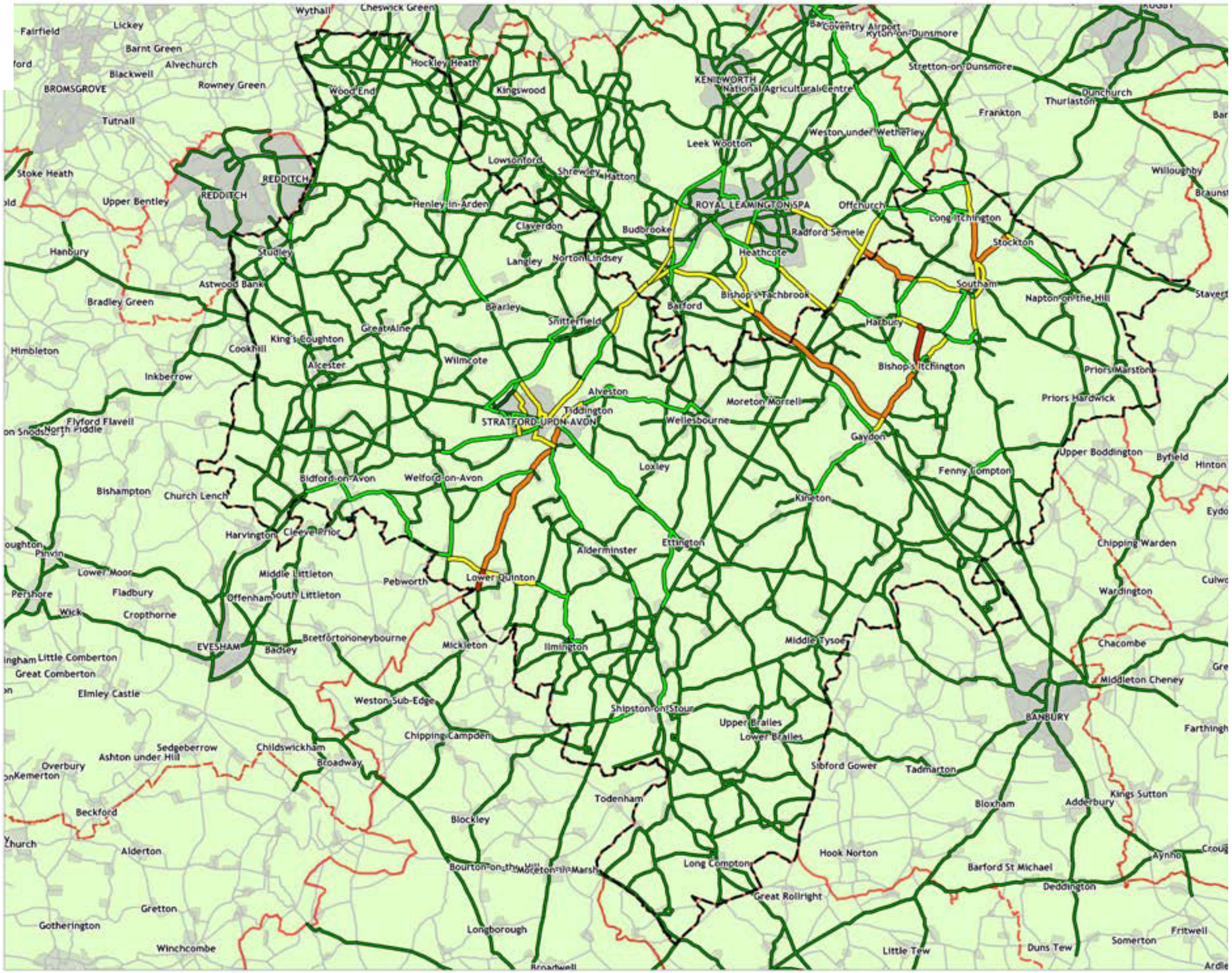
Key:

Additional two-way vehicle trips:

- 500 - 1000
- 250 - 500
- 100 - 250
- 50 - 100
- 0 -50

W: www.jmp.co.uk
E: Birmingham jmp.co.uk

Figure 10: Scenario 3 PM 1700-1800 flow



Project Title:
Stratford-on-Avon District STA

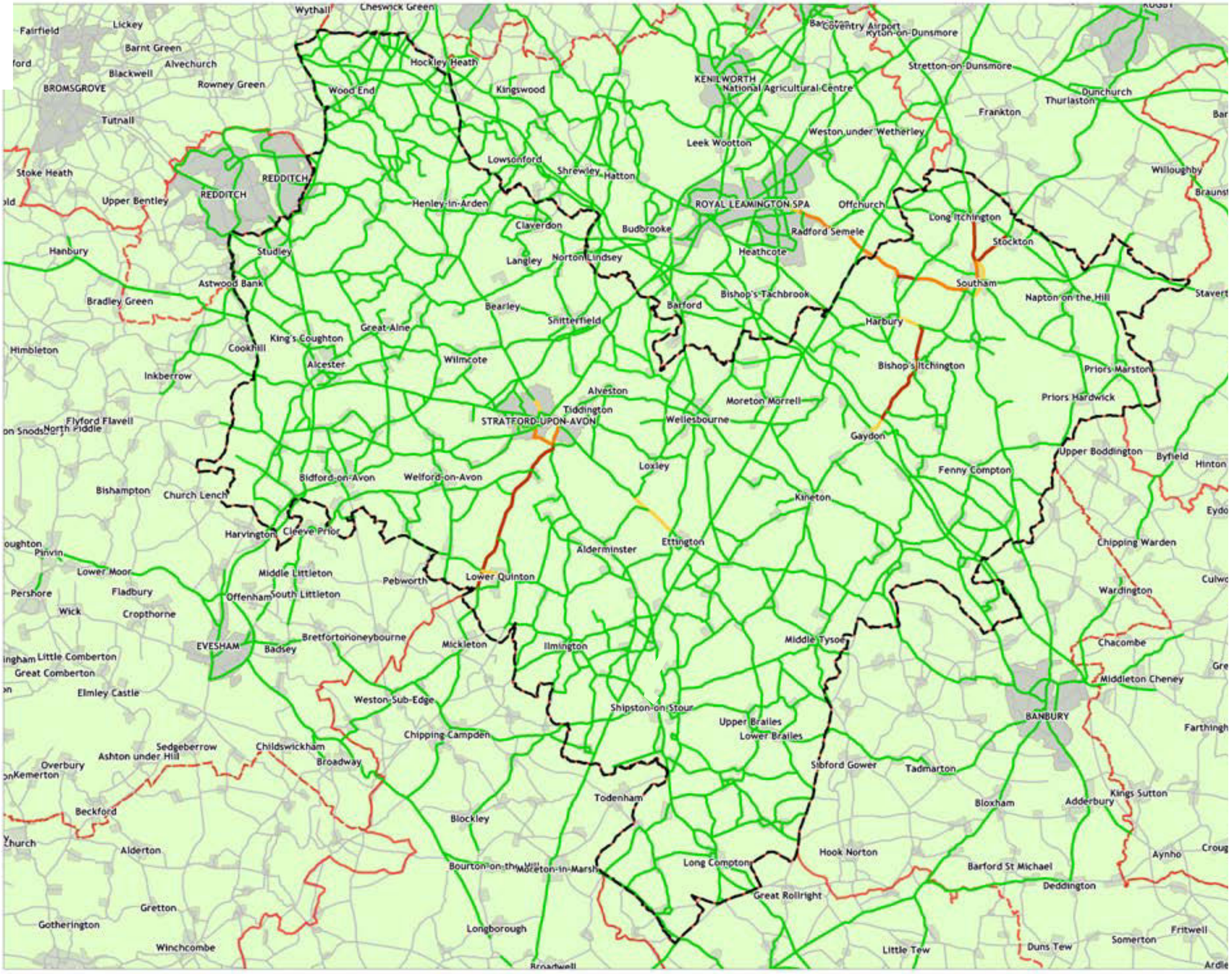
Key:

Additional two-way vehicle trips:

- 500 - 1000
- 250 - 500
- 100 - 250
- 50 - 100
- 0 -50

W: www.jmp.co.uk
E: Birmingham jmp.co.uk

Figure 11: Scenario 3 AM 0800-0900 GEH



Project Title:
Stratford-on-Avon District STA

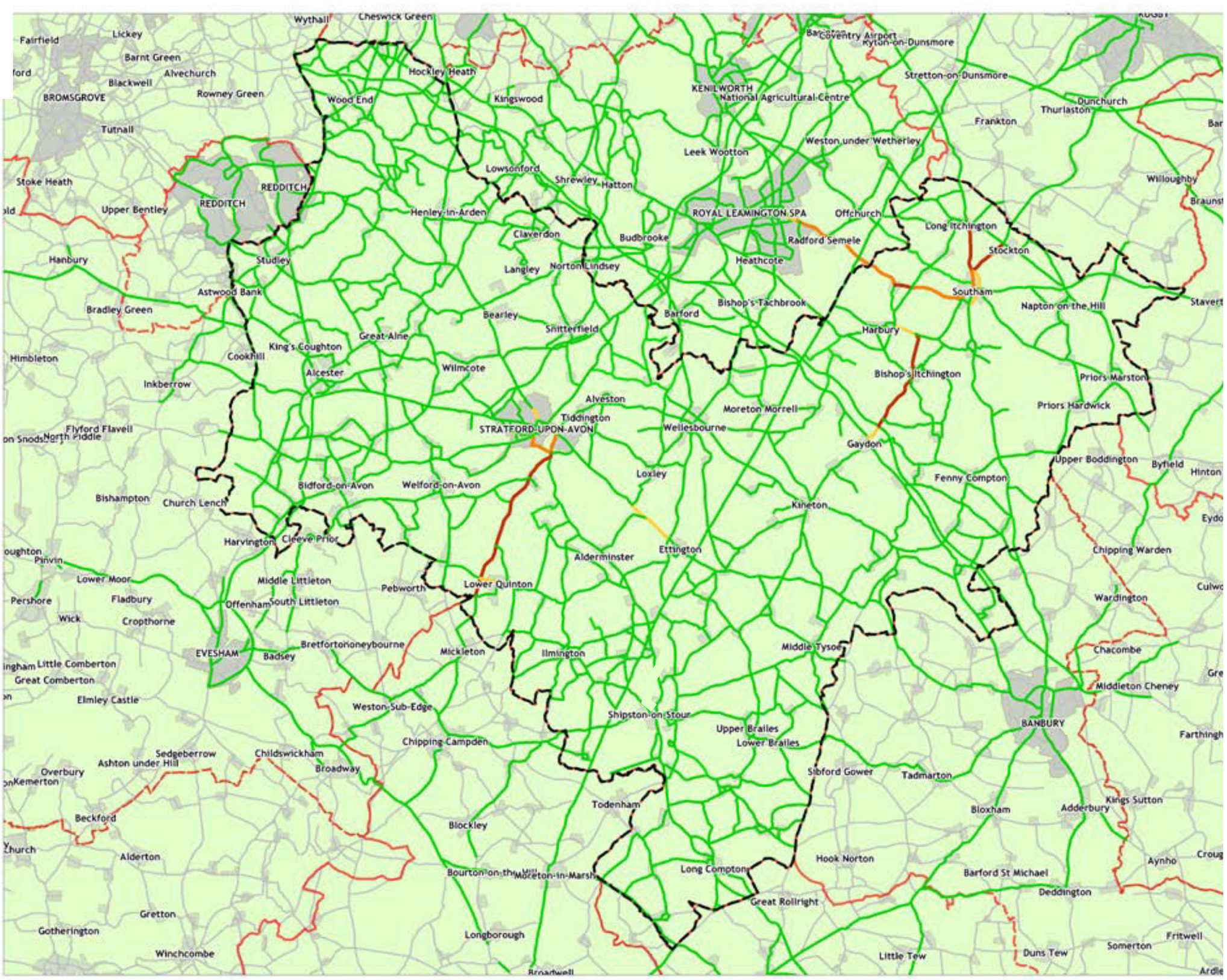
Key:

GEH

- >10
- 7.5 to 10
- 5 to 7.5
- 0 to 5

W: www.jmp.co.uk
E: Birmingham jmp.co.uk

Figure 12: Scenario 3 PM 1700-1800 GEH



Project Title:
Stratford-on-Avon District STA

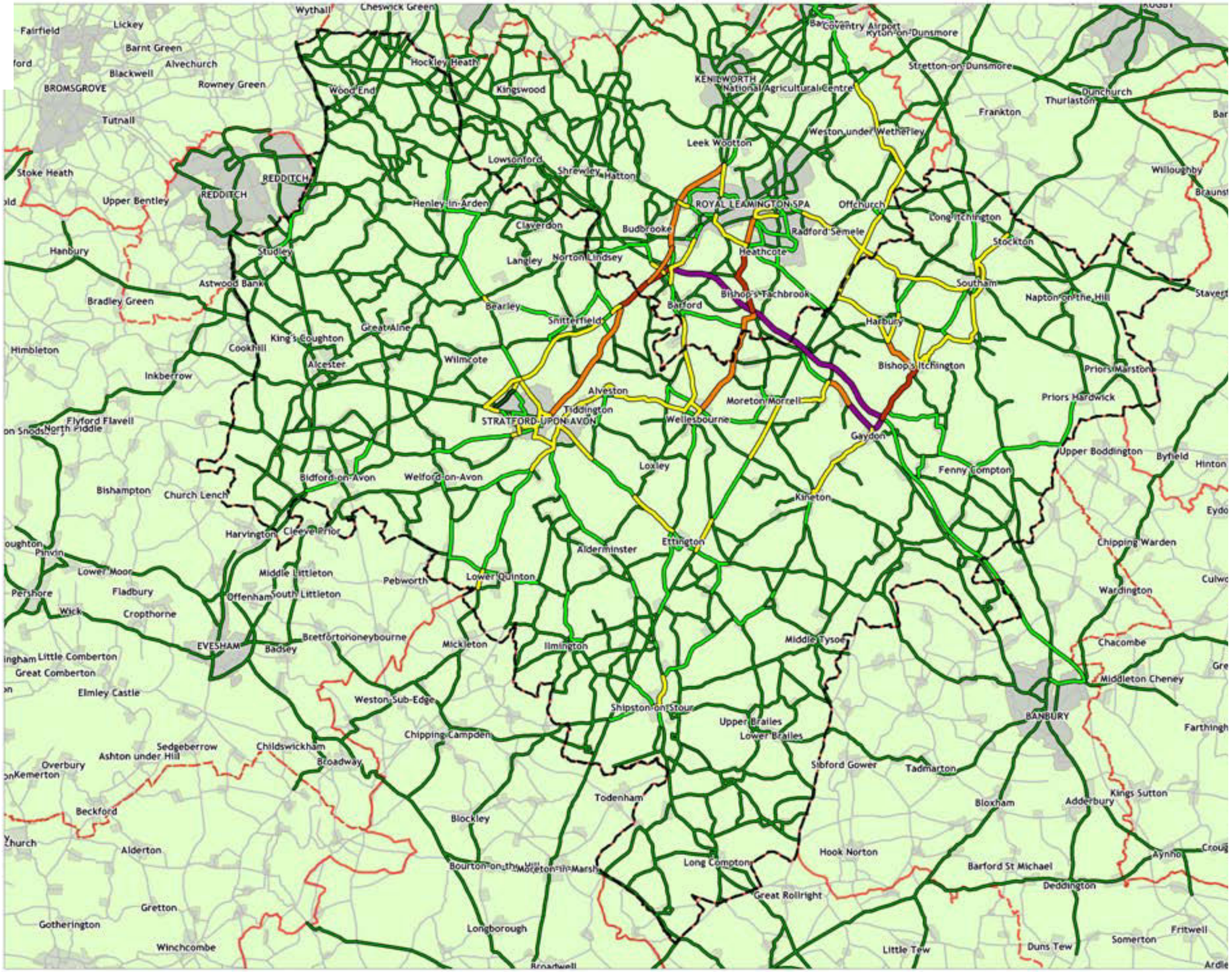
Key:

GEH

- >10
- 7.5 to 10
- 5 to 7.5
- 0 to 5

W: www.jmp.co.uk
E: Birmingham jmp.co.uk

Figure 13: Scenario 4 AM 0800-0900 flow



Project Title:
Stratford-on-Avon District STA

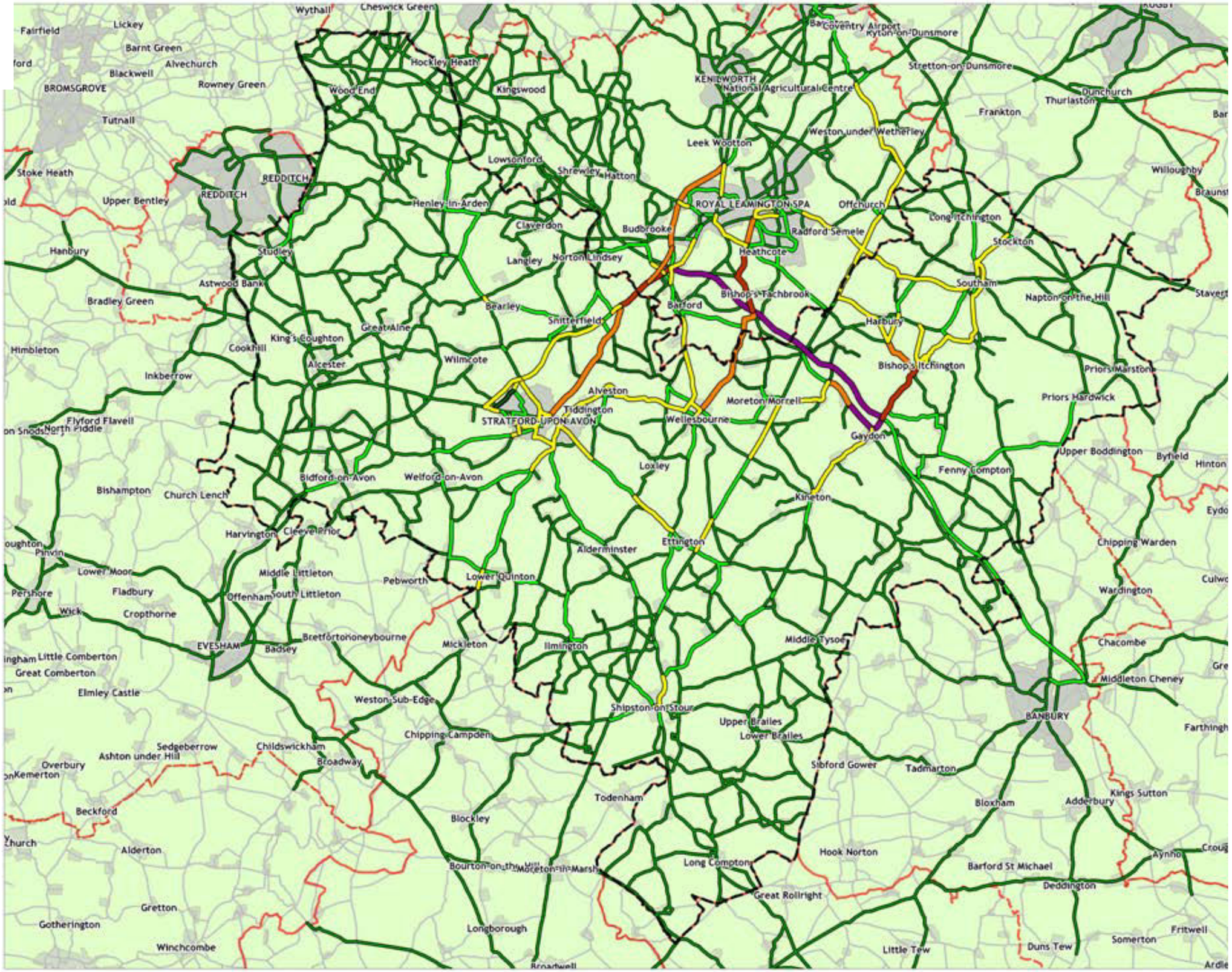
Key:

Additional two-way vehicle trips:

- 500 - 1000
- 250 - 500
- 100 - 250
- 50 - 100
- 0 -50

W: www.jmp.co.uk
E: Birmingham jmp.co.uk

Figure 14: Scenario 4 PM 1700-1800 flow



Project Title:
Stratford-on-Avon District STA

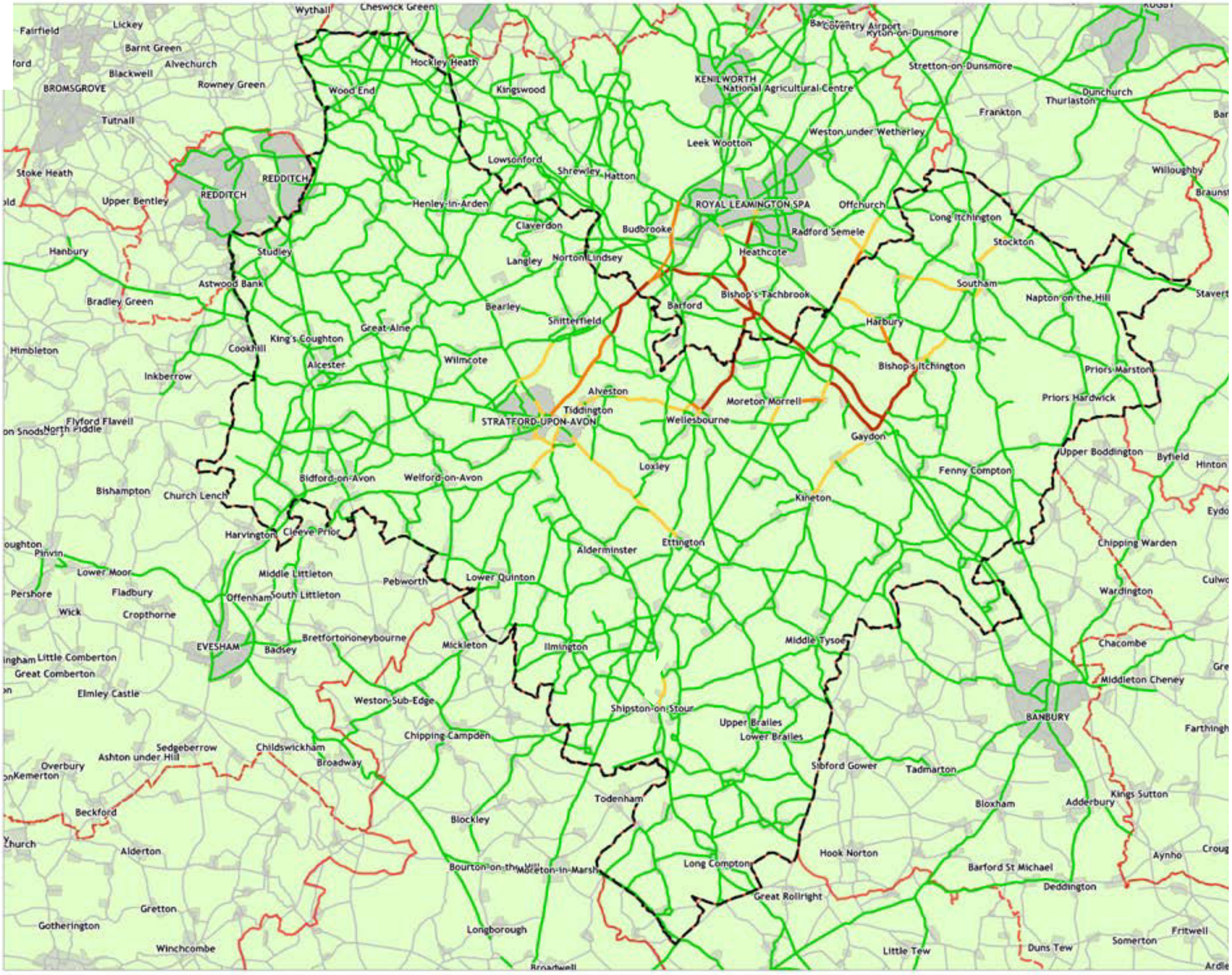
Key:

Additional two-way vehicle trips:

- 500 - 1000
- 250 - 500
- 100 - 250
- 50 - 100
- 0 -50

W: www.jmp.co.uk
E: Birmingham jmp.co.uk

Figure 15: Scenario 4 AM 0800-0900 GEH



Project Title:
Stratford-on-Avon District STA

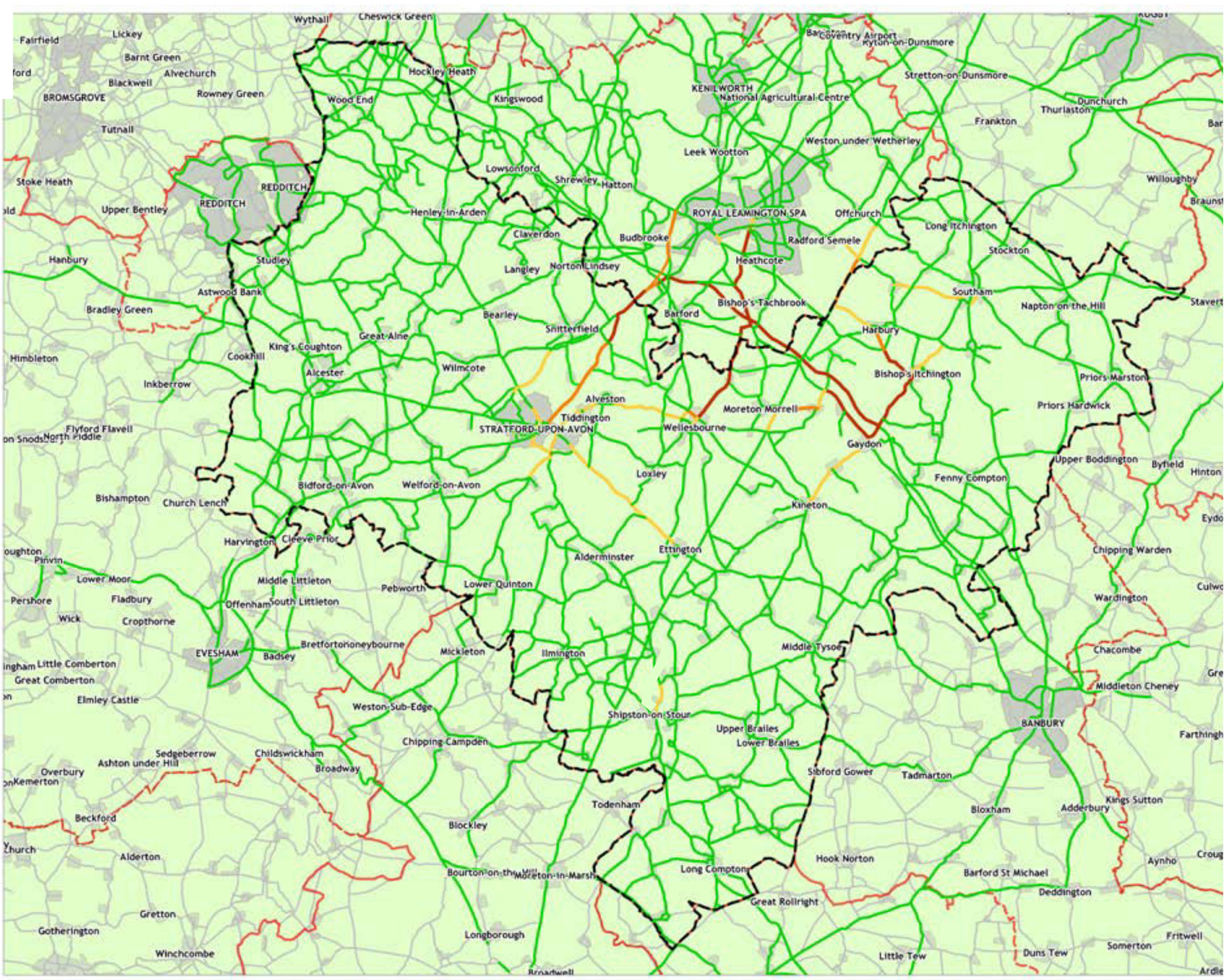
Key:

GEH

- >10
- 7.5 to 10
- 5 to 7.5
- 0 to 5

W: www.jmp.co.uk
E: Birmingham jmp.co.uk

Figure 16: Scenario 4 PM 1700-1800 GEH



Project Title:
Stratford-on-Avon District STA

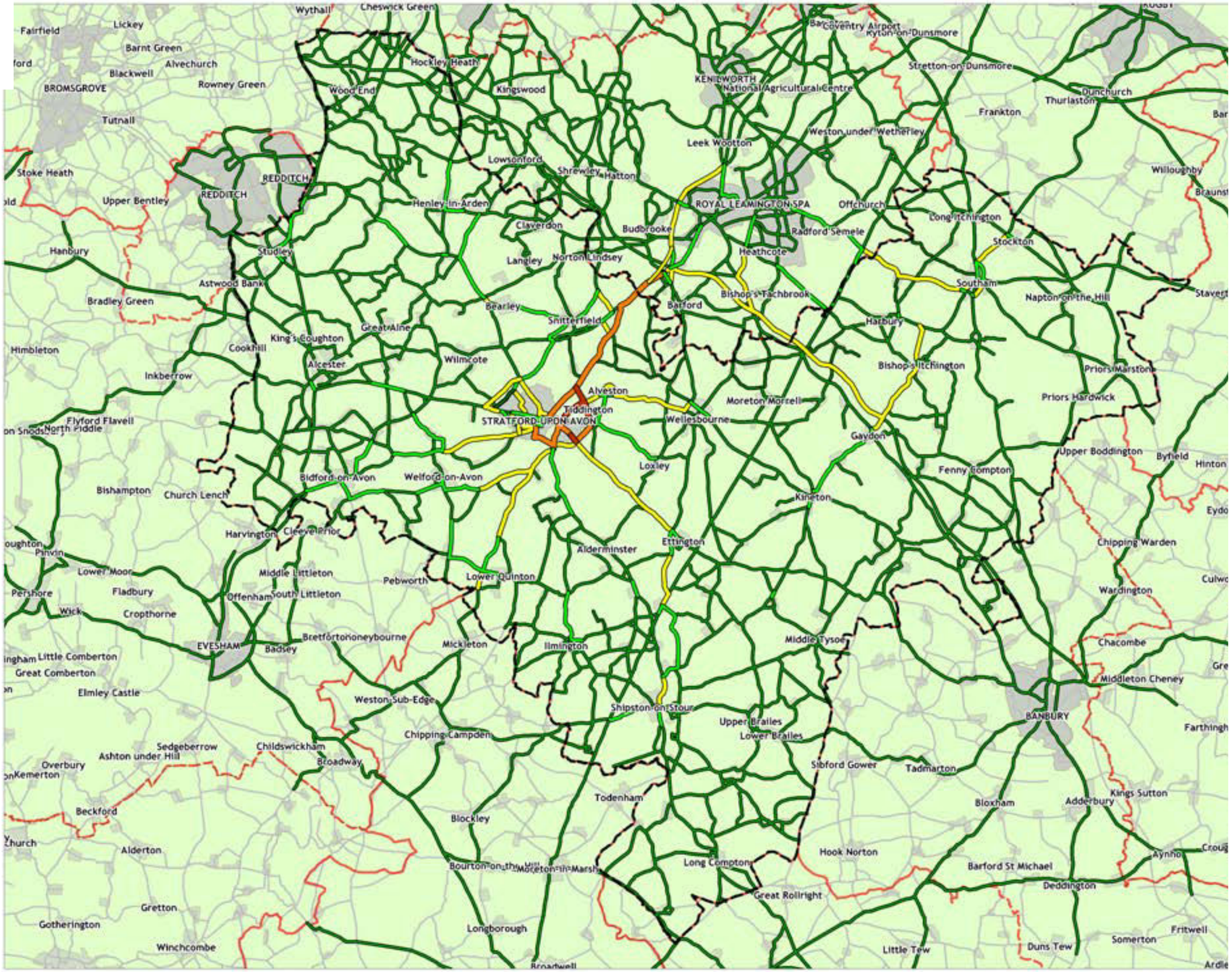
Key:

GEH

- >10
- 7.5 to 10
- 5 to 7.5
- 0 to 5

W: www.jmp.co.uk
E: Birmingham jmp.co.uk

Figure 17: Scenario 5 AM 0800-0900 flow



Project Title:
Stratford-on-Avon District STA

Key:

Additional two-way vehicle trips:

- 500 - 1000
- 250 - 500
- 100 - 250
- 50 - 100
- 0 -50

W: www.jmp.co.uk
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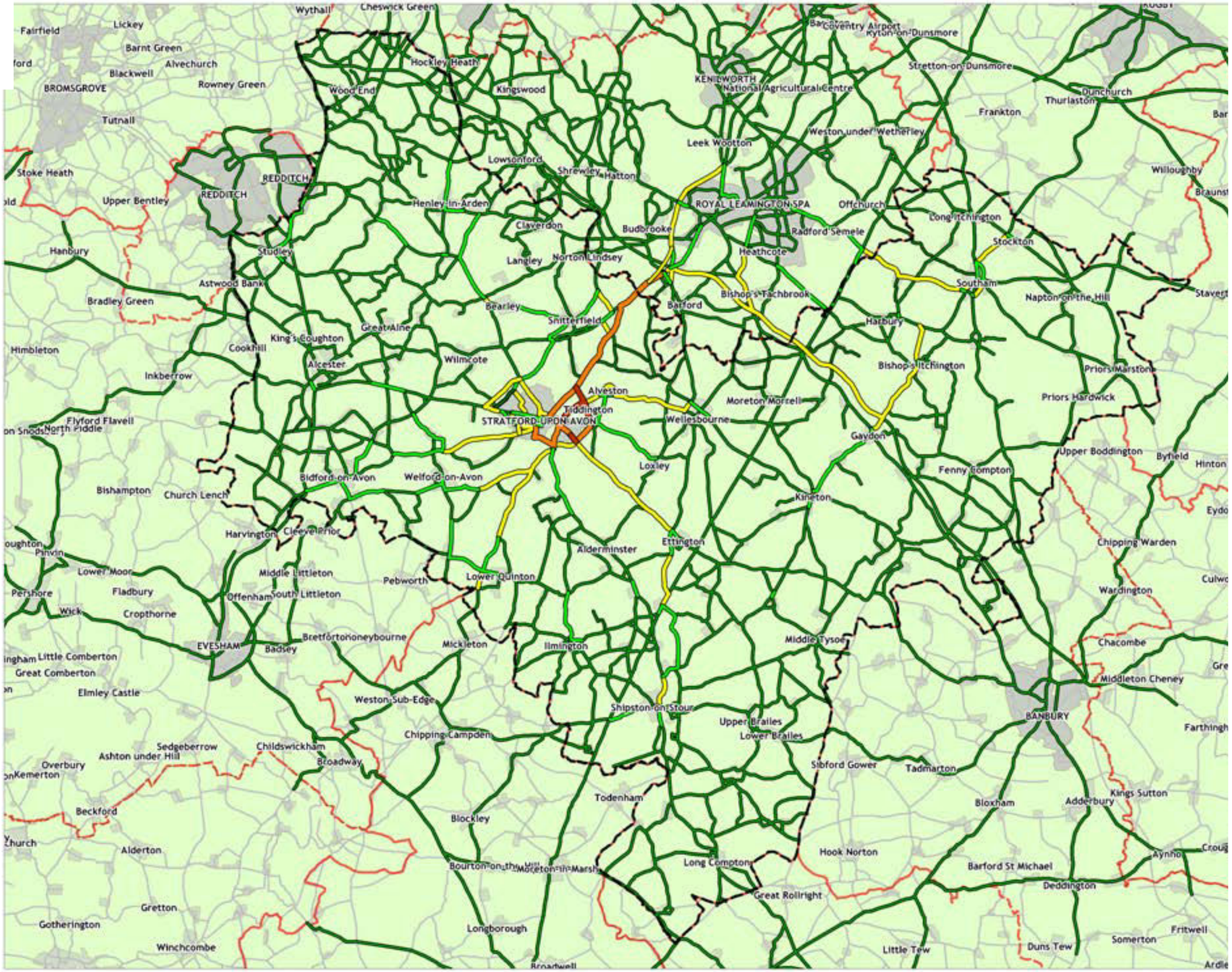
Figure 18: Scenario 5 PM 1700-1800 flow



Project Title:
Stratford-on-Avon District STA

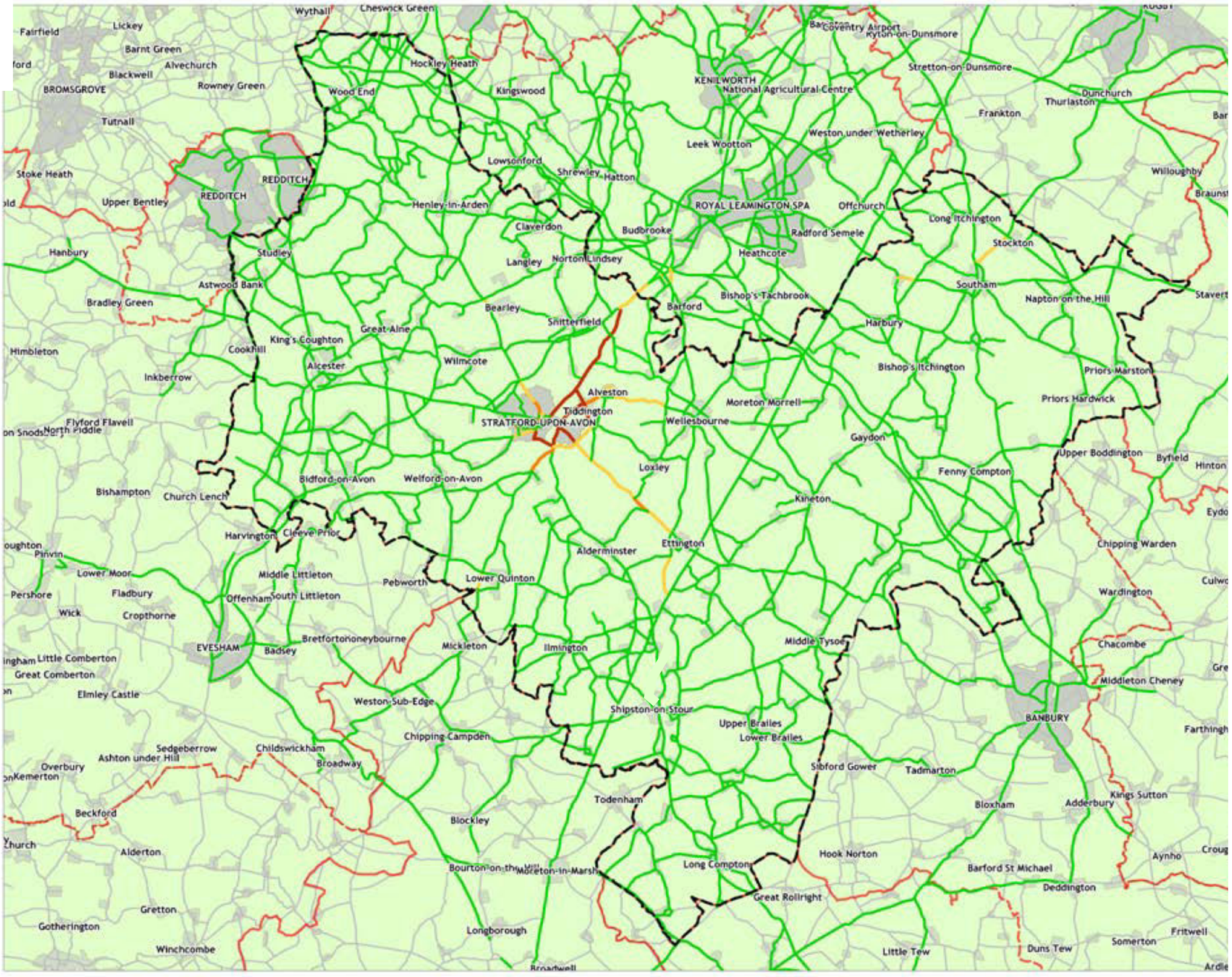
Key:

Additional two-way vehicle trips:

- 500 - 1000
- 250 - 500
- 100 - 250
- 50 - 100
- 0 -50

W: www.jmp.co.uk
E: Birmingham jmp.co.uk

Figure 19: Scenario 5 AM 0800-0900 GEH



Project Title:
Stratford-on-Avon District STA

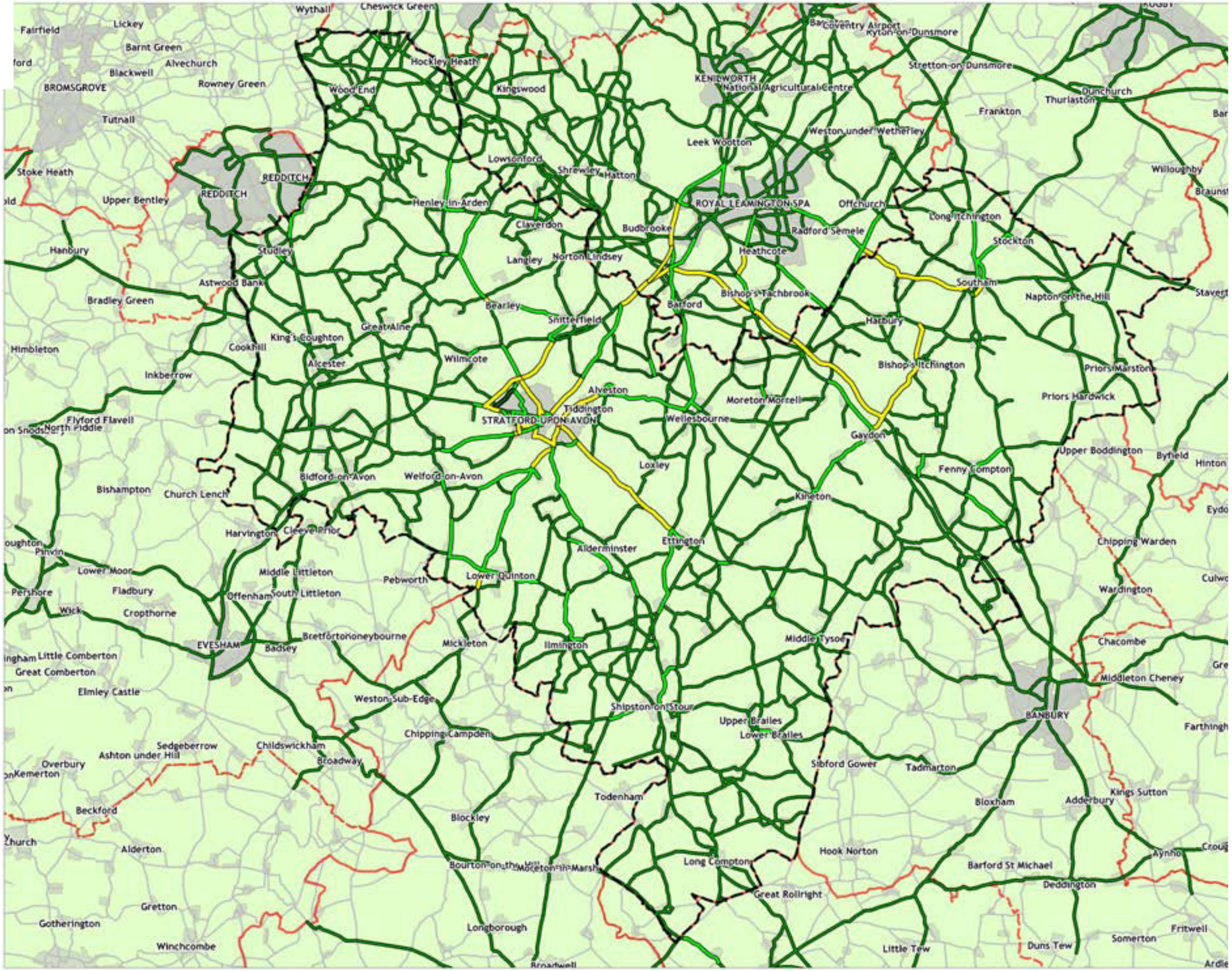
Key:

GEH

- >10
- 7.5 to 10
- 5 to 7.5
- 0 to 5

W: www.jmp.co.uk
E: Birmingham jmp.co.uk

Figure 2: Scenario 1 PM 1700-1800 flow



Project Title:
Stratford-on-Avon District STA

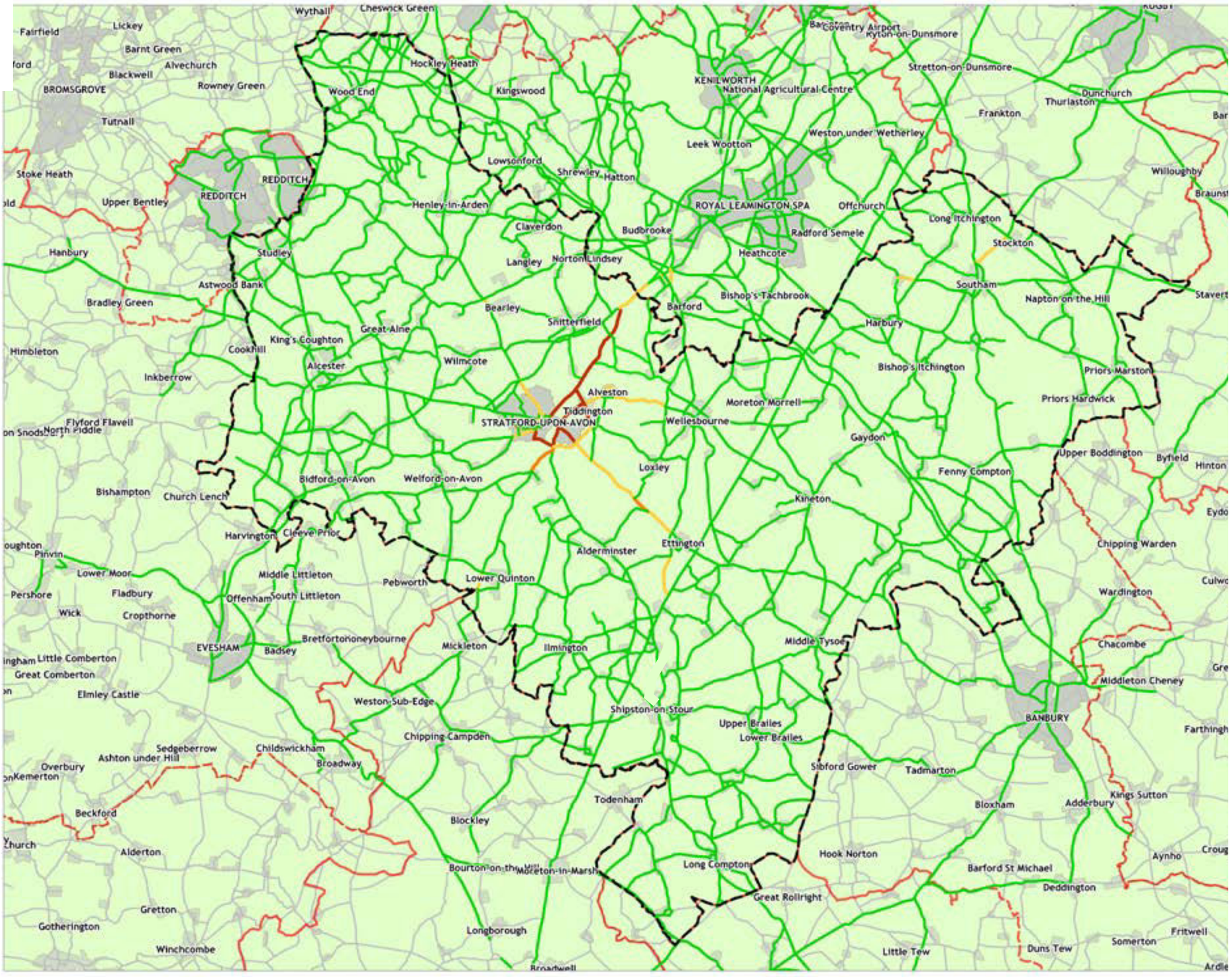
Key:

Additional two-way vehicle trips:

- 500 - 1000
- 250 - 500
- 100 - 250
- 50 - 100
- 0 -50

W: www.jmp.co.uk
E: Birmingham jmp.co.uk

Figure 20: Scenario 5 PM 1700-1800 GEH



Project Title:
Stratford-on-Avon District STA

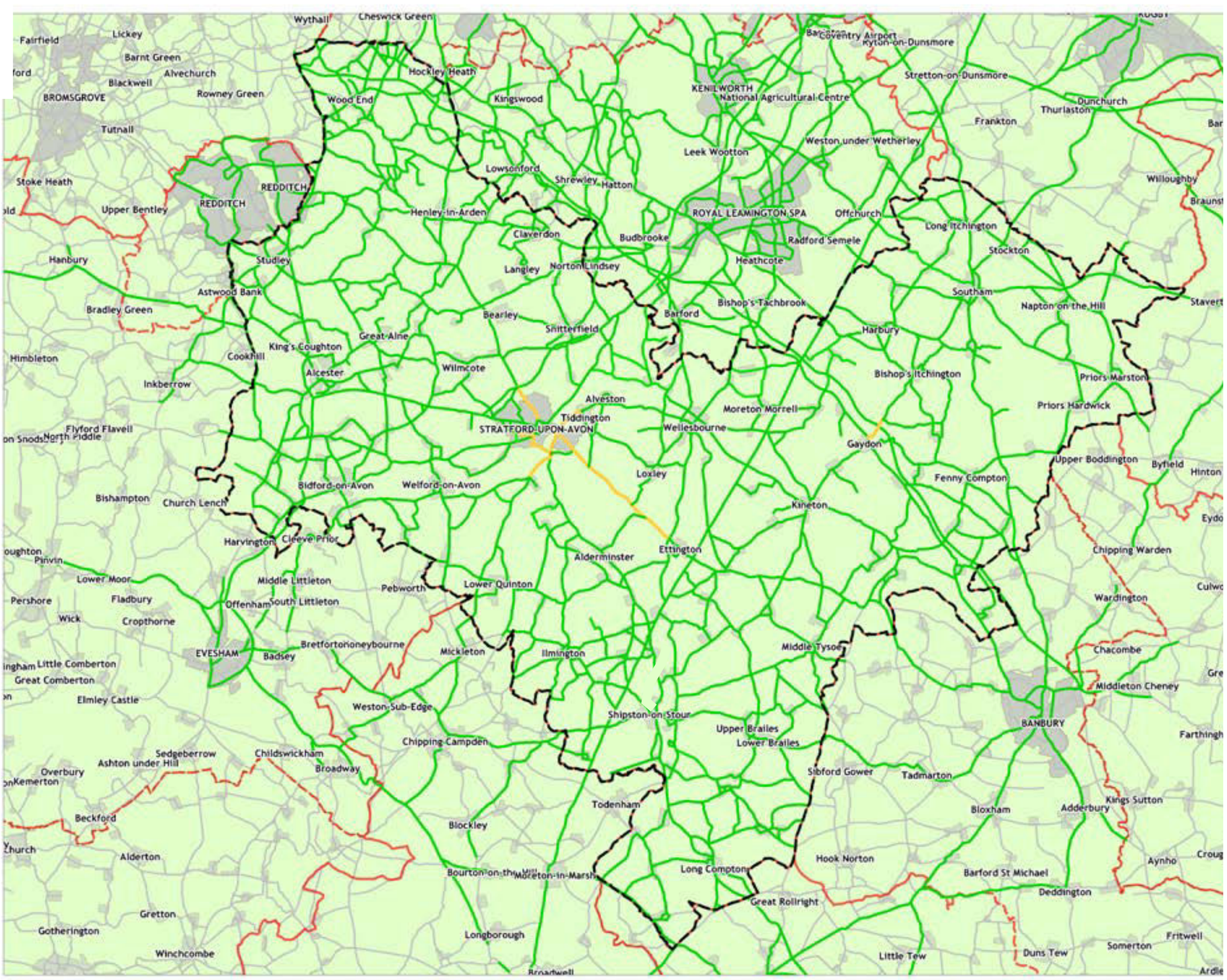
Key:

GEH

- >10
- 7.5 to 10
- 5 to 7.5
- 0 to 5

W: www.jmp.co.uk
E: Birmingham jmp.co.uk

Figure 3: Scenario 1 AM 0800-0900 GEH



Project Title:
Stratford-on-Avon District STA

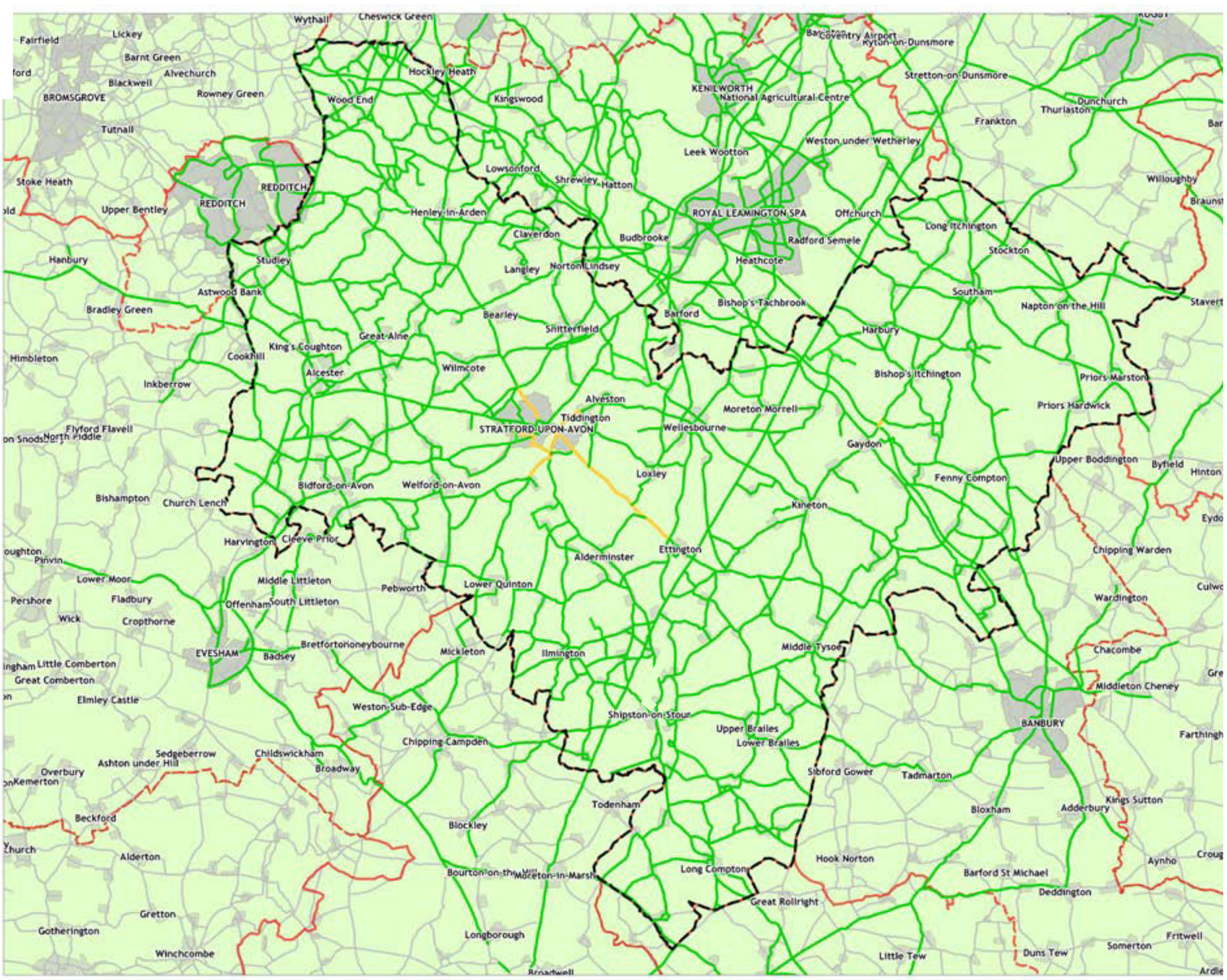
Key:

GEH

- >10
- 7.5 to 10
- 5 to 7.5
- 0 to 5

W: www.jmp.co.uk
E: Birmingham jmp.co.uk

Figure 4: Scenario 1 PM 1700-1800 GEH



Project Title:
Stratford-on-Avon District STA

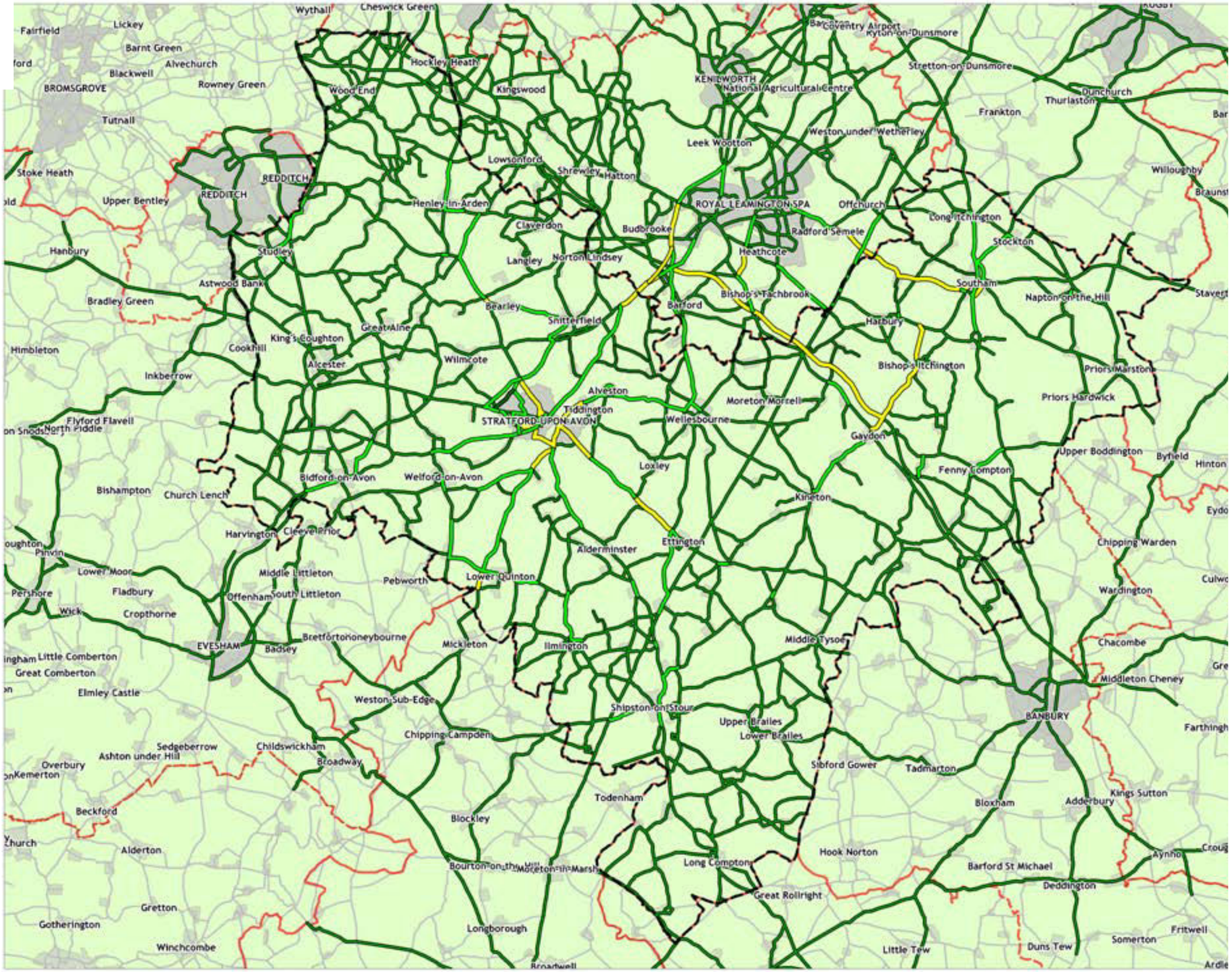
Key:

GEH

- >10
- 7.5 to 10
- 5 to 7.5
- 0 to 5

W: www.jmp.co.uk
E: Birmingham jmp.co.uk

Figure 5: Scenario 2 AM 0800-0900 flow



Project Title:
Stratford-on-Avon District STA

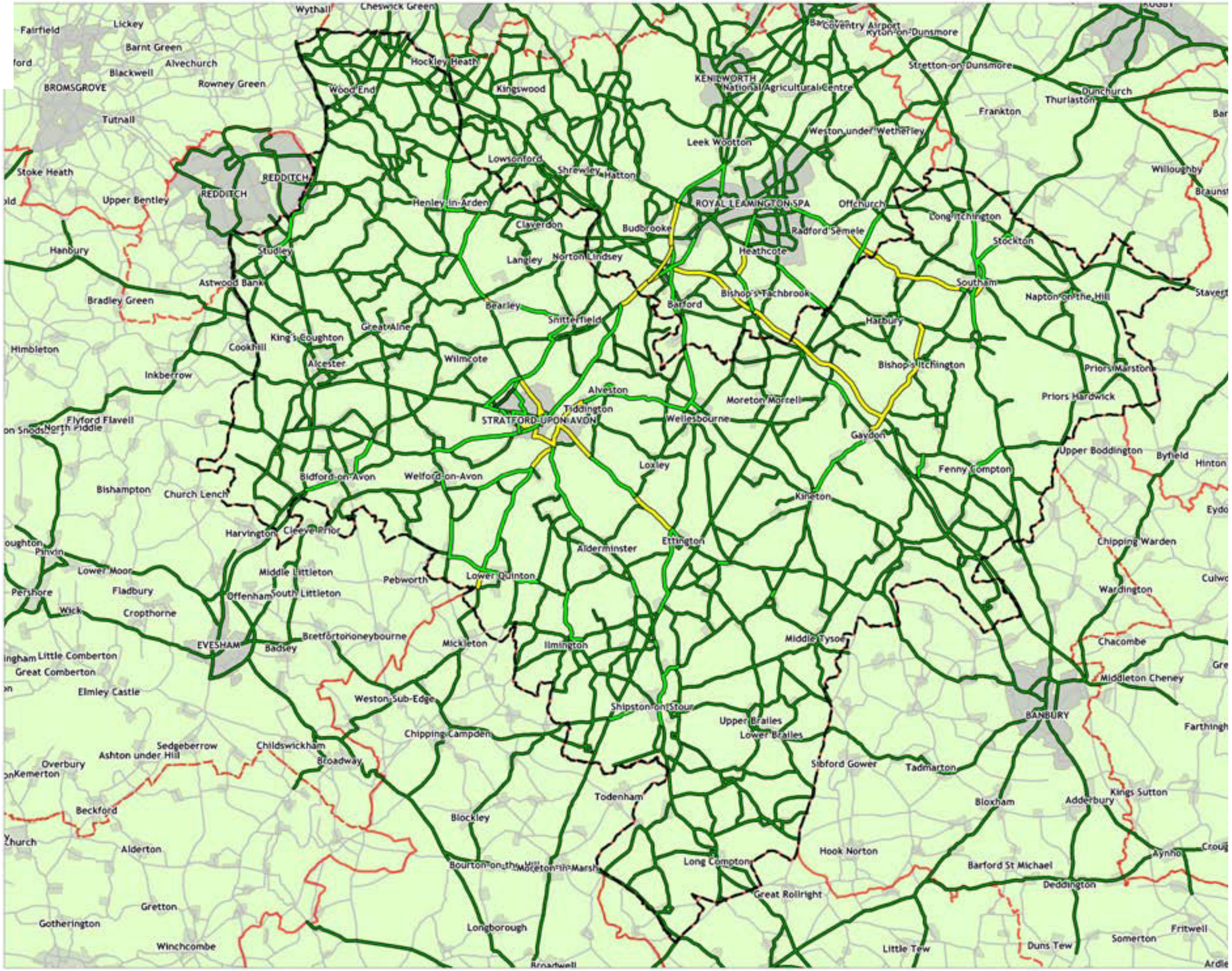
Key:

Additional two-way vehicle trips:

- 500 - 1000
- 250 - 500
- 100 - 250
- 50 - 100
- 0 -50

W: www.jmp.co.uk
E: Birmingham jmp.co.uk

Figure 6: Scenario 2 PM 1700-1800 flow



Project Title:
Stratford-on-Avon District STA

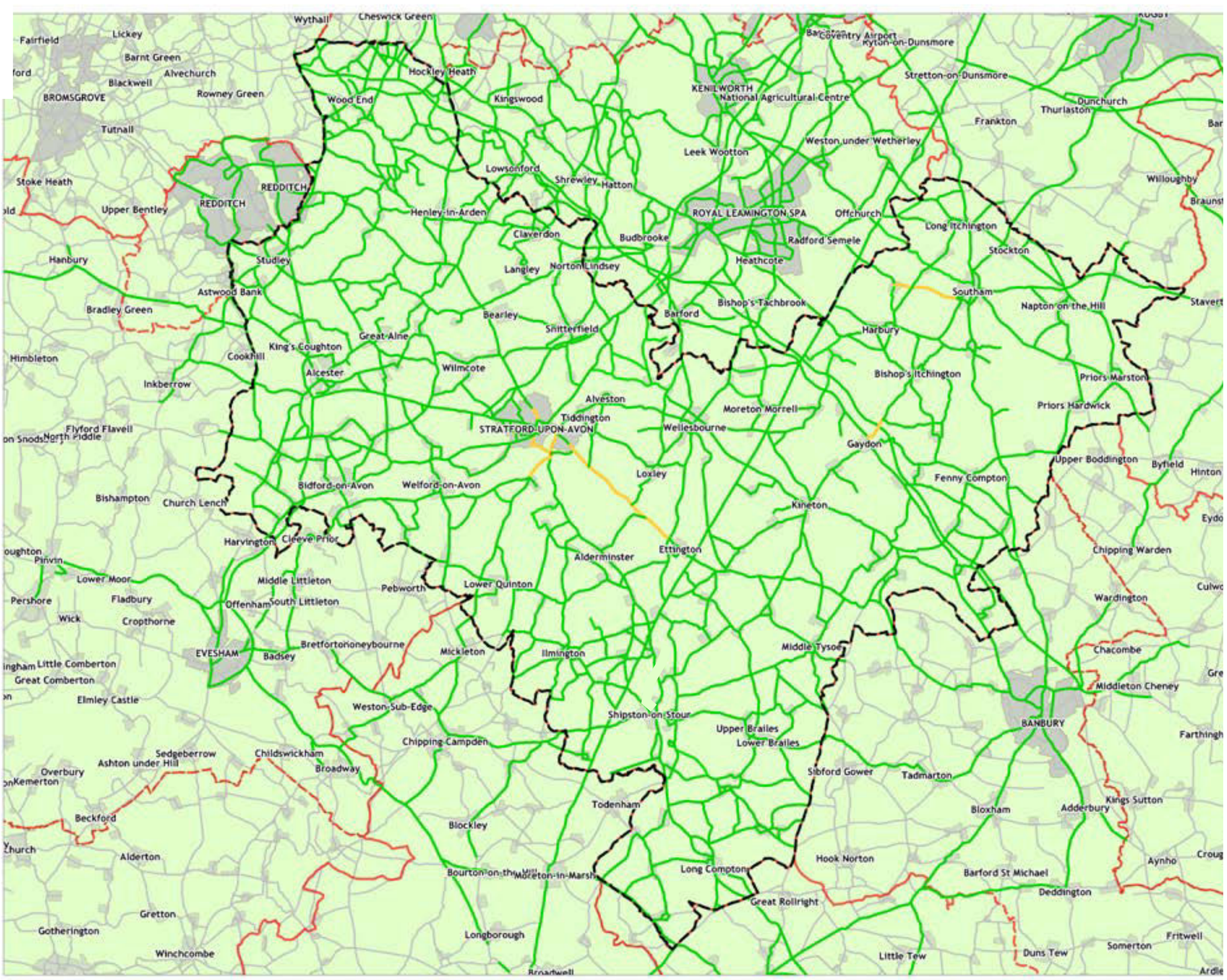
Key:

Additional two-way vehicle trips:

- 500 - 1000
- 250 - 500
- 100 - 250
- 50 - 100
- 0 -50

W: www.jmp.co.uk
E: Birmingham jmp.co.uk

Figure 7: Scenario 2 AM 0800-0900 GEH



Project Title:
Stratford-on-Avon District STA

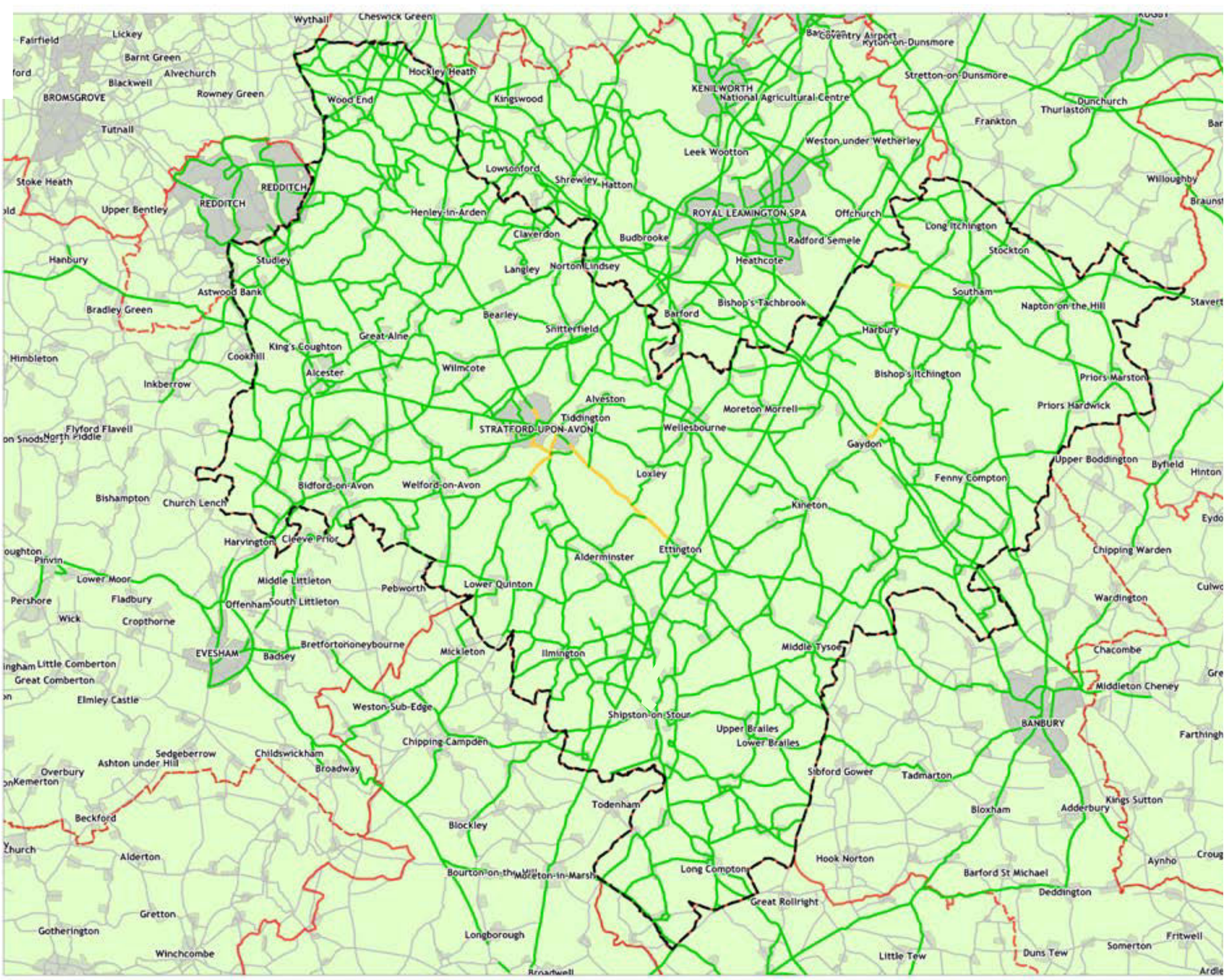
Key:

GEH

- >10
- 7.5 to 10
- 5 to 7.5
- 0 to 5

W: www.jmp.co.uk
E: Birmingham jmp.co.uk

Figure 8: Scenario 2 PM 1700-1800 GEH



Project Title:
Stratford-on-Avon District STA

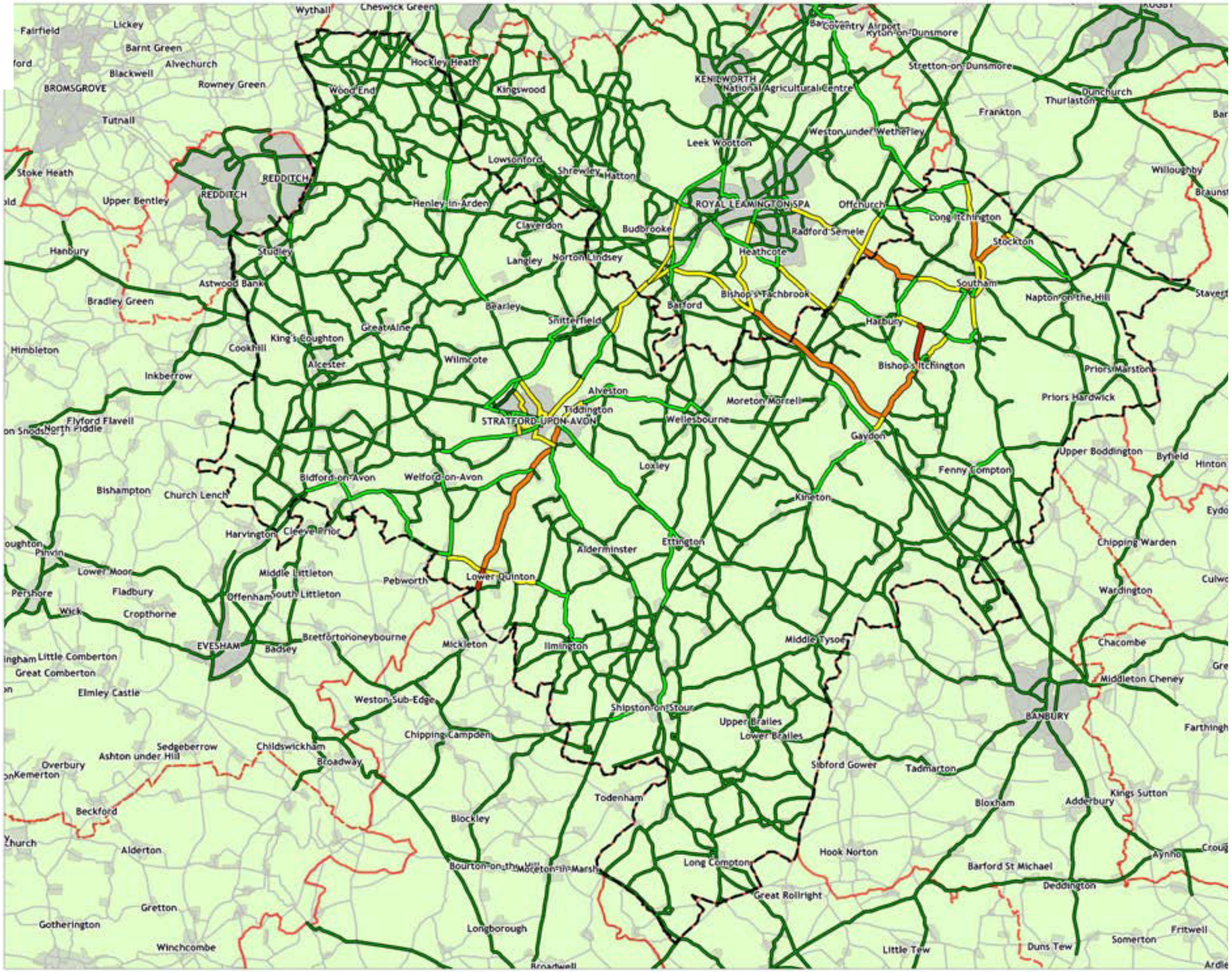
Key:

GEH

- >10
- 7.5 to 10
- 5 to 7.5
- 0 to 5

W: www.jmp.co.uk
E: Birmingham jmp.co.uk

Figure 9: Scenario 3 AM 0800-0900 flow



Project Title:
Stratford-on-Avon District STA

Key:

Additional two-way vehicle trips:

- 500 - 1000
- 250 - 500
- 100 - 250
- 50 - 100
- 0 -50

W: www.jmp.co.uk
E: Birmingham jmp.co.uk

Potential Development Location	Fruit & Veg	GPs	Hospitals	Employment	High Schools
alcester1	2	1	3	2	2
alcester2	1	1	2	2	1
alcester3	1	1	3	1	1
alcester4	1	1	3	1	1
alcester5	1	1	3	1	1
alcester6	1	1	3	1	1
alcester7	1	1	2	1	2
Alderminster	1	2	8	2	2
Alveston	1	1	2	1	2
Bearley	1	2	2	1	2
bidford1	1	1	2	2	2
bidford2	1	1	2	2	2
bidford3	1	1	2	2	2
bidford4	1	1	2	2	2
bidford5	1	1	2	2	2
bidford9	1	1	2	2	2
Bishops Itchington	1	1	3	1	2
Brailes (Upper and Lower)	1	1	1	1	6
Clifford chambers	1	2	7	1	1
Earlswood	2	2	7	7	7
Ettington	1	1	7	2	2
Fenny Compton	1	1	2	1	2
Gaydon	1	1	3	2	1
Great Alne	1	2	2	2	2
Halford	2	2	3	2	2
Harbury	1	1	8	1	2
henley in arden1	1	1	3	2	3
henley in arden2	1	1	3	2	3
henley in arden3	1	1	3	2	2
henley in arden4	1	1	3	2	2
Ilmington	2	2	7	2	1
kineton1	1	1	3	2	1
kineton2	1	1	3	2	1
kineton3	1	1	3	2	1
kineton4	1	1	3	2	1
kineton5	1	1	3	2	1
kineton6	1	1	3	2	1
Lighthorne Heath	1	1	8	1	2
Long Compton	2	2	5	2	2
Long Itchington	1	1	2	1	2
Long Marston	2	2	3	2	2
Mappleborough Green	1	1	4	4	1
Moreton Morrell	2	2	5	2	5
Napton-on-the-Hill	1	2	8	7	2
Newbold-on-Stour	1	1	8	2	2
Northend	2	2	6	3	2
Oxhill	1	1	6	6	1
Pillerton Priors	1	2	3	3	2
Quinton (Lower)	1	1	3	1	1

shipston on stour1	1	1	4	1	1
shipston on stour2	1	1	4	1	1
shipston on stour3	1	2	4	1	1
shipston on stour4	1	2	4	1	1
shipston on stour5	1	2	4	1	1
shipston on stour6	1	2	4	2	1
shipston on stour7	1	2	4	2	1
shipston on stour8	1	1	3	1	1
Snitterfield	1	1	7	3	2
southam1	1	1	3	3	2
southam2	1	1	3	2	2
southam3	1	1	3	2	2
southam4	1	1	3	2	2
southam5	1	1	2	1	2
southam6	1	1	2	1	2
southam7	1	1	3	1	2
southam8	1	1	2	2	2
southam9	1	1	2	2	2
Stockton	1	2	3	3	8
stratford1	1	1	1	1	1
stratford10	1	2	2	1	2
stratford11	1	2	2	1	3
stratford12	1	1	1	1	2
stratford13	1	1	1	1	2
stratford14	1	1	1	1	2
stratford15	1	1	1	1	2
stratford16	1	1	2	2	2
stratford17	1	1	1	1	3
stratford18	1	1	2	1	3
stratford19	1	1	1	1	3
stratford2	1	1	1	1	1
stratford3	1	1	1	1	1
stratford4	1	1	1	1	1
stratford5	1	1	1	1	1
stratford6	1	2	2	2	2
stratford7	1	1	2	1	2
stratford8	1	1	2	1	2
stratford9	1	1	2	1	2
studley1	1	1	4	3	1
studley2	1	1	3	3	1
studley3	1	1	3	3	1
studley4	1	1	3	3	1
studley5	1	1	3	2	2
studley6	1	1	4	2	1
studley7	1	1	4	2	1
studley8	1	1	3	2	2
Tanworth-in-Arden	7	2	8	8	8
Tiddington	1	1	1	1	2
Tredington	1	2	3	2	2
Tysoe (Upper & Middle)	1	1	5	5	6

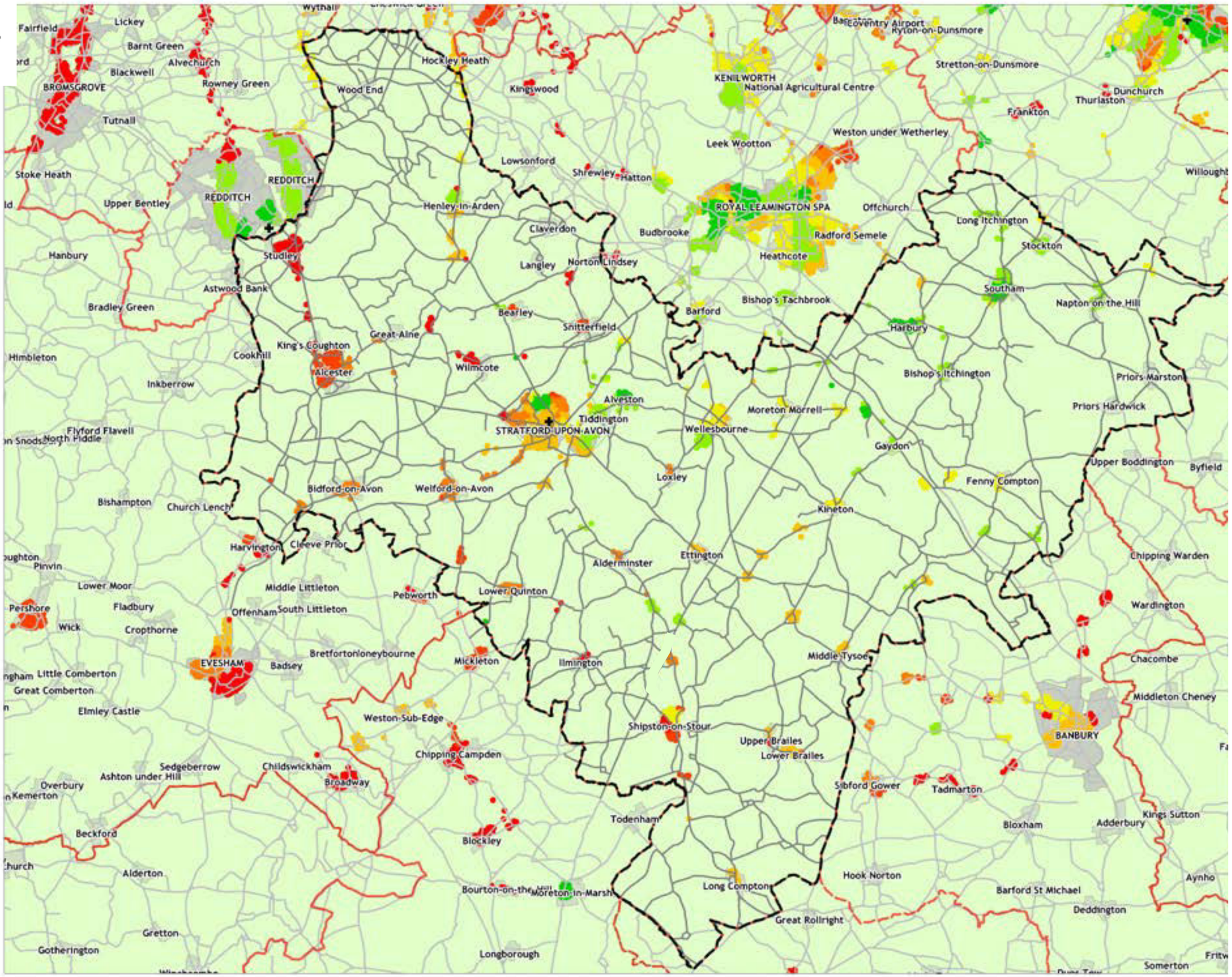
Welford-on-Avon	1	1	2	1	1
wellesbourne1	1	1	2	1	1
wellesbourne10	1	1	3	1	2
wellesbourne11	1	2	3	1	2
wellesbourne12	1	2	3	1	2
wellesbourne13	1	1	2	1	3
wellesbourne2	1	1	2	1	1
wellesbourne3	1	1	2	1	1
wellesbourne4	1	1	2	1	1
wellesbourne5	1	1	2	1	1
wellesbourne6	1	1	2	1	1
wellesbourne7	1	1	2	1	1
wellesbourne8	1	1	3	1	2
wellesbourne9	1	1	2	1	2
Wilmcote	1	2	2	2	2
Wootton Wawen	1	1	3	2	3
bidford6	8	8	8	8	8
bidford7	8	8	8	8	8
bidford8	8	8	8	8	8
Claverdon	8	8	8	8	8
HamptonLucy	8	8	8	8	8
PriorsMarston	8	8	8	8	8
Salford	8	8	8	8	8
southam10	8	8	8	8	8
southam11	8	8	8	8	8
studley10	8	8	8	8	8
studley9	8	8	8	8	8

Town Centres	Average Ranking Score
4	2.33
3	1.67
3	1.67
3	1.67
3	1.67
3	1.67
3	1.67
7	3.67
3	1.67
2	1.67
3	1.83
3	1.83
3	1.83
3	1.83
3	1.83
3	1.83
2	1.67
2	2.00
8	3.33
7	5.33
2	2.50
1	1.33
2	1.67
2	1.83
3	2.33
2	2.50
3	2.17
2	2.00
2	1.83
2	1.83
8	3.67
2	1.67
2	1.67
2	1.67
2	1.67
2	1.67
2	1.67
2	2.50
5	3.00
2	1.50
3	2.33
2	2.17
4	3.33
7	4.50
7	3.50
3	3.00
7	3.67
3	2.33
3	1.67

4	2.00
4	2.00
4	2.17
4	2.17
4	2.17
4	2.33
4	2.33
4	1.83
3	2.83
7	2.83
2	1.83
2	1.83
2	1.83
2	1.50
2	1.50
2	1.67
2	1.67
2	1.67
7	4.00
2	1.17
2	1.67
2	1.83
2	1.33
2	1.33
2	1.33
2	1.33
2	1.67
3	1.67
1	1.50
3	1.67
2	1.17
2	1.17
2	1.17
2	1.17
3	2.00
2	1.50
2	1.50
2	1.50
8	3.00
3	2.00
3	2.00
3	2.00
3	2.00
4	2.17
4	2.17
3	2.00
8	6.83
5	1.83
3	2.17
6	4.00

3	1.50
4	1.67
2	1.67
2	1.83
2	1.83
2	1.67
2	1.33
3	1.50
2	1.33
2	1.33
2	1.33
2	1.33
2	1.67
2	1.50
4	2.17
3	2.17
8	8.00
8	8.00
8	8.00
8	8.00
8	8.00
8	8.00
8	8.00
8	8.00
8	8.00
8	8.00
8	8.00

Figure 21: Public transport access to non-specialist hospitals



Project Title:
Stratford-on-Avon District STA

Key:

Public transport travel time

- over 60 minutes
- 50 to 60 minutes
- 40 to 50 minutes
- 30 to 40 minutes
- 20 to 30 minutes
- 10 to 20 minutes
- 0 to 10 minutes

Tested destination

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Appendix I Table 1:- Absolute Increase in 2028 Development Related Traffic on Base 2028 on Selected Routes and Areas

Locations	Base 2012		Base 2028		Scenario 1		Scenario 2		Scenario 3		Scenario 4		Scenario 5	
	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
Main Urban Centres														
Stratford-upon-Avon	12293	11401	13384	12625	973	971	848	845	957	954	1157	1155	1634	1631
Leamington Spa	17289	16462	19187	18038	276	275	279	278	542	541	1102	1101	282	281
Warwick	9712	8940	10948	9599	217	217	232	231	289	289	603	602	300	300
Main Towns and Villages														
Alcester	7808	7646	8670	8460	90	88	108	107	100	99	108	106	143	141
Bidford-on-Avon	7203	7165	7860	7856	201	200	255	253	287	286	256	255	285	284
Kineton	7828	7542	8430	8461	176	175	198	197	189	188	344	344	200	199
Henley-in-Arden	4402	4031	4743	4517	167	166	190	189	155	154	196	195	186	185
Shipston-on-Stour	4930	4712	5621	5287	223	222	271	270	236	235	334	333	293	293
Southam	8854	8384	9666	9270	329	325	372	368	702	699	537	533	357	353
Wellesbourne	9632	9124	10716	10047	265	262	285	282	239	236	828	825	359	356
Local Service Villages (selected)														
Bishop's Itchington	4173	3810	4625	4137	269	269	263	263	1024	1024	614	613	256	256
Harbury	6681	6121	7408	6615	141	141	143	143	399	399	454	454	126	126
Long Marston	1331	1224	1509	1330	67	67	61	61	69	69	62	62	59	59
Motorways and Trunk Routes														
M40 between J12 and J14	8182	7145	9175	8213	172	172	169	169	322	321	2090	2089	162	162
M40 between J14 and J15	10875	9434	12285	10416	123	123	116	116	208	207	1041	1041	152	152
A46 Stratford Northern Bypass	1322	1252	1428	1370	118	118	86	86	81	80	103	102	65	65
A46 between Marraway and M40 J15	3585	3261	3896	3609	131	130	78	77	141	140	504	504	324	324
A46 Warwick Bypass	5007	4615	5621	5285	142	141	129	129	165	164	463	463	217	217
AQMA areas (not already covered)														
A435 Studley Village Centre	1568	1637	1754	1885	26	26	32	32	25	25	32	31	40	40

Key:-		
Additional 2-way traffic		
0	50	
50	100	
100	250	
250	500	
500	1000	
1000	+	

Appendix I Table 2:- Percentage Increase in 2028 Development Related Traffic on Base 2028 on Selected Routes and Areas

Locations	Base 2028		Scenario 1		Scenario 2		Scenario 3		Scenario 4		Scenario 5	
	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
Main Urban Centres												
Stratford-upon-Avon	9%	11%	7%	8%	6%	7%	7%	8%	9%	9%	12%	13%
Leamington Spa	11%	10%	1%	2%	1%	2%	3%	3%	6%	6%	1%	2%
Warwick	13%	7%	2%	2%	2%	2%	3%	3%	6%	6%	3%	3%
Main Towns and Villages												
Alcester	11%	11%	1%	1%	1%	1%	1%	1%	1%	1%	2%	2%
Bidford-on-Avon	9%	10%	3%	3%	3%	3%	4%	4%	3%	3%	4%	4%
Kineton	8%	12%	2%	2%	2%	2%	2%	2%	4%	4%	2%	2%
Henley-in-Arden	8%	12%	4%	4%	4%	4%	3%	3%	4%	4%	4%	4%
Shipston-on-Stour	14%	12%	4%	4%	5%	5%	4%	4%	6%	6%	5%	6%
Southam	9%	11%	3%	4%	4%	4%	7%	8%	6%	6%	4%	4%
Wellesbourne	11%	10%	2%	3%	3%	3%	2%	2%	8%	8%	3%	4%
Local Service Villages (selected)												
Bishop's Itchington	11%	9%	6%	6%	6%	6%	22%	25%	13%	15%	6%	6%
Harbury	11%	8%	2%	2%	2%	2%	5%	6%	6%	7%	2%	2%
Long Marston	13%	9%	4%	5%	4%	5%	5%	5%	4%	5%	4%	4%
Motorways and Trunk Routes												
M40 between J12 and J14	12%	15%	2%	2%	2%	2%	4%	4%	23%	25%	2%	2%
M40 between J14 and J15	13%	10%	1%	1%	1%	1%	2%	2%	8%	10%	1%	1%
A46 Stratford Northern Bypass	8%	9%	8%	9%	6%	6%	6%	6%	7%	7%	5%	5%
A46 between Marraway and M40 J15	9%	11%	3%	4%	2%	2%	4%	4%	13%	14%	8%	9%
A46 Warwick Bypass	12%	15%	3%	3%	2%	2%	3%	3%	8%	9%	4%	4%
AQMA areas (not already covered)												
A435 Studley Village Centre	12%	15%	1%	1%	2%	2%	1%	1%	2%	2%	2%	2%

Key:-	
Additional 2-way traffic	
Low % Increase	
Moderate % Increase	
High % Increase	

Appendix J - Stratford-upon-Avon - Indicative Scheme Table Town Centre Improvements (TCI)

Scheme Location	Description	Rationale	Indicative Cost
Evesham Road/Evesham Place roundabout	Reconfiguration of the junction from a roundabout to a signal operated four arm priority junction	Potential capacity benefits of switching from a roundabout to traffic signal-controlled priority junction. Signalisation required due to the tidal nature of movements across the junction. During the AM heavy traffic flows are present northwards into Stratford whilst the opposite occurs in the PM. The use of signals allows the junction to be better tailored to the differing AM and PM conditions.	£750,000
Signalisation of the Gyratory	Co-ordinated signalisation of Warwick Road, Bridge Foot and Bridge Street Junction entry arms (Guild Street antry and merge with Bridgefoot northbound already signalised).	Heavy flows out of Stratford via Guild Street northbound to Warwick Road coupled with a heavy flow into Stratford southbound from the Warwick Road results in limited opportunities for traffic to enter the junction via Bridge Foot or Bridge street which in turn results in severe queuing particularly along Clopton Bridge which extends back a significant distance along the Banbury Road. Signalisation provides a greater element of control which, in turn, enables these impacts to be better mitigated.	£750,000
Tiddington Road/Swans Nest Lane /Banbury Road priority junction	Signalisation of the junction to co-ordinate with the Gyratory. Reconfiguration of the junction to enable traffic to turn right out of Tiddington road	Allowing traffic to turn right out of Tiddington Road removes the need for the u-turn at Banbury Road/Shipston Road which improves conditions at that junction. Reconfiguration of this junction, alongside the nearby Banbury Road/Shipston Road roundabout introduces a greater element of control over traffic movements and enables the tidal nature of the flow to be better accommodated.	£750,000
Banbury Road/Shipston Road roundabout	Reconfiguration of existing roundabout to signalised priority junction with 3 lanes on the approaches from Banbury Road/Shipston Road	Scheme intended to work in tandem with Tiddington Road junction scheme that removes need for u-turn. Signalisation of the junction results in a greater element of control over the movement of traffic through the junction, particularly due to the tidal nature of the flow in that area during peak periods, the net result is increased throughput and notably lower queues on approaches when the scheme is implemented.	£750,000
Grove Road/Rother Street	Redirection of flow by implementing a co-ordinated one way strategy. Grove Road becomes one way NB whilst Rother street becomes one way SB. Two lane SB approach extended from Rother Street to Evesham Place Roundabout	Queuing on Rother Street is frequently exacerbated by the limited opportunity for traffic travelling SB to exit onto Evesham Place, which, in turn results in lengthy queues that frequently block back through Greenhill Street and beyond. By making Grove Road one-way NB and Rother Street one-way SB the propensity for blocking back to occur is reduced significantly. Furthermore, the additional lanes provide additional storage capacity for any queues that do occur and they limit the propensity for queues to reach such an extent that they begin to impact upon the operation of adjacent major junctions.	£250,000
Birmingham Road / Windsor Street	Reconfiguration of roundabout to priority junction with restricted movements.	Priority junction has no right turns which limits the propensity for vehicles to wait for gaps on what is becoming an increasingly busy section of road network. Removing the roundabout also discourages the use of Windsor Street NB in favour of Arden Street which, because of the signals, has a greater control over traffic movements due to signalisation.	£500,000

Appendix K

Draft Core Strategy (February 2012)

The following note provides the formal response from the County Council's Transport Planning Group on key issues set out in the Stratford-on-Avon District Draft Core Strategy (February 2012).

Assess the scope to improve traffic management on Birmingham Road.

A consultants' study is currently underway to assess the feasibility of possible measures for tackling congestion along the corridor. The Study is due to produce a set of recommendations for consideration by the County Council towards the end of 2012.

As noted in paragraph 10.1.31 of the Draft Core Strategy (February 2012), there are a number of key brownfield opportunity sites within the town which have been identified in the Urban Design Framework (UDF) Supplementary Planning Document (SPD) which was adopted in 2007. The three most significant of these are listed below:-

- Western Road/Wharf Road area (Canal Quarter);
- Rother Street/Grove Road area (Rother Quarter);
- Bridgeway/Bridgefoot area.

Western Road/Wharf Road area (Canal Quarter)

The first of these (Canal Quarter) is accessed directly off Birmingham Road via Western Road to the south of the canal and Wharf Road to the north. The UDF envisages that the area would have a mix of residential, employment and cultural uses.

The above proposals could have implications for congestion on the route if proposed new uses generate significantly more traffic than existing uses, unless an effective mitigation package is developed to minimise impacts on Birmingham Road.

As part of the redevelopment proposals for this area, the UDF also proposes a new bridge running north/south across the canal linking Western Road with Maybrook Road which would be used by buses, cyclists and pedestrians. The bridge would enable buses to penetrate the area and access the proposed bus/rail interchange which is due to be provided as part of the redevelopment of the former Cattle Market site. It would need to be wide enough to accommodate two-way working for buses and provide a high-quality route for pedestrians and cyclists.

Our previous comments indicated that the proposed bridge would present a serious risk of blight to the scheme promoter as it would require land which currently occupied by a premier car dealership on Western Road. For this reason, the County Council would not wish to be the scheme promoter. It is

also not currently known whether the bridge would be feasible in engineering terms, nor has there been an assessment of likely cost.

Rother Street/Grove Road area (Rother Quarter)

Given its central location within the town, the developer should promote measures which encourage a significant proportion of trips to/from this area to be undertaken on foot, by bike or on public transport including Park and Ride which serves Wood Street to the north of the site. Enhanced pedestrian links should be provided between the site and the railway station.

Bridgeway/Bridgefoot area

For the Bridgeway area, the proposals are based on visitor and leisure uses, including a replacement Leisure Centre, possible conference centre, hotel, remodelled surface and multi-storey parking.

There is a need to provide high quality parking and refreshment facilities for coach drivers and passengers as part of redevelopment proposals for this area to encourage coaches to stop in the town instead of travelling through without stopping. There is also a need to improve pedestrian connections between Bridgeway and the town centre, whilst ensuring delays to vehicle traffic are minimised.

Provide a bus-rail interchange as part of the redevelopment of the former Cattle Market site.

A new bus/rail interchange is due to be provided as part of the redevelopment of the former Cattle Market site outside Stratford Rail Station. Along with providing better opportunities for interchange and an improved passenger environment, one of the anticipated benefits of the facility will be its potential to provide a dedicated location for bus layover purposes.

The County Council currently provides financial support for approximately half of all local bus services in Stratford-upon-Avon. If the bus/rail interchange is provided, it is proposed to schedule these services to serve the interchange. The County Council will also encourage the main commercial bus operator (Stagecoach in Warwickshire) to use the interchange for layover to reduce the impact of vehicles laying over from Wood Street and Bridge Street.

Investigate the scope for providing a bus station in the town centre.

In 2010/11, options for a town centre bus station were investigated by consultants on behalf of the County Council as part of a feasibility study. The study concluded that the Windsor Street multi-story car park site represented the optimum location for a single site bus station for Stratford-upon-Avon.

The study noted, however, that the following key issues would need to be considered fully before such a proposal could be taken further:-

(a) At present no economic case based on central government funding criteria for the development of a bus station in the town centre can be established.

(b) Section 106 is the only practical funding source although it could prove difficult to justify the use of this funding to cover the whole cost of the bus station.

(c) Private sector investment is unlikely unless a redevelopment proposal for the site and the surrounding area comes forward.

There are currently no proposals to progress the scheme due to the lack of a viable business case to justify the use of LTP capital funding, (which will be extremely limited for the foreseeable future). The Draft Core Strategy (February 2012) includes an aspiration for a bus station in the town but does not appear to make reference to Windsor Street as the optimum site. The redevelopment value of the Windsor Street site to the District Council is likely to be substantial and it is assumed that such a prime site would not be put forward in the Core Strategy for possible use as a bus station.

Support the implementation of a Parkway Rail Station at Bishopton adjacent to the park and ride facility.

The County Council is currently progressing the delivery of Stratford Parkway Rail Station which is due to open in 2013. The proposed site for the station is adjacent to the existing bus-based park and ride at Bishopton and the two facilities will share the existing car park.

Stratford Parkway is one of several initiatives that form part of the Shakespeare Rail Line Upgrade. It will contribute to the business case for increasing the frequency of rail services between Stratford-upon-Avon town and Birmingham.

Investigate the scope for providing a park and ride facility on the south side of the town.

In 2010, the County Council commissioned consultants to undertake a feasibility study to evaluate options for a possible southern Park and Ride scheme in Stratford-upon-Avon. The study reported in July 2011 and its key conclusions were as follows:-

(a) Site 1, adjacent to the Bird Group / Waitrose site, represents the optimum location for a southern Park and Ride site.

(b) No business case that meets criteria for external funding (e.g. from Central Government) exists at the present time to progress the development of a southern Park and Ride scheme.

(c) The successful delivery and operation of a southern Park and Ride is dependent on the associated development of a complementary town centre parking regime.

A southern Park and Ride service, which is developer-funded, has recently been introduced in Stratford-upon-Avon and operates at a half-hourly frequency between the town centre and the new Rosebird Centre development south of the town, (Site 1 referred to in (a) above).

The County Council will consider the financial implications of taking over the running of the shuttle bus which operates the service once the period of developer funding has ended.

Promote and implement the Historic Spine Project to improve pedestrian facilities through the town centre.

To support aspirations for improving the route, the County Council is currently consulting on proposals to restrict loading and parking on the western side of High Street with consequential measures to deal with displaced loading and blue badge parking. It is anticipated that an appropriate scheme is likely to be delivered in 2013.

Reduce the impact of HGV movements, particularly in the town centre and on Clopton Bridge.

The LTP 2011-2026 includes a proposal to investigate whether an environmental weight limit on Clopton Bridge would be feasible. It is worth noting that:-

1. The bridge is structurally sound despite the increase in large HGVs using it.

2. An weight limit would be very difficult to enforce as there are few if any suitable alternative routes.

3. The imposition of a weight limit could lead to an increase in the number of HGVs on other unsuitable routes, i.e. Tiddington Road, Grove Road and Birmingham Road and other routes in the town centre.

4. The above routes may be more attractive to HGV operators than a longer and more circuitous route via Wellesbourne and Barford bypass.

It may be possible to secure voluntary routing agreements with local freight operators including those at Long Marston to reduce the number of HGVs on Clopton Bridge. Such agreements are however not legally enforceable.

Assess the scope for a third river crossing to provide a route to take traffic around the town.

The Strategic Transport Assessment includes an assessment of a possible third river crossing as part of an Eastern Relief Road option (see Section 6.2 of main report). The indicative alignment runs east and north from A4390 Trinity Way to the A439 Warwick Road with junctions at Loxley Road and B4086 Tiddington Road.

Initial testing shows that the ERR is likely to unlock the greatest level of benefits in terms of reducing mean network delay, increasing the efficiency of the network in terms of improved vehicle throughout and improving mean network speeds when compared to other possible mitigation measures including a package of Town Centre Improvements (TCI) and a Western Relief Road (WRR). It is evident from the results, however, that the elements included in the indicative TCI package would still be required to mitigate conditions in the town centre, particularly on the Windsor Street and Rother Street/Evesham Place corridor during the PM peak period.

Provide a new road link between Warwick Road and Bridgeway.

A proposal for a new link road to serve the Leisure and Visitor Centre was initially identified in 2003 as a possible means of reducing congestion on Bridgeway Gyratory by providing a new access only road into the car and coach park off the A439 Warwick Road.

More detailed investigation showed that the scheme would have limited congestion reduction benefits. The scheme would however facilitate redevelopment opportunities in the Bridgeway area which is identified as a major opportunity site in the UDF.

In 2008, consultants were appointed as part of the World Class Stratford initiative to put forward detailed proposals for the Bridgeway area. Their recommendations were as follows:

- The alignment of the proposed Leisure Centre Link Road scheme should be modified to provide an enhanced sense of arrival, or “gateway” into the town; and

- The scheme should become part of a new two-way through route for traffic between Warwick Road and Bridgeway.

In view of the above recommendations, work on the planning application for the scheme was put on hold. The most realistic prospect of it now being brought forward would be as part of comprehensive redevelopment proposals for the Bridgeway area.

Investigate the potential for upgrading Lucy’s Mill Footbridge to make it more accessible to a range of users.

The lack of a cycle-friendly crossing over the river is a significant barrier for cycling in Stratford-upon-Avon, particularly for those living to the east of the river. Survey evidence indicates that the bridge is currently used by a significant number of cyclists and pedestrians. On the basis of this evidence, there would appear to be merit in upgrading the bridge to make it more accessible. There are however several constraints which would need to be overcome before an improvement scheme could be delivered, which are as follows:-

(a) The level of capital funding available for all transport projects will be severely restricted for the foreseeable future;

(b) The likely costs and benefits of the scheme would need to be evaluated against those for other competing transport schemes;

(c) There is potential for local objections preventing the public footpaths on either side of the bridge being upgraded to cycle track status;

(d) A ramped access which meets the requirements of the Disability Discrimination Act 1995 cannot be provided on the western river bank without encroaching onto private land; and

Compulsory Purchase Orders could be made to acquire the necessary land for the west ramp, but there would need to be a compelling case in the public interest and local residents have already indicated that they would oppose any improvements that affected their property.

Page 206, paragraph 11.2.15 – the transport impacts of various development scenarios have now been assessed using the CITEware strategic transport model and the results are summarised in the main STA report. These have helped to identify areas of stress on the wider transport. A more detailed assessment has also been undertaken in Stratford-upon-Avon using a micro-simulation traffic model to assess the implications of various development scenarios on the local road network in the town, and to identify possible highway mitigation options.

Section 7 – District Designations – Vale of Evesham Control Zone (pages 48-50)

The County Council's response to the consultation questions listed on page 50 of the Draft Core Strategy 2012 is given below:-

Q52 - Is it still appropriate to operate a policy to restrict development in the Vale of Evesham that generates heavy vehicle movements?

The County Council supports the adoption of a policy to reduce the impact of heavy vehicles generated by developments in the Vale of Evesham Control Zone in Warwickshire's historic towns and rural communities.

Such a policy would help to achieve a key objectives set out in the LTP Sustainable Freight Strategy which is to achieve an appropriate balance between the need to sustain and support the sub-regional and local economy whilst protecting and improving the environment.

Q53 - Are there any other points the draft policy should address?

As noted on page 104 of the Warwickshire LTP, the presence of increasingly large delivery vehicles in Stratford-upon-Avon town centre and on Clopton Bridge is particularly intimidating to pedestrians and cyclists and has had a detrimental effect on the environment in these areas of the town.
It is considered that the draft policy should have particular regard to developments which are likely to increase the number of HGVs at these locations.

Although A3400 Clopton Bridge is shown on the Warwickshire Advisory Lorry Route Map, this is because the number of suitable alternative routes is limited.

Q54 - Is there any other evidence that the District Council should be considering to help the development of this draft policy?

Survey data shows that the main HGV movement in Stratford-upon Avon is between the A439 Warwick Road and the B4632 Clifford Lane via Clopton Bridge.

The number of HGVs using Clopton Bridge increased from approximately 620 movements per 12-hour weekday (7am to 7pm) in June 2001 to approximately 800 movements in May 2011.

The data also shows that articulated vehicles make up an increasing percentage of total HGVs on Clopton Bridge, (29% in May 2011 compared to 24% in June 2001). This reinforces local perceptions that large delivery vehicles have become more noticeable.

Survey data from November 2007 showed that 27% of all HGV movements on Clopton Bridge between 7am and 7pm were associated with the former Engineer Resources Depot at Long Marston. This site lies within the Vale of Evesham Control Zone.

It is therefore suggested that the draft policy should seek to encourage local freight interests including those based at the Long Marston site and other relevant parties to secure voluntary routing agreements with the County Council to reduce the number of HGVs on Clopton Bridge.

Q55 - Do you have any further suggestions for monitoring the delivery of this draft policy?

Request that the freight operators make a financial contribution towards monitoring surveys.

Listed below are suggested amendments to some of the transport-related projects set out in the Section 11 – Schedule of Infrastructure Projects tables on pages 217-229 of the Draft Core Strategy – February 2012.

These are based on the principle that if a project is likely to deliver benefits across the transport network as a whole, then the County Council may consider making an appropriate funding contribution. If, however, a project is unlikely to deliver network-wide benefits or be financially sustainable, then the County Council would not normally consider making a funding contribution.

Section 11 – Schedule of Infrastructure Projects

Note: Phase 1 = 2011-2016, Phase 2 = 2016-2021, Phase 3 = post 2021.
The table does not show small scale schemes, e.g. public open space, proposed as part of specific development schemes.

What & Where	Anticipated Phasing	Who - Lead delivery organisation and key partners	Sources of funding	Critical dependencies (if any)
STRATEGIC AND GENERAL IMPROVEMENTS				
Additional semi-fast train service between Birmingham Snow Hill and Stratford-upon-Avon on the Shakespeare Line	Phase 1	Warwickshire County Council (WCC), train operators	WCC, West Midlands Passenger Transport Executive (Centro), train operators, private developers	
Stratford-Wellesbourne-Barford-Warwick-Leamington Spa Quality Bus Corridor (QBC)	Phase 1-2	WCC and bus operators	WCC, bus operators, private developers	
Stratford-Blackhill-Warwick QBC	Phase 1-2	WCC and bus operators	WCC, bus operators, private developers	
Stratford-Bidford-Evesham QBC	Phase 1-2	WCC and bus operators	WCC, bus operators, private developers	
Potential reinstatement of Stratford to Cheltenham railway line southwards to the District boundary	TBC	Stratford-on-Avon District Council (SDC), Network Rail, train operators, private developers	Network Rail, train operators, private developers, others TBC	Comprehensive feasibility testing required
Parkway railway station next to Bishopton park and ride	Phase 1	WCC, Network Rail, train operators	Network Rail, WCC, Department for Transport	
A46 Alcester to Stratford-upon-Avon Improvements	TBC	Highways Agency	Department for Transport	Promotion of Scheme Orders
A429 Portobello Crossroads Improvements	Phase 1 or 2	WCC	WCC, private developers	Evaluation of safety measures undertaken so far, traffic impact

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Section 11 – Schedule of Infrastructure Projects

What & Where	Anticipated Phasing	Who - Lead delivery organisation and key partners	Sources of funding	Critical dependencies (if any)
Parkway railway station in vicinity of M42 Junction 3	Phase 3	Centro, Network Rail, WCC, train operators	Network Rail, WCC, Department for Transport	
M42 widening north of Junction 3A	Phase 3	Department for Transport	Department for Transport	
Support for public transport, community transport initiatives, traffic management and better provisions for pedestrians and cyclists	On-going	WCC, public and community transport operators, Sustrans, SDC, town and parish councils	WCC, private developers and others	
STRATFORD-UPON-AVON (see SuA Area Policy Profile)				
Improvement of physical and functional links between town centre and Maybird Centre	TBC	WCC/SDC	WCC / Stratford-on-Avon District Council / owners/managers of Maybird Centre private developers	Outcome of feasibility study
Bus-rail inter-change adjacent to the Stratford-on-Avon railway station and improvements to Stratford Railway Station	Phase 1	WCC, Network Rail, private developer	Private developer	Implementation of redevelopment scheme on former Cattle Market site
Pedestrian improvement along the 'Historic Spine'	Phases 1 & 2	WCC/SDC	WCC, private developers	Achieving consensus on a preferred scheme
Stratford Visitor and Leisure Centre Link Road	Phase 1	Private developers	Private developers	Promotion of scheme for Redevelopment of Bridgeway area

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Section 11 – Schedule of Infrastructure Projects

What & Where	Anticipated Phasing	Who - Lead delivery organisation and key partners	Sources of funding	Critical dependencies (if any)
Bridgeway improvements (incl. improvements for pedestrians on Bridgefoot) and traffic management on Clopton Bridge	Phases 1 & 2	WCC, private developers	WCC, private developers	Promotion of scheme for redevelopment of Bridgeway area.
Potential Park and Ride facility on southern side of the town near Trinity Way/Shipston Road roundabout	Phases 2 & 3	Private developer	Private developer	Restrictions on town centre parking would need to be imposed to make this viable
Potential bus station in town centre	Phases 2 & 3	SDC	SDC, bus operators, Private developers	Availability of an appropriate site. Willingness of bus operators to use facility
Improvements to on and off road cycle links including on road links between town centre and railway stations	On-going	WCC	WCC, private developers	
Assess the scope for a third river crossing to provide a route to take traffic around the town	TBC	WCC	WCC, private developers	Comprehensive feasibility testing required
Examine potential upgrading of Lucy's Mill Footbridge to make it more accessible to a range of users	TBC	TBC	TBC	Comprehensive feasibility testing required
Potential transport improvements recommended by the A3400 Birmingham Road Traffic Management Study	TBC	WCC	WCC, private developers	Comprehensive feasibility testing required

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Section 11 – Schedule of Infrastructure Projects

What & Where	Anticipated Phasing	Who - Lead delivery organisation and key partners	Sources of funding	Critical dependencies (if any)
Potential transport improvement schemes recommended by the Stratford-on-Avon District Strategic Transport Assessment	TBC	WCC	WCC, private developers	Comprehensive feasibility testing required
ALCESTER (See Alcester Area Policy Profile)				
Improve/promote on and off road cycle routes including additional routes to connect to nearby settlements and National Cycle Network	On-going	WCC/Sustrans	WCC, private developers	
BIDFORD-ON-AVON (See Bidfordon-Avon Area Policy Profile)				
Improve/promote on and off road cycle routes including additional routes to connect to nearby settlements and National Cycle Network	On-going	WCC/Sustrans	WCC, private developers	
Investigate feasibility of providing a pedestrian/cycle bridge across River Avon to improve links to Big Meadow	TBC	WCC	TBC	Comprehensive feasibility testing required

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Section 11 – Schedule of Infrastructure Projects

What & Where	Anticipated Phasing	Who - Lead delivery organisation and key partners	Sources of funding	Critical dependencies (if any)
HENLEY-IN-ARDEN (see Henley-in-Arden Area Policy Profile)				
Improve railway station (appearance, access to and facilities) including new interchange and car park to the west of the line	Phase 1-2	WCC	Network Rail, private developers	
Improve/promote on and off road cycle routes including a new cycle route and upgraded public right of way to Mays Wood	On-going	WCC	WCC, private developers	
KINETON (see Kineton Area Policy Profile)				
Promote on and off road cycle including connections to established routes and surrounding areas	On-going	WCC/Sustrans	WCC, private developers	
SHIPSTON (See Shipston Area Policy Profile)				
Promote/improve on and off road cycle routes	On-going	WCC/Sustrans	WCC, private developers	

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Section 11 – Schedule of Infrastructure Projects

What & Where	Anticipated Phasing	Who - Lead delivery organisation and key partners	Sources of funding	Critical dependencies (if any)
SOUTHAM (See Southam Area Policy Profile)				
Investigate scope for pedestrianisation and traffic management measures in parts of the town centre	TBC	WCC	Private developers	Achieving consensus on a preferred scheme
Mitigate impacts of High Speed 2 railway on landscape and properties	Phase 3	TBC	TBC	
Promote/improve on and off road cycle routes including links to National Cycle Route 41 and the Grand Union Canal and better links to the town centre	On-going	WCC/Sustrans		
Improve pedestrian links to the town centre and countryside	On-going	WCC	WCC, private developers	
STUDLEY (See Studley Area Policy Profile)				
Investigate opportunities for mitigating the impact of traffic on the A435	On-going	WCC	Various	
Improve/promote on and off road cycle routes and Public Rights of Way	On-going	WCC/Sustrans		

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Section 11 – Schedule of Infrastructure Projects

What & Where	Anticipated Phasing	Who - Lead delivery organisation and key partners	Sources of funding	Critical dependencies (if any)
WELLESBOURNE (See Wellesbourne Area Policy Profile				
Create additional car parking in village centre	TBC	WCC, Stratford District Council, Parish Council	TBC	
Improve/promote on and off road cycle links and Public Rights of Way	On-going	WCC/Sustrans	TBC	

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Warwickshire County Council

Stratford-on-Avon Strategic Transport Assessment

S-PARAMICS Modelling Report

211439-19-R.005.2

Issue | 10 October 2012

Job number 211439-19

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Contents

Appendices

1 Executive Summary

1.1 Overview

Arup were commissioned by Warwickshire County Council (WCC) to undertake detailed testing, using the Stratford-upon-Avon S-PARAMICS model, which is intended to assist in the completion of the over-arching Stratford-on-Avon Strategic Transport Assessment.

Testing has been undertaken through five distinct stages, namely:

- Stage 1 - Stratford-upon-Avon Threshold Testing – designed to identify the threshold growth levels that can be accommodated within the existing road network.
- Stage 2 - Stratford-upon-Avon Location Testing – designed to assess the impact of locating growth within specific areas of Stratford-upon-Avon when compared to the more general growth pattern outlined within stage 1.
- Stage 3 -Detailed CITEware output testing – designed to provide further information on the impacts that the various development scenarios, identified through earlier CITEware testing, may have on the Stratford-upon-Avon road network.
- Stage 4 – Detailed mitigation testing – designed to test a number of potential mitigation schemes derived in response to the outcomes from stages 1 to 3
- Stage 5 – Specific Scenario Testing: CITEware Scenario 5 – designed to test the outcome of a specific growth strategy implemented alongside a specific mitigation measure.

1.2 Stage 1 – Threshold Testing

The objective of the threshold assessment is to identify the threshold levels of growth that can be accommodated within the existing Stratford-upon-Avon road network as well as providing an overview of the potential areas of stress within the network that may either constrain or altogether prohibit growth.

By applying general, TEMPRO-informed growth to all O-D"s within the model it presents a worst case scenario against which alternative growth strategies can be compared. Thus the base scenarios produce in Stage 1 provide the reference conditions against which all further scenarios are tested.

Two distinct growth packages have been tested, High and Medium. The factors and methodology for deriving these different growth packages are based on the TEMPRO 6.2 dataset and the detailed methodology behind the forecasting, is included within the report.

1.3 Stage 2 - Development Specific Impacts

The objective of stage 2 is to understand the implications on the network that a more focussed growth strategy may have in comparison to the generalised growth scenarios tested previously.

The latest Stratford-on-Avon District Draft Core Strategy Documentation (February 2012) outlines 16 sites, without planning permission, within the boundaries of Stratford upon Avon that were identified within the Strategic Housing Land Availability Assessment (SHLAA). The 16 SHLAA sites have been grouped into 3 broad locations. Each of which contains 5 or 6 potential sites. The split of sites that have been tested is as follows:

- North of Stratford – containing sites 1, 2, 3, 4, 5 and 11
- East of Stratford – containing sites 12 to 16
- West of Stratford – containing sites 6 to 10

The net level of growth contained within each of these options needs to correlate, at least in part, to the TEMPRO growth values that have been tested previously. Thus it was decided that the following tests would be undertaken:

- 2028 Stratford Medium Growth plus Broad location and;
- 2028 Stratford High Growth plus Broad location

1.4 Stage 3 – Strategic Option Testing

WCC have also commissioned JMP Consultants to undertake a series of option tests using the CITEware strategic model. The strategic modelling exercise has been used to identify the area wide implications of the adoption of a number of District-wide growth scenarios. Some of these scenarios have then been taken forward for more detailed testing within the S-PARAMICS modelling. Initially, the following scenarios have been tested:

- Scenario 2 - Stratford-on-Avon District Council (SDC) **Option F** (Wider Dispersal, Preferred Approach) – Allocation of 8,000 dwellings and 30.5 Ha of employment across the District
- Scenario 3 - SDC **Rural Brownfield** option – Allocation of 7,000 dwellings plus an additional 800 dwellings at each of the Harbury, Southam Cement works and Long Marston Former Engineer Resource Depot sites.
- Scenario 4 - SDC **Gaydon Focus** Option – allocation of 8,000 dwellings through dispersed sites across the District plus 5,000 dwellings in a new settlement near Gaydon.

CITEware analysis showed that the strategic assessment results for Scenario 1 - Option E (Wider Dispersal) were virtually indistinguishable from Scenario 2 - Option F referred to above. In view of this, it was only necessary to test either Scenario 1 or Scenario 2 in S-Paramics. Scenario 2 was chosen as it includes a relatively lower level of housing provision in Stratford-upon-Avon compared to Scenario 1 and is identified as SDC"s preferred option in the Draft Core Strategy (February 2012).

1.5 Stage 1 to 3 Recommendations

Stages 1 to 3 identify that a number of locations within the Stratford-upon-Avon road network are likely to demonstrate capacity issues as demand is forecast forward from 2011, namely:

- Evesham Road/Evesham Place roundabout
- Banbury Road/Shipston Road roundabout
- Clifford Lane/Shipston Road Junction (AM only)
- Rother Street SB (mainly PM)
- Alcester Road approach to Wildmoor roundabout (PM)
- Bishopton Lane approach to Bishopton Roundabout (PM)

As more growth is allocated within the model there is a tendency for these issues to be exacerbated rather than new issues arising.

Stage 2 demonstrates that allocation of growth in the North appears to incur the least number of issues. Allocating growth in the East appears to exacerbate the issues likely to occur around both the Evesham Road/Evesham Place roundabout and the Banbury Road/Shipston Road roundabout. Allocation of growth in the West is most likely to affect the Evesham Road.

Stage 3 demonstrates that, when considering the Strategic options, the town centre operation is still a significant capacity constraint during the PM peak which is exacerbated within the South Eastern area, most likely due to the limited amount of route choice within this area.

During the AM peak, issues within the town centre are lessened by the outward focus of growth in the Gaydon option whilst in other options conditions on the inner routes towards the town are improved. These impacts do, however, appear to shift towards some of the external junctions as the CITEware analysis appears to indicate that a large number of trips will still be drawn to the town from the strategic sites across the District. The flow of trips into Stratford from these sites manifests in issues at the following locations:

- Bishopton Roundabout
- Warwick Road SB (and the Gyratory)
- Shipston Road/Clifford Lane Junction

This demonstrates that a higher level of dispersal is unlikely to mitigate the issues within the town centre during the PM as these are caused by a high volume of trips departing from the town and the inability of the existing road network layout to accommodate those trips. The CITEware analysis appears to indicate that, despite the high dispersal approach to growth, a large number of trips will still be attracted to Stratford-upon-Avon and it is these trip departures in the PM that still cause the network to fail.

During the AM the higher dispersal has the potential to improve the conditions on the inner town centre network but there are now issues occurring at a number of the external junctions. These issues are likely to occur as a result of an increase in the number of trips heading towards Stratford-upon-Avon from the wider District network, converging on a small number of external junctions.

Stages 1 to 3 demonstrate that a more strategic approach to mitigation may be required to alleviate the congested conditions within the town centre. In particular, any schemes which have the potential to alleviate the level of demand along the Banbury Road NB corridor towards the Gyratory or the Evesham Road/Evesham Place roundabout are likely to incur the highest levels of benefit.

Other less strategic options that may also benefit from mitigation include the following locations:

- Stratford Gyratory
- Banbury Road/Shipston Road
- Evesham Road/Evesham Place Roundabout

Within the PM peak the issues are presented in the form of increased queuing on the Grove Road/Evesham Place SB approach to the roundabout (i.e. out of Stratford). The tidal nature and the overall imbalance of flows at this roundabout between periods indicate that signals may be required to improve junction operation. Another issue that occurs in the PM is that the queuing back along Grove Road SB quickly blocks back through the junction with Evesham Place/Rother Street. Since traffic travelling along Evesham Place has priority the opportunity for southbound vehicles to exit Rother Street is reduced but the demand for the movement increases. Further attention may be required at this junction to mitigate these effects.

1.6 Stage 4 – Mitigation Testing

The objective of Stage 4 is to test a series of mitigation scenarios derived as a result of the aforementioned Stages 1 to 3. Three scenarios have been tested with a view to understanding the potential options available to mitigate the impacts of growth in traffic upon the Stratford-upon-Avon road network:

- 2028 Reference plus outline Eastern Relief Road (ERR)
- 2028 Reference plus outline Western Relief Road (WRR)
- 2028 Reference plus Town Centre Improvements (TCI)

1.7 Stage 4 Conclusion

Testing revealed that all three scenarios have the potential to improve congestion within the Stratford-upon-Avon road network. The greatest benefits are during the PM peak hour as this is the hour when the network is under the greatest level of stress.

All three scenarios demonstrate provision of relief within the PM peak hour as each is able to accommodate greater levels of vehicle demands than the Reference Case with lower average journey times. The ERR and TCI schemes result in greater levels of vehicles being released within the model network than the WRR, indicating that, although all three provide relief, the ERR and TCI are more likely to exert a greater influence on the town centre conditions than the WRR.

The ERR provides additional capacity for vehicles to reassign away from the town centre whilst the TCI scheme enables a greater volume of trips to pass through the town centre within the model network. Thus, both options allow more trips to take place.

The outcome of Stage 4 demonstrated that, whilst no single scheme demonstrates a solution to the problems likely to occur within Stratford-upon-Avon, all schemes demonstrate potential to unlock additional benefits and extend the operational life of the existing road network.

All of the tests undertaken demonstrate that the highest levels of stress on the network are to the South East and South of Stratford so it is reasonable to conclude that implementation of the ERR is likely to unlock the greatest level of benefits.

Despite testing each of the individual options within Stage 4, the optimum solution is most likely to be the implementation of all three schemes in one form or another. Whilst this is unlikely to be achievable it is highly recommended that at least some elements of the TCI scenario are investigated further due to the potential that these schemes have to complement either the ERR or WRR options should they be brought forward.

1.8 Stage 5 – Scenario 5 Testing

The purpose of Stage 5 is to present the initial findings from the testing of a potential combined growth allocation and mitigation option within the Stratford-upon-Avon S-PARAMICS model, namely:

- Option F (8,000 dwellings across Stratford-on-Avon District) plus a 2,500 dwelling urban extension to the South East of Stratford-upon-Avon alongside an indicative Eastern Relief Road option, known as **Scenario 5**

1.9 Stage 5 Conclusion

Analysis of the results obtained through the allocation of Scenario 5 growth alongside the implementation of an Eastern Relief Road (ERR) indicates that within the AM an increase in mean speeds is experienced across significant sections of the network when compared to the original 2028 high growth network conditions. Furthermore, the propensity for the network to lock up in the south east is removed entirely by the implementation of the ERR despite the fact that an additional 2500 dwellings are allocated within that area.

Aside from the impacts within the Windsor Street/Rother Street/Grove Road area, alongside the Shipston Road/Clifford Lane junction the growth and mitigation strategy presented within Scenario 5 appears to largely maintain, and in some instances improve, overall network operation levels.

Analysis of the network statistics also reveals that focussing a significant proportion of growth within the Eastern Urban extension will have the potential to draw traffic growth away from the Town Centre which means that despite the relatively stable number of total vehicles released onto the network, Scenario 5 Growth plus the ERR results in lower levels of mean delay and higher average speeds during both the AM and PM periods. These benefits are dependent upon a capped level of growth within the area being realised and should be investigated further before any firm conclusions are drawn but they do present an additional, interesting, benefit that may be unlocked through the allocation of a large proportion of growth within a specific area, especially when supported by new infrastructure, such as the ERR, in close proximity.

2 Stratford-upon-Avon Strategic Transport Assessment – S-PARAMICS modelling

2.1 Introduction

The following Report presents the initial outcomes of the Strategic Transport Assessment of Stratford-upon-Avon using the existing S-PARAMICS micro simulation model.

Testing has been undertaken through five distinct stages, namely:

- Stage 1 - Stratford-upon-Avon Threshold Testing – designed to identify the threshold growth levels that can be accommodated within the existing road network.
- Stage 2 - Stratford-upon-Avon Location Testing – designed to assess the impact of locating growth within specific areas of Stratford-upon-Avon when compared to the more general growth pattern outlined within stage 1.
- Stage 3 -Detailed CITEware output testing – designed to provide further information on the impacts that the various development scenarios, identified through earlier CITEware testing, may have on the Stratford-upon-Avon road network.
- Stage 4 – Detailed mitigation testing – designed to test a number of potential mitigation schemes derived in response to the outcomes from stages 1 to 3
- Stage 5 – Specific Scenario Testing: Scenario 9 – designed to test the outcome of a specific growth strategy implemented alongside a specific mitigation measure.

An overview of the approach to all elements of testing is presented within the following sections of this report

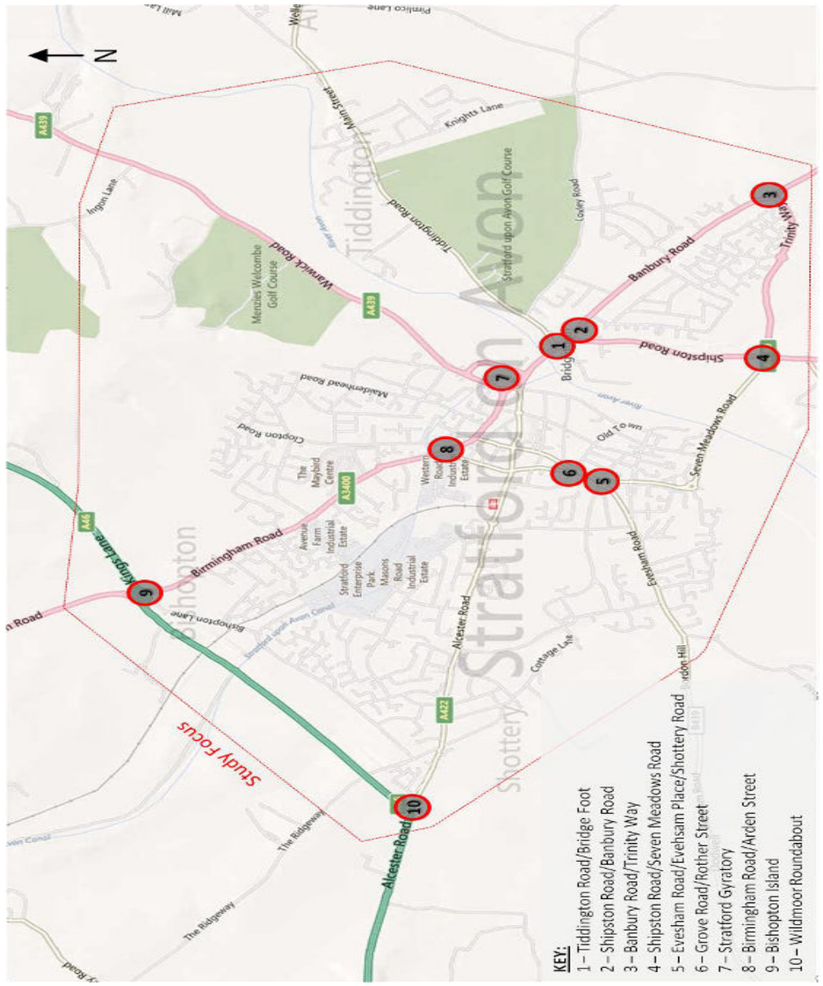
2.2 Scope

Testing has been undertaken using the 2007 Base year S-PARAMICS model of Stratford-upon-Avon. The model has been developed with a 2007 Base year and there currently exists forecast year models for the 2011, 2015 and 2021 years inclusive of all necessary committed developments.

Although the coverage of the model stretches as far as Alcester in the West, near the M40 to the East and Quinton to the South, the focus of this assessment is the immediate road network in close proximity to the Stratford-upon-Avon town centre.

The indicative focus of the study area, alongside a number of key junctions that are refered to throughout the report is illustrated within Figure 1.

Figure 1 - Study Area and Key Junctions



3 Stage 1 – Stratford-upon-Avon Threshold Testing

3.1 Objective

The purpose of the threshold assessment is to identify the threshold levels of growth that can be accommodated within the existing Stratford-upon-Avon road network as well as providing an overview of the potential areas of stress within the network that may either constrain or altogether prohibit growth.

Testing of a number of different stages of growth was proposed to enable a full picture of the likely implications of incremental growth to be established.

3.2 Establishing the Reference conditions

A particular issue that can occur when looking at the impacts of growth over a local plan period is that, by simply assigning the expected growth levels that will be achieved at the end of the period, the impacts are likely to appear insurmountable and it is almost impossible to provide a clear focus for any mitigation strategy.

Currently there exists a series of models of Stratford-upon Avon for various years, the most recent of which was the 2015/2021 model produced for the purposes of the recent Land at Bishopton Development assessment[1]. This model represents the latest agreed Stratford-upon-Avon model network. As such it is this network has served as the Reference network.

During the development of the 2015 Model it was concluded that the growth associated with committed developments within this model roughly equates to the level of growth, between 2011 and 2015, predicted through interrogation of the TEMPRO database (V6.2 data set 62)

Thus, it was concluded that the demands for the 2011 and 2015 models would serve as the reference demands for the first in a series of scenario tests designed to identify the initial reference conditions against which further growth scenarios can be assessed.

It is intended that the 2011 demands will serve as the Base demands against which the proportion of growth assigned to the network will be measured.

Forecast demands beyond 2015 will be wholly reliant upon the TEMPRO database. Particular attention is drawn to the following guidance:

"Part of the role of TEMPRO is to act as a nationally-consistent benchmark distribution of growth in planning data. Without such a benchmark, it would for example be easy to end up in a situation where every area of the country justified transport proposals on the basis of above-average employment growth. Given the need for model assumptions to be acceptable to local stakeholders, the Department does not insist that the central case in every study should be consistent with TEMPRO planning data" (WebTAG unit 3.15.2 para 5.7.7)

This outlines the justification behind using TEMPRO to inform the allocation of growth within the Highway model. In line with current guidance the forecasting is proposed to occur over two distinct growth scenarios; Medium growth (i.e. unadjusted TEMPRO factors) and High Growth (TEMPRO adjusted by NTM AF09 West Midlands).

NTMAF09 has been adopted in lieu of income and fuel adjustments as it predicts growth of a similar magnitude whilst ensuring the overall methodology is as simple and transparent as possible.

[1] JMP Report „MID3176.R001 – Stratford 2015 & 2021 Model Development

By applying general, TEMPRO informed, growth to all origin to destination trip movements (O-D"s) within the model it presents a worst case scenario against which alternative growth strategies can be compared. Thus the base scenario conditions presented within Stage 1 provide the reference conditions against which all further scenarios are tested.

3.3 High Growth vs. Medium Growth

As has already been mentioned, two distinct growth packages have been tested, High and Medium. The factors and methodology for deriving these different growth packages are outlined within the following section of this report.

The rationale behind adopting such an approach is that it should allow early identification of the stress points on the network and the point at which the issues become severe in terms of the overall impact on network operation compared to the level of growth required to instigate the severe conditions. It is highly likely that, at least in the PM period, allocating the high growth 2011 to 2028 period in a single stage will simply reveal that the network cannot accommodate that level of growth and significant impacts will be experienced across a wide area. It will not identify what causes the issues nor will it identify the order in which areas of the network become over capacity.

3.4 Stage 1 Forecasting

The plan year for the assessment of full development is understood to be 2028, which is the end year in the Core Strategy period. As a result, an incremental approach to the assessment of the impacts of growth between 2011 and 2028 has been proposed. The forecast growth levels applied within this initial assessment have been applied generically across the model network based on growth factors extracted from the TEMPRO database.

The forecasting process was applied to the Stratford-upon-Avon S-PARAMICS model demands from 2015 onwards as the 2015 demands are assumed to be the most up to date. Similarly, the 2015/2021 model network was used to ensure consistency with current development control assessments.

3.5 Forecasting Methodology

In order that the impacts of this generalised growth can be better understood it is proposed that two different growth scenarios be assessed:

- Med Growth – whereby all Light Vehicle demand within the model is forecast forwards from 2015 onwards using the Stratford-on-Avon District Growth factor
- High Growth – whereby all Light Vehicle demand within the model is forecast forwards from 2015 onwards using the Stratford-on-Avon District Growth factor which has been adjusted by the NTMAF09 dataset

All HGV growth within both of the aforementioned scenarios is to be forecast using NTM All Roads factor.

The purpose of undertaking the assessment of two different growth scenarios is that it will allow easier identification of the potential impacts that may occur within a range of possible growth scenarios.

Given experiences elsewhere within Warwickshire, it is reasonable to conclude that the higher levels of growth predicted will not be accommodated without an associated mitigation strategy and subsequent Infrastructure Delivery Schedule. Since, at this stage, the focus is on

identifying those areas that are most likely to either require, or at least benefit from, the implementation of mitigation, adopting the medium and high growth tests in unison should provide a „best" and „worst case" set of options against which comparisons of network performance (initially changes in mean speed on the various highway links within the model) can be made.

It is understood that the preferred growth options for Stratford District are likely to be outwardly focussed where the town of Stratford-upon-Avon is concerned. As a result the TEMPRO factors for the District have been used in lieu of the Stratford-upon-Avon town factors. It should be noted that adoption of the latter would result in even greater levels of growth being assigned within the modelling work.

3.6 Growth Factors

The base year used to inform the model forecasting process is assumed to be 2011 and the resultant TEMPRO forecast factors, derived for both AM and PM forecasting, are presented within the following Tables 1 and 2 respectively[2]:

Table 1 - AM TEMPRO Factors (Stratford District)

Year	**TEMPRO Factors**		NTMAF09 Adjusted
	Origin	Destination	Local Growth Figure
2017	1.0168	1.0552	1.033587149
2019	1.0179	1.0651	1.05623356
2021	1.0189	1.075	1.078586261
2023	1.0227	1.0866	1.101205755
2025	1.0264	1.0982	1.123584558
2028	1.0278	1.1118	1.157879827

Table 2 - PM TEMPRO Factors (Stratford District)

Year	**TEMPRO Factors**		NTMAF09 Adjusted
	Origin	Destination	Local Growth Figure
2017	1.0521	1.0284	1.03782725
2019	1.0612	1.032	1.061405707
2021	1.0702	1.0356	1.084716055
2023	1.0816	1.0424	1.108880208
2025	1.0931	1.0492	1.132945118
2028	1.1065	1.0555	1.170001957

3.7 Demands

The following two figures illustrate the net growth (2011 onwards), assigned within the model, across the various scenarios as a result of the application of the aforementioned forecast methodology. For reference the current model 2011, 2015 and 2021 demands have been presented alongside the Med and High growth options.

Figure 2 - Net AM Growth 2011 onwards (Modelled vs Med Growth vs High Growth)

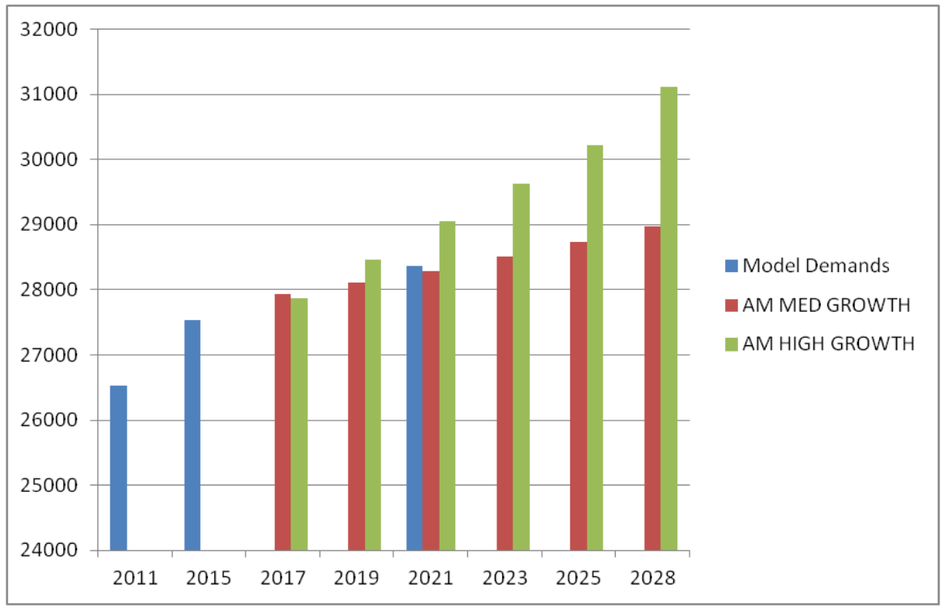
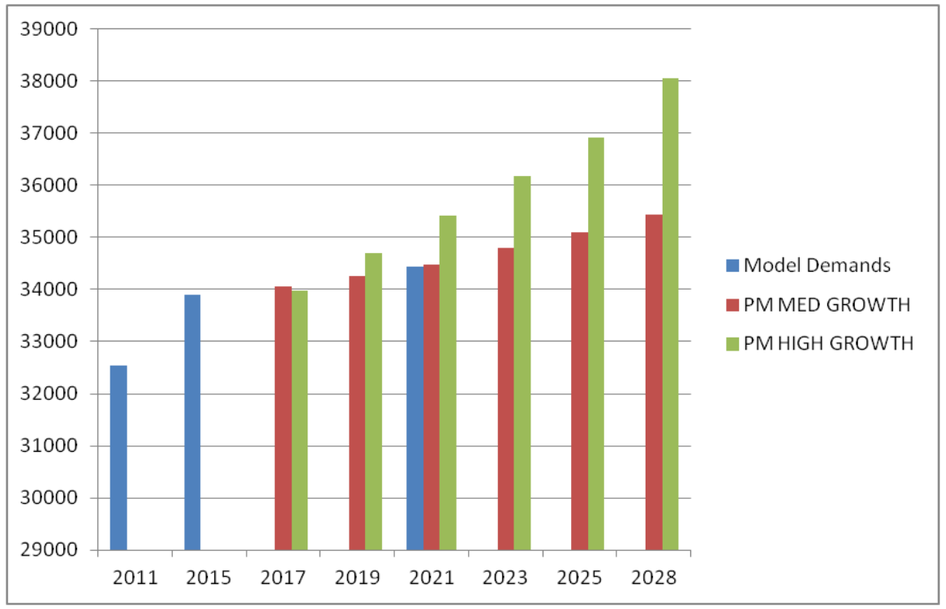


Figure 3 - Net PM Growth 2011 onwards (Modelled vs Med Growth vs High Growth)



[2] Factors quoted are Authority Level (i.e. growth within the entire District of Stratford-on-Avon inclusive of the town of Stratford-upon-Avon), Origin & Destination, Car Driver, AM and PM time period only. Base year 2011.

Analysis of net growth across both AM and PM model periods reveals that the rate of growth is far higher within the High growth scenarios and this higher rate of growth is present from 2019 onwards. There is little difference within 2017. Furthermore the figures appear to demonstrate that, the divergence between the medium and high growth options is greatest post 2021. As a result only the medium growth option for 2017 and 2019 scenarios was assessed**.** From 2021 onwards both growth options have been assessed.

The 2021 model demands do not precisely match the TEMPRO predictions because the methodology for derivation within the original modelling work used both area specific TEMPRO factors and NTEM informed external growth whereas the current methodology, for simplicity, uses one single, district-wide, growth factor.

Changes in percentage growth levels across the AM and PM model periods have been presented within the following figures. Overall it can be seen that maximum growth levels in the AM model period are over 9% in the medium growth and over 17% in the high growth scenario. Similarly growth within the PM period is over 8% in the medium growth and over 16% in the high growth scenario.

It is interesting to note that within the 2017 forecasts the Medium growth option presents a marginally higher rate of growth than the High growth option. This is most likely to be due to the interpolation of the TEMPRO factors, whilst the local factors tend to represent a better reflection of local growth they also tend to be „front-loaded" in so far as the rate of growth is higher in the immediate years and then gradually reduces as planning assumptions become less certain. Meanwhile the NTM growth represents a factor which has been adjusted by national figures which means that it represents a more strategic factor which is influenced by national forecasts and predicts higher growth in future years.

Figure 4 - AM Percentage Change in Demand (Med Growth vs High Growth)

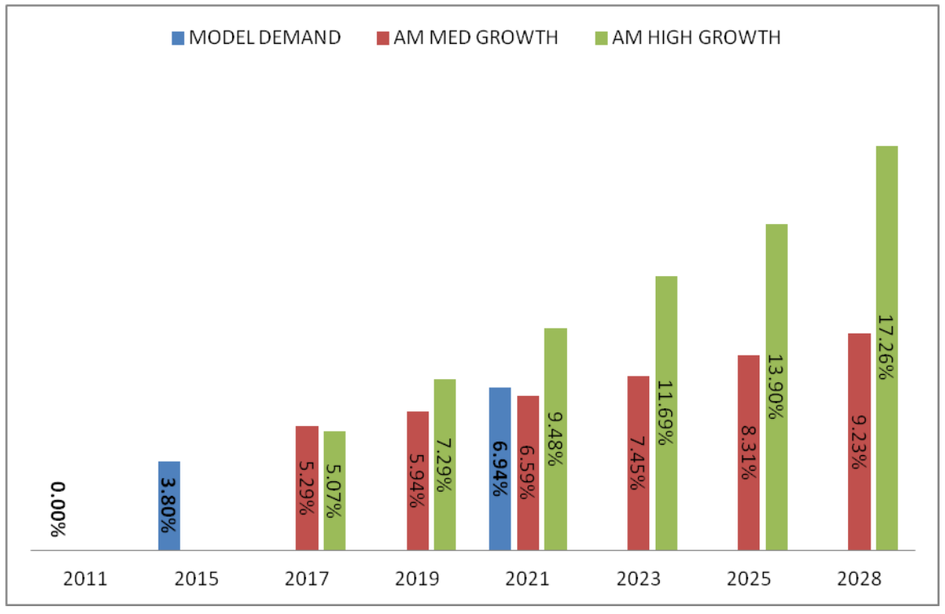
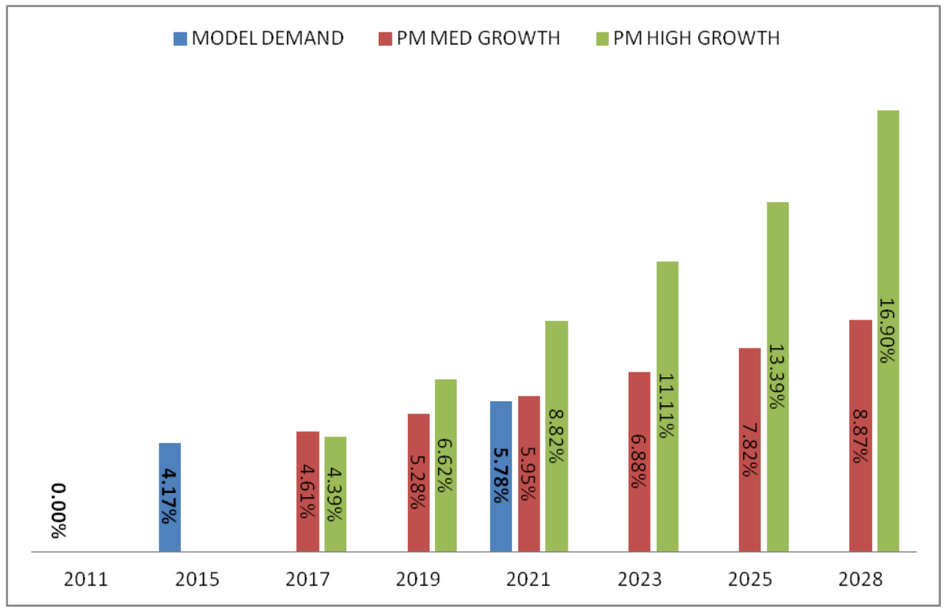


Figure 5 - PM Percentage Change in Demand (Med Growth vs High Growth)



3.8 Peak Spreading

The approach to "peak spreading", where people retime their journeys to avoid the most congested conditions in the traditional highway peaks (0800-0900) and (1700-1800), is consistent with earlier modelling work. Peak spreading proportions for growth between 2015 and 2021 are based on the average of the peak spreading proportions used within the two model scenarios whilst post-2021 peak spreading is based on the same proportions as was adopted within the earlier 2021 modelling work. The resultant proportions are summarised within the following Table:

Table 3- Peak Spreading Proportions

	2015	**2021**	**Average**
0700 to 0800	28.05%	48.03%	38.04%
0800 to 0900	71.95%	51.97%	61.96%
1600 to 1700	44.47%	46.09%	45.28%
1700 to 1800	55.53%	53.91%	54.72%

A summary of the model demands assigned within each scenario is as follows:

Table 4 - Assigned Demand Totals

DEMAND	**2011**	**2015**	**2017**	**2019**	**2021**	**2023**	**2025**	**2028**
AM MODEL DEMAND	26531	27538	-	-	28373	-	-	-
AM MED GROWTH	-	-	27936	28108	28280	28508	28736	28981
AM HIGH GROWTH	-	-	27877	28465	29045	29634	30218	31110

PM MODEL DEMAND	32549	33907	-	-	34430	-	-	-
PM MED GROWTH	-	-	34048	34268	34487	34788	35094	35435
PM HIGH GROWTH	-	-	33978	34703	35421	36166	36909	38051

3.9 Scenarios

A summary of the resultant test scenarios is as follows:

- **Scenario 01** 2011 - 2011 Reference Model
- **Scenario 02** 2015 - 2011 Reference Model + 2015 committed Developments
- **Scenario 03** A 2017 Med Growth – Scenario 02 forecast forward 2 years using the TEMPRO database
- **Scenario 04** A 2019 Med Growth - Scenario 02 forecast forward 4 years using the TEMPRO database
- **Scenario 05** A & B 2021 Med & High Growth - Scenario 02 forecast forward 6 years using the TEMPRO database
- **Scenario 06** A & B 2023 Med & High Growth - Scenario 02 forecast forward 8 years using the TEMPRO database
- **Scenario 07** A & B 2025 Med & High Growth - Scenario 02 forecast forward 10 years using the TEMPRO database
- **Scenario 08** A & B 2028 Med & High Growth - Scenario 02 forecast forward 12 years using the TEMPRO database

4 Stage 1 – Results Analysis

4.1 Mean Speed

Initially, a single measure has been used to assess the overall network performance. The purpose of this stage of testing is simply to identify area of the network that may require interventions to enable growth to be realised. By using mean speed as the measure, areas that are classified as coming under stress can be determined as being either those which suffer low average speeds along the links or a drop in the average speed occurs as a result of the growth on the network.

The mean speeds across the critical network area, for all test scenarios, have been presented within **Appendix A**

4.2 2011 Reference Conditions

2011 Reference conditions are presented within Figure 1 and Figure 2 within Appendix A of this report.

4.2.1 2011 AM Network Conditions (App A Figure 1)

Analysis of the AM (08:00 to 09:00) peak hour 2011 network mean speed plot reveals the following:

- The mean speeds on links approaching Stratford-upon-Avon from the South and South-East are already low.
- Average Speeds along three of the approaches to the Evesham Road/Evesham Place Roundabout are below 10 mph travelling inbound towards the town centre.
- Low speeds along Clopton Bridge propagate back through Banbury Road and Shipston Road – this issue will be exacerbated by the high u-turn movement at the Banbury Road/Shipston Road roundabout (vehicles turning right out of Tiddington Road wishing to travel to Stratford-upon-Avon)

4.2.2 2011 PM Network Conditions (App A Figure 2)

Analysis of the PM (17:00 to 18:00) 2011 network mean speed plot reveals the following:

- The mean speeds on the Arden Street and Birmingham Road NB approaches to the Birmingham Road/Arden Street junction are relatively low and propagate back to the Alcester Road junction in the south and the Gyratory to the East
- Mean speeds are already low on Rother Street Southbound and the surrounding local network.
- Low mean speeds are present on the Bishopton Lane approach to Bishopton roundabout (A46/A3400 roundabout) and the Alcester Road approach to Wildmoor junction (A46/A422 roundabout)

Average speeds on the Birmingham Road, around the Maybird Centre, are particularly low (between 5 and 15mph)

4.3 2015 Reference Conditions

2015 Reference conditions are presented within Figure 3 and Figure 4 within Appendix A of this report.

4.3.1 2015 AM Network Conditions (App A Figure 3)

Analysis of the AM 2015 network mean speed plot reveals very little difference in network conditions, compared to 2011, with the exception of the following:

- Average Speeds along three of the approaches to the Evesham Road/Evesham Place Roundabout are lower for longer indicating queue propagation.
- Low means speed on Banbury Road now extend back to the junction with Rushbrook Road.
- A drop in average mean speed is noticeable along Clifford Lane on the approach to the junction with Shipston Road.

4.3.2 PM Network Conditions (App A Figure 4)

Analysis of the PM 2015 network mean speed plot reveals the following differences, when compared to the 2011 network:

- Low mean speeds are experienced along the length of Evesham Place/Rother Street SB.
- Speeds along Banbury Road NB have begun to drop on the approach to Clopton Bridge
- The mean speed on Clopton Bridge NB has reduced.
- Lower speeds are likely on the approaches to Wildmoor and Bishopton Roundabout from Stratford-upon-Avon
- Mean speeds have reduced on all approaches to the Evesham Place roundabout and on Bridgeway Gyratory.
- Mean speeds have reduced on the NB and WB approaches to the Seven meadows Road/Trinity Way roundabout

4.4 2017 Reference Conditions

2017 Reference conditions are presented within Figure 5 and Figure 6 within Appendix A of this report.

4.4.1 2017 AM Network Conditions (App A Figure 5)

Analysis of the AM 2017 network mean speed plot reveals very little difference in network conditions, compared to 2015.

4.4.2 PM Network Conditions (App A Figure 6)

Analysis of the PM 2017 network mean speed plot reveals very little difference in network conditions, compared to 2015, with the exception of the following:

- Low mean speeds along the length of Rother Street SB now propagate back beyond the junction with Wood Street

4.5 2019 Reference Conditions

2019 Reference conditions are presented within Figure 7 and Figure 8 within Appendix A of this report.

4.5.1 2019 AM Network Conditions (App A Figure 7)

Analysis of the AM 2019 network mean speed plot reveals very little difference in network conditions, compared to 2017.

4.5.2 PM Network Conditions (App A Figure 8)

Analysis of the PM 2019 network mean speed plot reveals very little difference in network conditions, compared to 2017, with the exception of the following:

- The propensity for average speeds to drop below 10mph, along areas of the Alcester Road travelling WB out of Stratford-upon-Avon has increased.
- There are lower mean speeds on the WB approach to the A4390 Seven Meadows Road/Trinity Way roundabout.

4.6 2021 to 2028 Reference Conditions

Between 2021 and 2028 there is a marked change in impact depending upon which scenario has been analysed. As would be expected, the conditions observed in earlier analysis tend to worsen but there are no new issues presented during the application of the additional growth.

4.6.1 2021 to 2028 Medium Growth AM network performance

Between 2019 and 2028, when analysing the medium growth scenarios, mean speeds are observed to further reduce in the following locations:

- Evesham Road NB towards Evesham Place – speeds drop to below 15 mph as far back as Paddock Lane
- Shottery Road EB towards Evesham Place –speeds on the approach to the junction are as low as 5 mph
- Banbury Road NB towards Clopton Bridge – low speeds are experienced on all sections of Banbury Road to just south of Dale Avenue, this is causing blocking back on adjacent junctions.
- Speeds on the majority of links within the gyratory drop below 15mph.
- Average speeds have dropped significantly on the Alcester Road EB/Masons Road SB approaches to the Alcester Road/Masons Road junction

4.6.2 2021 to 2028 Medium Growth PM network performance

By 2028 the network conditions within the town centre have worsened significantly. Mean speeds are observed to further reduce in the following locations:

- Speeds on Grove Road have dropped below 10 mph in the NB direction on the approach to the Arden Street/Greenhill Street junction and 15mph in the SB direction
- Speeds on all the SB links across Windsor Street and Rother Street SB are frequently below 5 mph and only higher than 15mph on one occasion.
- Speeds on the majority of the gyratory do not now exceed 15 mph.
- Low speeds propagate back from the gyratory along Banbury Road NB and stretch beyond the junction with Dale Avenue
- Speeds throughout the town centre are particularly low across most links.
- Low speeds on the Tiddington Road approach to Alveston Manor junction which propagate back onto Loxley Road.
- Speeds along Alcester Road EB, towards the town centre, do not exceed 15mph until west of the junction with Masons Road
- Speeds on the Alcester Road WB towards the A46 are below 5 mph
- Speeds on Bishopton Lane NB on Bishopton Lane are below 5 mph

4.6.3 2021 to 2028 High Growth AM network performance

By 2028, when High growth levels are assessed, the network conditions have worsened significantly from those experienced within the 2019 medium growth scenario. Assessment of the 2028 High Growth network mean speed plot (Figure 23) reveals the following observations:

- Low speeds on Banbury Road NB as far back as Trinity Way
- Low speeds on the Shipston Road approach to the roundabout with Banbury Road
- Low speeds on both Clifford Lane and Shipston Road at the point where the two roads meet
- Low speeds on Evesham Road between Evesham Place and Hathaway Lane
- Low speeds on Shottery Road as far back as Quineys Road propagating back from Evesham Place
- Low speeds on Seven Meadows Road propagating beyond the junction with Wetherby Way
- Low speeds in and around the Alcester Road/Grove Road and Birmingham Road/Arden Street junctions.
- Speeds on Alcester Road EB, west of the junction with Brookside Road, rarely exceed 20 mph and are frequently below 10 mph
- Speeds on the Birmingham Road, travelling SB into the town centre, are rarely above 20 mph from as far back as the junction with Worths Way

4.6.4 2021 to 2028 High Growth PM network performance

By 2028, when High growth levels are assessed, the network conditions are significantly worse in the PM high growth scenario. Between 2021 and 2028, when high growth is applied, the speeds on the links within the town centre gradually reduce until they reach a point where the majority of average peak hour network speeds within the town centre are below 5 mph.

Severe impacts are experienced across the length of the Guild Street , as well as significant sections of Birmingham Road, Alcester Road, Warwick Road and Banbury Road. Observations of the model in operation reveal that, towards the end of the modelled hour, congestion within the town centre is so high the model begins to lock up. It is likely that some average speeds are actually being overestimated on account of the fact that the network is at a standstill towards the end of the period and vehicles do not manage to travel the length of many of the links in the town centre area.

4.7 Summary

4.7.1 Severe Impacts

Undertaking an incremental approach to the analysis reveals that a series of constraints to growth become apparent very early on in the analysis and, rather than further growth creating new issues, these simply get gradually worse as the level of demand increases.

Two areas within the model appear to consistently constrain growth and suffer from severe congestion with wide implications for network operation across Stratford if left unchecked, and these are outlined in the following section:

4.7.2 Evesham Place/Evesham Road roundabout

By 2028 this roundabout is a problem in both the AM and PM. In the AM the issue relates to vehicles travelling inbound towards the town centre which manifests in the form of low average speeds along Evesham Road, Shottery Road and Seven Meadows Road. In the PM the queuing along Rother Street is likely to reach such an extent that it blocks back through Wood Street and Windsor Street. When comparing the Medium growth and High growth options, during the PM, some of the links appear to return higher average speeds. This is actually because the network has locked up entirely in this area towards the end of the model period. Since the average speed is calculated only for vehicles that traverse the length of the link higher speeds can be returned on the basis that, when the speed on the link is at its lowest, vehicles are actually at a standstill. This means that, on occasions, conditions in some areas can appear to be improved on the maps when in reality they are worsened. Frequently the links in the surrounding area will still demonstrate a worse level of performance which should make instances where this affect occurs more obvious.

4.7.3 Banbury Road/Shipston Road roundabout

Low means speeds are present along Banbury Road and Shipston Road which appears initially within the AM and then, in later growth scenarios, in both the AM and PM peak hours. During the 2028 High growth scenarios low speeds, of less than 10mph, are notable along the length of Banbury Road NB during the AM and PM peaks as well as on a significant proportion of Shipston Road during the AM peak.

These low speeds are primarily caused by two contributing factors:

- The large volume of u-turning traffic that uses the roundabout to access the town centre from Tiddington Road and;
- Queuing back from the Bridge Foot/Bridgeway junction on the gyratory

4.7.4 Moderate Impacts

Aside from the two aforementioned locations there are a number of other locations where issues occur, some are period specific whilst others simply involve significant reductions in speeds, whilst remaining above the 5 mph band, and these include the following:

- Warwick Road SB back from the gyratory
- The links on the Gyratory itself
- Arden Street/Birmingham Road signalised junction
- Alcester Road/Grove Road junction
- Shipston Road/Clifford Lane Junction
- Trinity Way/Seven Meadows Road Roundabout
- Bishopton Lane approach to Bishopton Roundabout
- Alcester Road approach to Wildmoor roundabout

4.8 Stage 1 Conclusion

Analysis of the aforementioned scenarios reveals a number of potential network constraints that are likely to require mitigation to enable future growth to be realised. The most severe impacts are experienced at the junctions between Banbury Road/Shipston Road and Evesham Road/Evesham place. This is not surprising as these two junctions represent the only two routes into the town centre from the South East

5 Stage 2 - Development Specific Impacts

5.1 Objective

To understand the implications on the network that a more focussed growth strategy may have in comparison to the generalised growth scenarios tested previously.

5.2 Development Scenarios

The latest Stratford-on-Avon District Draft Core Strategy Documentation (February 2012) outlines 16 sites, without planning permission, within the boundaries of Stratford upon Avon that were identified within the Strategic Housing Land Availability Assessment (SHLAA). In order to test the impact that allocating growth in any of these locations may incur it is proposed that the sites be combined into a few options within which growth can be allocated.

Whilst this does not identify the impacts or merits of any one specific site, it should highlight any potential benefits or impacts of locating growth in one of three broad locations. The 16 SHLAA sites have been grouped into 3 broad locations. Each of which contains 5 or 6 potential sites. The split of sites that have been tested is as follows:

- North of Stratford – containing sites 1, 2, 3, 4, 5 and 11
- East of Stratford – containing sites 12 to 16
- West of Stratford – containing sites 6 to 10

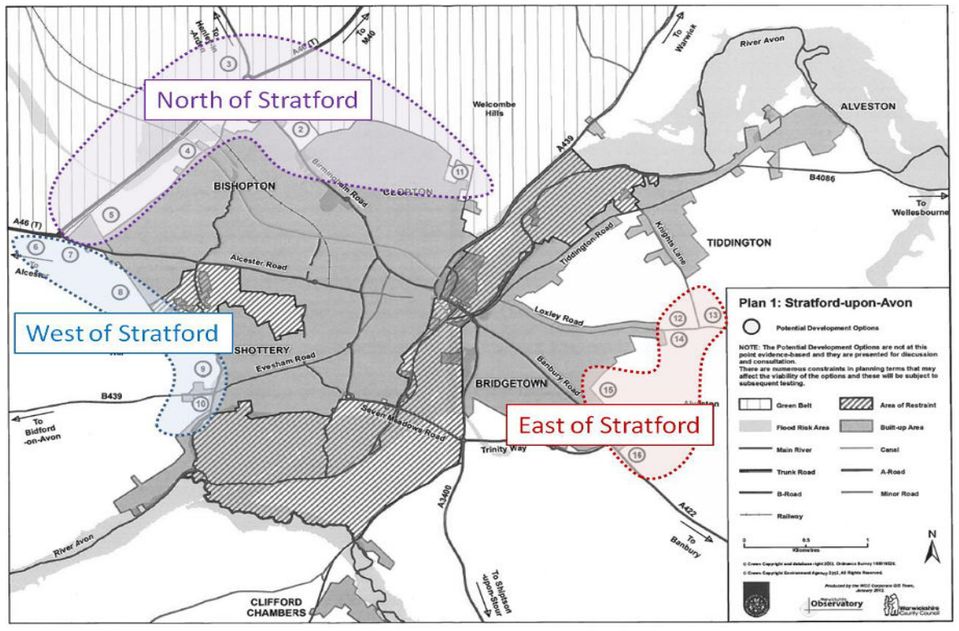
For the purposes of this assessment 3 and 6 were allocated a small proportion of housing, in reality these sites are likely to be retained as employment sites. The above locations are illustrated within **Error! Not a valid bookmark self-reference.**.

The net level of growth contained within each of these options needs to correlate, at least in part, to the TEMPRO growth values that have been tested previously. Thus it was decided that the following tests would be undertaken:

- 2028 Stratford Medium Growth plus Broad location and;
- 2028 Stratford High Growth plus Broad location

Earlier analysis indicated that, by 2028, the high growth option is not deliverable within the current Stratford highway network. Stage 2 is intended to identify whether allocating growth in a specific area will affect this conclusion. Similarly Stage 2 will also provide a comparison between focussed and unfocussed growth and could potentially reveal whether focussing growth in a specific area can alleviate the predicted levels of congestion or, alternatively, worsen them.

Figure 6 - Stratford Broad Locations



5.3 SHLAA Growth

Initial testing assumed that 840 dwellings in Stratford-upon-Avon (as defined by Option E on page 80 of the Draft Core Strategy February 2012) would be allocated across each of the broad locations. This represents a higher level of growth than Option F which specifies 560 dwellings in the town. The trip generation was calculated based on the standard approach adopted by Warwickshire County Council for estimating residential trip generation. This assumes that 60 % of dwellings are assumed to create a peak hour trip of which 80% are outbound and 20% inbound within the AM with the reverse occurring within the PM.

Pre-peak trip generation figures were calculated by working out the volume of demand in each model hour as a function of the respective 2 hour period. Thus, the AM pre-peak hour was calculated by multiplying the AM peak values by 0.38 whilst the PM pre-peak values were obtained by multiplying the peak hour values by 0.48.

The resultant trip generation to be distributed across the sites is outlined within the following Table:

Table 5 - 840 Dwelling Trip Generation

TRIP RATES:	IN	OUT		IN	OUT
AM PEAK	**101**	**403**	PM PEAK	**403**	**101**
AM PRE PEAK	**39**	**157**	PM PRE PEAK	**192**	**48**

Once the trip generation was determined a proportion was then allocated to each of the sites within each of the broad locations. The proportion of each location assumed to be made up by each of the individual component sites is summarised within Table 6.

Growth within each of the scenarios has then been adjusted by the relevant amount that is presented within the SHLAA locations. This means that net growth within the model is at the same level as that which was tested in the previous scenarios; the only difference is that a proportion of that growth is now allocated within specific locations on the network.

Overall the maximum growth levels in the AM model period are still over 9% in the medium growth and over 17% in the high growth scenario. Similarly growth within the PM period is retained at over 8% in the medium growth and over 16% in the high growth scenario.

Table 6 – Individual Site Assignment

Location	CS Site	S-PARAMICS Zone	Proportion
NORTH	1	74	15%
	2	26	15%
	3	300	5%
	4	301	5%
	5	302	50%
	11	21	10%
WEST	6	303	10%
	7	304	10%
	8	305	45%
	9	306	25%
	10	307	10%
EAST	12	308	20%
	13	309	20%
	14	310	20%
	15	55	20%
	16	311	20%

5.4 Results

The results from the North, East and Western growth allocation scenarios are presented within **Appendix B** of this report.

5.5 North Broad Location Results Analysis

Within the first set of scenarios that have been tested, growth has been allocated to the sites in the North.

5.5.1 2028 AM High Growth Network Performance

Analysis of the AM network performance when a proportion of the growth is allocated to sites in the North reveals that there are very few differences between the North option (Figure 25) and the general growth option (Figure 23). The only notable difference between the two options is that the average speeds along Banbury Road NB towards Stratford Town Centre are slightly quicker near Trinity Way, when growth is allocated in the North.

5.5.2 2028 PM High Growth Network Performance

Similarly, analysis of the PM network performance reveals that there are very few differences between the North option (Figure 26) and the general growth option (Figure 24). It is notable that the average speed along the Alcester Road approach to Wildmoor roundabout reduces further when growth is focussed in the North. Critically, the inner town network performance is still particularly poor with average speeds of less than 10 mph on a significant number of links.

5.5.3 2028 AM Medium Growth Network Performance

Analysis of the AM network performance when a proportion of the growth is allocated to sites in the North reveals that there are very few differences between the North option (Figure 27) and the general medium growth option (Figure 21).

5.5.4 2028 PM Medium Growth Network Performance

PM analysis of the North option reveals that the only notable difference between the North option (Figure 28) and the general medium growth option (Figure 22) is an increase in queuing along the Alcester Road approach to Wildmoor roundabout.

5.6 East Broad Location Results Analysis

Within the second set of scenarios that have been tested, growth has been allocated to the sites in the East.

5.6.1 2028 AM High Growth Network Performance

Analysis of the AM network performance when a proportion of the growth is allocated to sites in the East reveals that there are very few differences between the East option (Figure 29) and the general growth option (Figure 23).

5.6.2 2028 PM High Growth Network Performance

Similarly analysis of the PM network performance reveals that there are very few differences between the East option (Figure 30) and the general growth option (Figure 24). It is notable that the average speed along the Banbury Road NB reduces further when growth is focussed in the East. Speeds on Birmingham Road SB appear marginally higher. Critically, the inner town network performance is still particularly poor with average speeds of less than 10 mph on a significant number of links.

5.6.3 2028 AM Medium Growth Network Performance

Analysis of the network performance when a proportion of the growth is allocated to sites in the East (Figure 31) compared to the general growth option (Figure 21) reveals that speeds along the Banbury Road NB are lower for a longer section, speeds are affected as far back as Trinity Way. Speeds along Tiddington Road SB and Seven Meadows Road NB are also lower for longer sections in the focussed growth option.

5.6.4 2028 PM Medium Growth Network Performance

Analysis of the PM network performance reveals that, within the PM peak hour, there are very few differences between the East option (Figure 32) and the general growth option (Figure 22). When comparing AM to PM it is notable that the trip patters are largely towards the sites within the PM whilst they primarily originate from the sites in the AM, thus problems in the AM could potentially be more focussed as issues arise adjacent to the site locations.

5.7 West Broad Location Results Analysis

5.7.1 2028 AM High Growth Network Performance

Analysis of the AM network performance when a proportion of the growth is allocated to sites in the West (Figure 33) when compared to the general growth option (Figure 23) reveals that average speeds are potentially higher along Banbury Road NB when growth is allocated in the West. Similarly speeds along Evesham Road NB have reduced in response to the allocation of growth in the West.

5.7.2 2028 PM High Growth Network Performance

Analysis of the PM network reveals that there are very few differences between the West option (Figure 34) and the general growth option (Figure 24). It is notable that number of instances, within the town centre, where the average speed drops below 5 mph appears to have reduced. Despite this, the inner town network performance is still particularly poor with average speeds of less than 10 mph on a significant number of links.

5.7.3 2028 AM Medium Growth Network Performance

Analysis of the AM network performance reveals that there are very few differences between the West option (Figure 35) and the general growth option (Figure 21).

5.7.4 2028 PM Medium Growth Network Performance

Analysis of the PM network performance when a proportion of the growth is allocated to sites in the West (Figure 36) when compared to the general growth option (Figure 22) reveals an increase in average speeds along Banbury Road NB as well as along the Alcester Road NB approach to Wildmoor Roundabout and the Bishopton Lane NB approach to Bishopton Roundabout. The number of instances where speeds within the town centre drop below 5 mph also appears to have reduced.

5.8 Development Only Impacts

The previous analysis compares the impact of a general allocation of growth up to 2028 levels against more focussed options whereby an element of the growth has been allocated to a broad location within the model. Whilst this methodology provides an indication of the impacts of a focussed growth strategy compared to an unfocussed growth strategy it does not demonstrate the specific impacts that may occur in respect of the adoption of the individual locations.

As a result a series of „low growth" options have been derived whereby the growth associated with each of the broad locations has been allocated to the 2015 scenario model. The outcome of these assessments has been presented within **Appendix C** of this report.

The analysis of the results focuses on the broad impacts of the various scenarios. At this stage the localised impacts in the areas immediately adjacent to the development locations have not been assessed. It is inevitable that allocating developments within the various locations will result in localised impacts that will require further analysis, during a more detailed assessment stage, to determine the likely impacts and any appropriate mitigation strategy.

5.8.1 North Broad Location Impacts

When comparing the impact of allocating growth in the North to the reference 2015 network conditions reveals very few additional impacts upon the either the AM or PM peak hour network conditions.

5.8.2 East Broad Location Impacts

When comparing the impact of allocating growth in the East to the reference 2015 network conditions reveals a reduction in average speeds along Banbury Road NB and Seven Meadows Road NB within the AM and PM peak hours whilst, within the PM, there is also a notable increase in the number of occasions where the speeds on links within the town centre drops below 10mph.

5.8.3 West Broad Location Impacts

When comparing the impact of allocating growth in the West to the reference 2015 network conditions reveals very few additional strategic impacts upon the either the AM or PM peak hour network conditions. The only notable exception to this is that the allocation of growth to the West leads to a further reduction in average speeds along the Shottery Road, Evesham Road and Seven Meadows Road approaches to the Evesham Road/Evesham Place roundabout.

5.9 Summary

Notwithstanding the requirement to assess the more localised impacts in close proximity to the broad locations, testing of the allocation of growth to the general broad locations has revealed that, during the PM peak, under conditions of high growth, no particular option demonstrates an improvement in network conditions over and above those experienced within the more general 2028 PM high growth option.

When considering the other scenarios the following conditions have been observed:

- Allocation of growth to the North has the potential to alleviate some of the conditions along Banbury Road NB whilst potentially increasing issues around Wildmoor Roundabout.
- Allocation of Growth to the East will inevitably exacerbate the congested conditions around Banbury Road NB, the Gyratory and Seven Meadows Road.
- Allocation of growth to the West will be most likely to impact upon Evesham Road, particularly in the AM peak hour due to the increased volume of trips heading towards the town centre.

5.10 Stage 2 Conclusion

Allocating growth in any of the broad locations is unlikely to improve the PM network conditions when considering the high growth scenario.

Allocation of growth in the North appears to incur the least number of issues. Whilst allocating growth in the East appears to exacerbate the issues likely to occur around both the Evesham Road/Evesham place roundabout and the Banbury Road/Shipston Road roundabout. Allocation of growth in the West is most likely to affect the Evesham Road.

6 Stage 3 - Strategic Option Testing

6.1 Overview

WCC have also commissioned JMP Consultants to undertake a series of option tests using the CITEware strategic model. The strategic modelling exercise has been used to identify the area wide implications of the adoption of a number of District-wide growth scenarios. These options require testing within the strategic model as the coverage of the Stratford-upon-Avon S-PARAMICS model is insufficient to ascertain all of the wide area impacts.

One outcome of the CITEware testing is the ability to translate the strategic model trip movements into S-PARAMICS Origin Destination (O-D) pairs. This means that the localised impacts on the Stratford-upon-Avon road network, from any of the growth options identified within the strategic modelling exercise, can be identified by testing the impacts of the strategic O-D movements within the Stratford-upon-Avon S-PARAMICS model.

Initially, the following scenarios have been selected for testing namely:

- Stratford-on-Avon District Council (SDC) **Scenario F** – Allocation of 8,000 dwellings and 10 Ha of employment through dispersed sites across the District
- SDC **Rural Brownfield** option – Allocation of 7,000 dwellings plus an additional 800 dwellings at each of the Harbury, Southam Cement works and Long Marston sites.
- SDC **Gaydon Focus** Option – allocation of 8,000 dwellings through dispersed sites across the District plus 5,000 dwellings in a new settlement near Gaydon.

Each of the aforementioned scenarios have already been tested by JMP using CITEware and the output AM and PM peak hour matrices from this test have been provided for interrogation thorough the S-PARAMICS model.

These matrices represent both internal and external growth within the model as it encapsulates the effects of a District wide growth strategy on the Stratford-upon-Avon road network.

In order that the assessment can be comparable with those that have been undertaken previously the level of growth within the model has been capped at a level that is consistent with the high growth scenarios.

The CITEware matrices have been factored to provide pre-peak values using the same factors as were used to extrapolate the broad location pre-peak matrices (i.e. 0.39 and 0.48 for the AM and PM respectively).

Growth within the CITEware model, although informed through analysis of the TEMPRO database, will not necessarily equate to the same levels within the S-PARAMICS model. Partly this is because the CITEware assessment does not assign all trips associated with the various development options into the PARAMICS model network and partly because the PARAMICS model contains a larger proportion of more clearly defined O-D values when compared to CITEware not all of these are subject to growth when translating the CITEware outputs into S-PARAMICS inputs. This means that adjustments to the CITEware totals may be required, once they have been extracted from the Strategic model, prior to inclusion within the S-PARAMICS model, to ensure that the assessment is consistent with that which has previously been undertaken.

As CITEware uses census based journey to work distributions for the entire District there is an element of internalisation that takes place when transposing the outputs from CITEware into S-PARAMICS. This is partly caused by CITEware accounting for an element of internalisation within each of the sites. Furthermore, some of the larger sites that lie outside the District may use external links within the wide area network that have been assigned zones within the S-PARAMICS model. As these trips travel along the links assigned within a single zone, during the trip capture process, they are captured as both origin and destination which translates into greater levels of internalisation when converted into S-PARAMICS O-D matrices.

The internal trips have been discounted within the modelling to ensure that the level of growth assigned within the model equates to that which is predicted within the TEMPRO database. Since internal trips which start and end in the same zone are never released onto the S-PARAMICS network, their inclusion would result in an over prediction of the level of growth as the trip would be counted within any growth adjustments but would never actually occur within the model. Thus, the removal of internal trips from the CITEware matrices, prior to assignment within the S-PARAMICS model, maintains growth at a consistent and comparable level across all scenarios.

As the CITEware growth represents all growth within the model it represents a closer reflection of the overall growth scenario than the broad location scenarios. As a result of this, and in an attempt to ensure that the growth levels forecast within the model were not overly optimistic, peak spreading assumptions were applied to the CITEware growth to provide individual levels of growth for each hour within the model period. These proportions are available within Table 3 of this report.

6.2 Scenario F

Scenario F involves dispersal of up to 8000 houses across the district.

The total growth predicted by the CITEware Scenario F assessment, less internalisation, has been compared to the growth predicted through TEMPRO within the following Table:

Table 7- CITEware/TEMPRO Forecast Comparisons – Scenario F

Period	TEMPRO	CITEware	Difference
AM (07:00 to 09:00	3831	3678	153
PM (16:00 to 18:00)	4998	3871	1127

The overall levels of growth predicted through the TEMPRO analysis, for both AM and PM periods is 17.31% and 16.91% respectively. Analysis of the previous table reveals that the CITEware „Scenario F" testing predicts lower levels of growth than those predicted via TEMPRO.

Because the level of growth predicted through TEMPRO is higher than CITEware it was necessary to increase the overall growth within the model, to maintain a consistent level of growth across all scenarios. This increase was applied by adjusting the TEMPRO predicted growth levels by the CITEware demand totals with the remainder being assigned to the model as growth, within matrix level four.

A comparison of the demands contained within the 2028 High Growth Scenario and the 2028 CITEware scenario F by matrix level is provided for the AM and PM periods within the following tables:

Table 8 - 2028 AM Forecast Growth Comparisons – Scenario F

Demand	(07:00 to 08:00)		(08:00 to 09:00)	
	TEMPRO	CITEware	TEMPRO	CITEware
Background	9534	9534	14730	14730
HGV	793	793	816	816
Com Dev	451	451	969	969
Growth (TEMPRO)	1840	74	1991	80
Growth (CITEware)	0	1766	0	1911
Total	**12618**	**12618**	**18505**	**18505**

Table 9 - 2028 PM Forecast Growth Comparisons – Scenario F

Demand	(16:00 to 17:00)		(17:00 to 18:00)	
	TEMPRO	CITEware	TEMPRO	CITEware
Background	13993	13993	15404	15404
HGV	820	820	524	524
Com Dev	1139	1139	1177	1177
Growth (TEMPRO)	2493	562	2505	565
Growth (CITEware)	0	1930	0	1940
Total	**18443**	**18443**	**19610**	**19610**

Application of forecasting in this way ensures that the level of demand within each hour is directly comparable between both the Reference Case scenarios and the respective CITEware Scenarios, in this case Scenario F.

6.2.1 Results Analysis – Scenario F

The mean speed plots resulting from the application of the CITEware Scenario F O-D matrices within the S-PARAMICS network are presented within **Appendix D** of this report, AM and PM peak hour plots have been presented within Figure 43 and Figure 44 respectively.

6.2.2 2028 Scenario F AM Network Performance

Analysis of the network performance, when growth is allocated as per SDC Scenario F, reveals that there are a number of differences between the network conditions under Scenario F growth (Figure 43) and the general high growth scenario (Figure 23).

The outward nature of the focus on growth, dispersed across the District, seems to result in little difference in conditions within the town centre. Analysis of the network performance, when growth is allocated as per SDC Scenario F, reveals that there are a number of differences between the network conditions under Scenario F growth (Figure 43) and the general high growth scenario (Figure 23).

Generally, improvements are present in the South West where the speeds on the Evesham Road approach to Evesham Place are higher in Scenario F than the general high growth scenario. Average speeds along Banbury Road NB are still low although the length of the sections where speed has dropped is now shorter than has been observed within the general high growth scenario and there is a corresponding minor increase in speeds along Shipston Road within Scenario F when compared to the high growth scenario.

Notably, the average speed on the Shipston Road NB approach to the junction with Clifford Lane drops considerably in Scenario F compared to the general high growth scenario. A similar situation has occurred on the A46 WB approach to Bishopton Roundabout and the Warwick Road SB approach to the gyratory.

6.2.3 2028 Scenario F PM Network Performance

Analysis of the PM peak network conditions reveals very little difference between the town centre network conditions within Scenario F growth (Figure 44) and those within the general high growth scenario (Figure 24), in particular the mean speed on the majority of links within the town centre is still below 10mph.

It appears that conditions to the South East under Scenario F are far worse than those within the general high growth scenario. This is likely to be partly due to the fact that irrespective of the scenario the focus of trip generation is outwards from the town and the large volume of trips trying to leave the town at the same time will inevitably lead to the creation of significant issues within the town centre network.

It appears that there is a convergence of very low mean speeds with the Banbury Road/Tiddington Road junction at the centre. Conditions along Trinity Way WB are also considerably worse within Scenario F.

6.2.4 Scenario F Conclusion

Focussing growth outward of Stratford-upon-Avon may result in marginally less congestion during the AM peak hour within the southern areas of the network on routes towards Stratford town centre. It will, however, result in increased congestion around external jounctions on key routes into the town. The CITEware analysis appears to demonstrate that the attraction of Stratford-upon-Avon to developments within the wider District will still result in a large proportion of additional trips utilising the Stratford-upon-Avon road network.

These additional trips put pressure on external junctions such as Bishopton Roundabout and Shipston Road/Clifford Lane, as the volume of traffic coming into the town from external zones has increased.

The same conditions are reflected within the PM although the town centre still demonstrates an inability to facilitate the additional demand assigned to the network as a result of Scenario F. Despite the dispersed approach to the allocation of growth across the District the CITEware analysis appears to predict that a large volume of the newly created trips will still be attracted to Stratford-upon-Avon. The fact that they are coming from further afield means that the effect of this attraction is to exert additional pressures on the external road network whilst the volume of trips likely to be leaving Stratford-upon-Avon during the PM is still of sufficient magnitude to cause considerable issues on the inner town centre road network. Furthermore, conditions have worsened significantly in and around the South East quadrant of the model network within Scenario F. This could be indicative of the pattern and dispersal of growth resulting in network failure in and around the Tiddington Road/Banbury Road junction.

6.3 Rural Brownfield

The rural Brownfield option involves dispersal of up to 7000 houses across the District as well as 800 dwellings ate each of the Harbury, Southam Cement Works and Long Marston Sites.

The total growth predicted by the CITEware assessment, less internalisation, has been compared to the growth predicted through analysis TEMPRO within the following Table:

Table 10- CITEware/TEMPRO Forecast Comparisons – Rural Brownfield

Period	TEMPRO	CITEware	Difference
AM (07:00 to 09:00	3831	4307	-477
PM (16:00 to 18:00)	4998	4545	452

Analysis of the previous table reveals that the CITEware „Rural Brownfiled" testing predicts higher levels of growth in the AM and lower levels of growth in the PM than is predicted through TEMPRO.

Because, within the AM, the level of growth predicted through TEMPRO is lower than CITEware it was necessary to reduce the overall level of traffic within the model, to maintain a consistent level of growth across all scenarios. This reduction was applied by adjusting the background matrices by the difference in overall growth between TEMPRO predicted growth levels and the CITEware demand. Growth levels within matrix level four equates to 0 trips.

Because, within the PM period, the level of growth predicted through TEMPRO is higher than CITEware it was necessary to increase the overall growth within the model, to maintain consistent growth levels. This increase was applied by adjusting the TEMPRO predicted growth levels by the CITEware demand totals with the remainder being assigned to the model as growth, within matrix level four.

A comparison of the demands contained within the 2028 High Growth Scenario and the 2028 CITEware Rural Brownfield scenario is provided for the AM and PM periods within the following tables:

Table 11 - 2028 AM Forecast Growth Comparisons – Rural Brownfield

Demand	(07:00 to 08:00)		(08:00 to 09:00)	
	TEMPRO	CITEware	TEMPRO	CITEware
Background	9534	9305	14730	14482
HGV	793	793	816	816
Com Dev	451	451	969	969
Growth (TEMPRO)	1840	0	1991	0
Growth (CITEware)	0	2069	0	2239
Total	**12618**	**12618**	**18505**	**18505**

Table 12 - 2028 PM Forecast Growth Comparisons – Rural Brownfield

Demand	(16:00 to 17:00)		(17:00 to 18:00)	
	TEMPRO	CITEware	TEMPRO	CITEware
Background	13993	13993	15404	15404
HGV	820	820	524	524
Com Dev	1139	1139	1177	1177
Growth (TEMPRO)	2493	226	2505	227
Growth (CITEware)	0	2267	0	2279
Total	**18443**	**18443**	**19610**	**19610**

6.3.1 Results Analysis – Rural Brownfield

The mean speed plots resulting from the application of the CITEware Scenario F O-D matrices within the S-PARAMICS network are presented within **Appendix D** of this report, AM and PM peak hour plots have been presented within Figure 45 and Figure 46 respectively.

6.3.2 2028 Rural Brownfield AM Network Performance

Analysis of the network performance when growth is allocated as per SDC Rural Brownfield Allocation reveals that there are very few differences between the network conditions under Brownfield growth (Figure 45) and the general high growth option (Figure 23).

Generally network conditions are broadly similar within the Rural Brownfield option when compared to the high growth scenario with the notable exceptions of further reductions in average speeds along key sections of road network into Stratford-upon-Avon. In particular:

- Shipston Road NB approach to the junction with Clifford Lane
- Warwick Road SB towards the gyratory
- A46 WB towards Bishopton Roundabout
- A422 NB towards Banbury Road/Shipston Road roundabout

These impacts are likely to be symptomatic of an increase in the number of trips trying to enter the town from the wider District area.

6.3.3 2028 Rural Brownfield PM Network Performance

Analysis of PM network conditions, when considering the Rural Brownfield option, reveals a similar pattern of impacts to those exhibited within Scenario F. In some instances speeds along Banbury Road average 15-20 mph but lie between sections that are 5mph or less. This is most likely to indicative of conditions becoming so bad that vehicles can no longer traverse

the length of the link and, thus, no lower average speeds are recorded because vehicles on the link have come to a standstill.

In general however, it is clear that there are few obvious improvements to conditions within the town centre and, furthermore, there is a significant likelihood that the network within the southeast quadrant will again simply fail to accommodate all of the additional demand.

6.3.4 Rural Brownfield Conclusion

Assessing the potential impact of the Rural Brownfield option against the general high growth scenario reveals that there are very few differences between either option, during the AM with the exception of a number of occasions where speeds on the outer edges of the network are observed to drop due to an increase in the number of trips travelling towards Stratford.

During the PM the issues mirror those revealed during the analysis of Scenario F in so far as the network appears unable to facilitate the additional level of demand and severe impacts appear to be experienced in and around the southeast quadrant of the model network.

6.4 Gaydon Focus

The Gaydon Focus option involves dispersal of up to 8,000 houses across the District as well as a 5,000 dwelling new settlement in close proximity to Gaydon Village south of the M40.

The total growth predicted by the CITEware assessment, less internalisation, has been compared to the growth predicted through TEMPRO within the following Table:

Table 13- CITEware/TEMPRO Forecast Comparisons – Gaydon Focus

Period	TEMPRO	CITEware	Difference
AM (07:00 to 09:00	3831	4892	-1061
PM (16:00 to 18:00)	4998	5259	-257

Analysis of the previous table reveals that the CITEware „Gaydon Focus" testing predicts higher levels of growth than TEMPRO.

Because the level of growth predicted through TEMPRO is lower than CITEware it was necessary to reduce the overall level of traffic within the model, to maintain a consistent level of growth across all scenarios. This reduction was applied by adjusting the background matrices by the difference in overall growth between TEMPRO predicted growth levels and the CITEware demand. Growth levels within matrix level four equates to 0 trips.

A comparison of the demands contained within the 2028 High Growth Scenario and the 2028 CITEware Gaydon Focus scenario is provided for the AM and PM periods within the following tables:

Table 14 - 2028 AM Forecast Growth Comparisons – Gaydon Focus

Demand	(07:00 to 08:00)		(08:00 to 09:00)	
	TEMPRO	CITEware	TEMPRO	CITEware
Background	9534	9025	14730	14178
HGV	793	793	816	816
Com Dev	451	451	969	969
Growth (TEMPRO)	1840	0	1991	0
Growth (CITEware)	0	2350	0	2543
Total	**12618**	**12618**	**18505**	**18505**

Table 15 - 2028 PM Forecast Growth Comparisons – Gaydon Focus

Demand	(16:00 to 17:00)		(17:00 to 18:00)	
	TEMPRO	CITEware	TEMPRO	CITEware
Background	13993	13862	15404	15273
HGV	820	820	524	524
Com Dev	1139	1139	1177	1177
Growth (TEMPRO)	2493	0	2505	0
Growth (CITEware)	0	2623	0	2636
Total	**18443**	**18443**	**19610**	**19610**

6.4.1 Results Analysis – Gaydon Focus

The mean speed plots resulting from the application of the Gaydon Focus O-D matrices within the S-PARAMICS network are presented within **Appendix D** of this report, AM and PM peak hour plots have been presented within Figure 47 and Figure 48 respectively.

6.4.2 2028 Gaydon Focus AM Network Performance

Analysis of the network performance when growth is allocated as per the SDC Gaydon Focus reveals that there are a number of differences between the network conditions under the Gaydon Focus growth (Figure 47) and the general high growth option (Figure 23).

The outward nature of the focus on growth, dispersed across the District, coupled with the potential attractiveness of a nearby settlement, seems to result in potentially improved conditions within the town centre. Overall there appears to be quite a few occasions where the average speed on the links in the town centre is at least one band higher in the Gaydon Focus option when compared to the general high growth scenario.

There do not appear to be any significant differences in the outer network conditions when comparing the impacts of Gaydon focussed growth versus the general high growth scenario. The only notable exceptions to this is an increase in the average speeds along the A46 WB approach to Bishopton Roundabout and a minor increase in the average speeds along Banbury Rd SB (near Trinity Way) with Gaydon focussed growth.

6.4.3 2028 Gaydon Focus PM Network Performance

Analysis of PM network conditions when considering the Gaydon Focus option reveals a similar pattern of impacts to those which are exhibited within the previous strategic model scenarios. It is clear that there are no obvious improvements to conditions within the town centre and, furthermore, there is a significant likelihood that the network within the southeast quadrant will simply fail to accommodate all of the additional demand.

6.4.4 Gaydon Focus Conclusion

Analysis of the network performance when growth is allocated as per SDC Gaydon Focus reveals that there is potential within the AM period for network conditions within the town centre to improve. Overall the option could have the potential to alleviate conditions in the town centre by shifting some of the focus of growth away from the town centre. Furthermore the new settlement may also attract trips away from the town.

6.5 Stage 3 Conclusion

Assessing the performance when the strategic growth options are assigned to the model network reveals very few differences when compared to the impacts experienced under the TEMPRO, high growth scenario.

Testing of the strategic options reveals that, during the AM there are occasions where the mean speeds on the approaches to junctions within the inner urban area, heading towards the town centre improve whilst conditions within the town centre remains largely unchanged in most options. The Gaydon Focus does appear to result in an improvement in town centre conditions, potentially due to the attractiveness of the nearby new settlement; further investigation is recommended to ascertain the true potential of this effect in more detail.

Junctions on the external edges of the town centre are likely to experience a worsening of conditions, during the AM peak, as the pattern within the strategic options indicates that trips are likely to travel from further afield towards Stratford rather than the overall attraction of Stratford being reduced.

Since the level of attraction towards Stratford-upon-Avon from within the District appears to have been retained within the strategic options then the overall effect is that the trips generated within the strategic options are still departures that are required to exit the town during the PM period, thus there is little difference in the conditions within the town centre when any option is tested. Furthermore there is a significant likelihood that the network within the southeast quadrant will simply fail to accommodate all of the additional demand coming into the town from the wider area.

7 Stages 1 to 3 Summary and Conclusion

7.1 Summary

A series of growth options have been tested within the Stratford-upon-Avon S-PARAMICS model through the following three stages:

- Stage 1 - The allocation of general growth across the model network;
- Stage 2 - The above scenario with a focussed element of growth in one of 3 broad locations
- Stage 3 - The allocation of dispersed growth options across the district

7.1.1 Stage 1

Evesham Place/Evesham Road and Shipston Road roundabout

By 2028 this roundabout is a problem in both the AM and PM. In the AM the issue relates to vehicles travelling inbound towards the town centre which manifests in the form of low average speeds along Evesham Road, Shipston Road and Seven Meadows Road. In the PM the queuing along Rother street is likely to reach such an extent that it blocks back through Wood Street and Windsor Street.

Banbury Road/Shipston Road roundabout

Low means speeds are present along Banbury Road and Shipston Road; initially this occurs within the AM and then, in later growth scenarios, in both the AM and PM peaks hours. During the 2028 High growth scenarios, low speeds of less than 10mph are notable along the length of Banbury Road NB, on Clopton Bridge as well as on a significant proportion of Shipton Road.

These low speeds are primarily caused by two contributing factors:

- The large volume of u-turning traffic that uses the Banbury Road/ Shipston Road roundabout to access the town centre from Tiddington Road and;
- Queuing back from the Bridge Foot/Bridgeway junction on the gyratory

Moderate Impacts

Aside from the two aforementioned locations there are a number of other locations where issues occur, some are period specific whilst others simply involve speeds dropping well below the limit of the links but mostly remaining above the 5 mph band these include the following:

- Warwick Road SB back from the gyratory
- The Gyratory
- Arden Street/Birmingham Road signalised junction
- Alcester Road/Grove Road junction
- Shipston Road/Clifford Lane Junction
- Trinity Way/Seven Meadows Road Roundabout
- Bishopton Lane Approach to Bishopton Roundabout
- Alcester Road approach to Wildmoor roundabout

7.1.2 Stage 2

Testing of the allocation of growth to the general broad locations has revealed that, during the PM peak, under conditions of high growth, no particular option demonstrates an improvement in network conditions over and above those experienced within the more general 2028 PM high growth option.

When considering the other scenarios the following conditions have been observed:

- Allocation of growth to the North has the potential to alleviate some of the conditions along Banbury Road NB whilst potentially increasing issues around Wildmoor roundabout.
- Allocation of growth to the East will inevitably exacerbate the congested conditions around Banbury Road NB, the Gyratory and Seven Meadows Road.
- Allocation of growth to the West will be most likely to impact upon Evesham Road, particularly in the AM peak hour due to the increased volume of trips heading towards the town centre.

7.2 Stage 3

Focussing growth outward of Stratford-upon-Avon may potentially result in less congestion during the AM peak hour within Stratford town, particularly on some approaches into the town. It will, however, result in increased congestion on key external routes into the town centre. The CITEware analysis appears to demonstrate that the attraction of Stratford-upon-Avon to developments within the wider District will still result in a large proportion of additional trips utilising the Stratford-upon-Avon road network.

These additional trips are now likely to place pressure on external junctions such as Bishopton Roundabout and Shipston Road/Clifford Lane, as the volume of traffic coming into the town from external zones has increased.

The same conditions are reflected within the PM although the town centre still demonstrates an inability to facilitate the additional demand assigned to the network as a result of Scenario F.

Despite the dispersed approach to the allocation of growth across the District the CITEware analysis appears to predicted that a large volume of the newly created trips will still be attracted to Stratford-upon-Avon during the AM peak. The fact that they are coming from further afield means that the effect of this attraction is to exert additional pressures on the external road network whilst the volume of trips likely to be leaving Stratford-upon-Avon during the PM is still of sufficient magnitude to cause considerable problems on the inner town centre road network and, furthermore, there is a significant likelihood that the network within the southeast quadrant will simply fail to accommodate all of the additional demand.

7.3 Stage 1 to 3 Conclusion

A number of locations within the network are likely to demonstrate capacity issues as demand is forecast forward from 2011. Some issues begin to occur at certain locations as early as 2015 namely:

- Evesham Road/Evesham Place roundabout
- Banbury Road/Shipston Road roundabout
- Clifford Lane/Shipston Road Junction (AM only)
- Rother Street SB (mainly PM)
- Alcester Road approach to Wildmoor roundabout (PM)
- Bishopton Lane approach to Bishopton Roundabout (PM)

As more growth is allocated within the model there is a tendency for these issues to be exacerbated rather than new issues arising. As the growth period extends beyond 2021 there are also issues with the general speeds along the Birmingham Road SB and Alcester Road EB corridors.

When considering the broad locations, it is apparent that allocation of growth in the North appears to incur the least number of problems. Allocating growth in the East appears to exacerbate the issues likely to occur around both the Evesham Road/Evesham Place roundabout and the Banbury Road/Shipston Road roundabout. Allocation of growth in the West is most likely to affect the Evesham Road.

When considering the Strategic options it is clear that the town centre operation is still a significant problem during the PM peak which is exacerbated within the South Western area, most likely due to the limited amount of route choice within this area.

During the AM peak, issues within the town centre are lessened by the outward focus of growth in the Gaydon option whilst in other options conditions on the inner routes towards the town are improved. These impacts do, however, appear to shift towards some of the external junctions as the CITEware analysis appears to indicate that a large number of trips will still be drawn to the town from the strategic sites across the District. The flow of trips into Stratford from these sites manifests in issues at the following locations:

- Bishopton Roundabout,
- Warwick Road SB (and the Gyratory)
- Shipston Road/Clifford Lane Junction

Thus, it can be concluded that a higher level of dispersal is unlikely to mitigate the issues within the town centre during the PM as these are caused by a high volume of trips departing from the town and the inability of the existing road network layout to accommodate those trips. The CITEware analysis appears to indicate that, despite the high dispersal approach to growth, a large number of trips will still be attracted to Stratford-upon-Avon and it is these trip departures in the PM that still cause the network to fail.

During the AM the higher dispersal has the potential to improve the conditions on the inner town centre network but there are now problems occurring at a number of the external junctions. These issues are likely to occur as a result of an increase in the number of trips heading towards Stratford-upon-Avon from the wider District network, converging on a small number of external junctions.

7.4 Further Recommendations

With the current network layout it is highly unlikely that the levels of high growth predicted through analysis of TEMPRO can be accommodated without significant implications on overall network performance.

A number of areas of the network are likely to require attention in the future. The proximity of the focus of growth to these areas will undoubtedly affect when the attention is required.

A more strategic approach to mitigation may be required to alleviate the congested conditions within the town centre. In particular, any schemes which have the potential to alleviate the level of demand along the Banbury Road NB corridor towards the Gyratory or the Evesham Road/Evesham Place roundabout are likely to incur the highest levels of benefit.

Other less strategic options that may be of benefit are outlined as follows:

Stratford Gyratory - The Gyratory is only partially signal controlled at present (i.e. on the A3400 Guild Street eastbound approach and A3400 Bridgefoot northbound section). Issues entering onto the gyratory from the Bridgefoot westbound approach already tend to exacerbate the queuing conditions along Clopton Bridge which, in turn exacerbates queuing conditions along Banbury Road NB. Similarly, blocking back from the Gyratory extends back along Warwick Road SB and, at times, Bridge Street and Wood Street. These conditions are likely to worsen in the future and so it is recommended that a scheme which increases the control of vehicles through the gyratory is investigated.

Banbury Road/Shipston Road Roundabout – Initially during the early test years problems at this junction occur in the AM and then during subsequent test years they occur in both AM and PM peak hours. The two main contributing factors to the queuing along Banbury Road are the volume of u-turners travelling towards Stratford town centre from Tiddington Road as well as queue propagation back from the Gyratory. These issues will need to be overcome to enable additional growth to be accommodated within the existing road network.

Evesham Road/Evesham Place Roundabout – During the AM, issues are presented in the form of increased queuing along Evesham Road NB, Seven Meadows Road NB and Shottery Road EB approaches to the roundabout during the AM peak (i.e. towards Stratford-upon-Avon).

Within the PM peak the issues are presented in the form of increased queuing on the Grove Road/Evesham Place SB approach to the roundabout (i.e. out of Stratford). The tidal nature and the overall imbalance of flows at this roundabout between periods indicate that signals may be required to improve junction operation. Another issue that occurs in the PM is that the queuing back along Grove Road SB quickly blocks back through the junction with Evesham Place/Rother Street. Since traffic travelling along Grove Road has priority the opportunity for southbound vehicles to exit Rother Street is reduced but the demand for the movement increases. Further attention may be required at this junction to mitigate these effects.

The above recommendations provide an overview of potential mitigation measures that may be required irrespective of the location of the growth within the area. Notwithstanding this, there will inevitably be a need for the localised impacts of any development to be assessed in conjunction with the aforementioned potential measures.

At this stage the assessment has focussed on the broad impacts on the highway network likely to be exacerbated throughout the plan period. It is recommended that, once a preferred approach to the allocation of development within the area has been identified, more detailed analysis of the localised impacts likely to occur as a result of the allocation of the various developments is undertaken with a view to determining a suitable mitigation strategy to overcome the potential localised impacts alongside the wider strategic mitigation strategy.

7.5 Sensitivity Testing

At this early stage of testing it has been imperative that overall growth levels be kept consistent to enable the differences between options, and the subsequent network wide impacts, to be easily distinguishable. It is interesting to note that each of the strategic options results in varying levels of demand being assigned to the network. This is then balanced out using TEMPRO to inform the overall growth levels.

Further investigation could be undertaken to assess the impacts of these different options in terms of the net growth that they predict as it may result in lower impacts or, conversely, more pronounced impacts, in certain areas depending upon the specific focus.

Such an approach will however, make distinguishing the cause of impacts (growth scenario or level of growth) more difficult than the current assessment approach. Once the magnitude of growth within the model vary between tests the number of variables increases as impacts may be related to magnitude of development or location rather than simply location. Thus, if two scenarios, where different developments of different sizes are located in different areas we cannot specifically conclude that an impact is attributable to any one single element (size, location, distribution, etc). We can clearly define the impacts still but we cannot determine the specific cause.

Once a preferred option is identified, however, such an approach will then be required to enable thorough determination of the likely mitigation measures required to accommodate the option.

8 Stage 4 Mitigation Testing

8.1 Introduction

The purpose of this Stage is to present the initial findings from the testing of potential forecast mitigation options within the Stratford-upon-Avon S-PARAMICS model. Following completion of Stages 1 to 3, a number of recommendations were presented. This stage of testing is intended to ascertain the potential benefits that can be achieved through addressing some of the issues that have been highlighted.

8.2 Objective

The objective of this stage is to establish an overview of the potential performance of each individual mitigation strategy. Furthermore, it should allow ease of identification of any options which do not provide sufficient improvements in the overall network conditions to merit further investigation.

8.3 Stage 4 Scenarios

A number of outline scenarios have been tested with a view to understanding the potential options available to mitigate the impacts of growth in traffic upon the Stratford-upon-Avon road network.

Initially three scenarios have been tested namely:

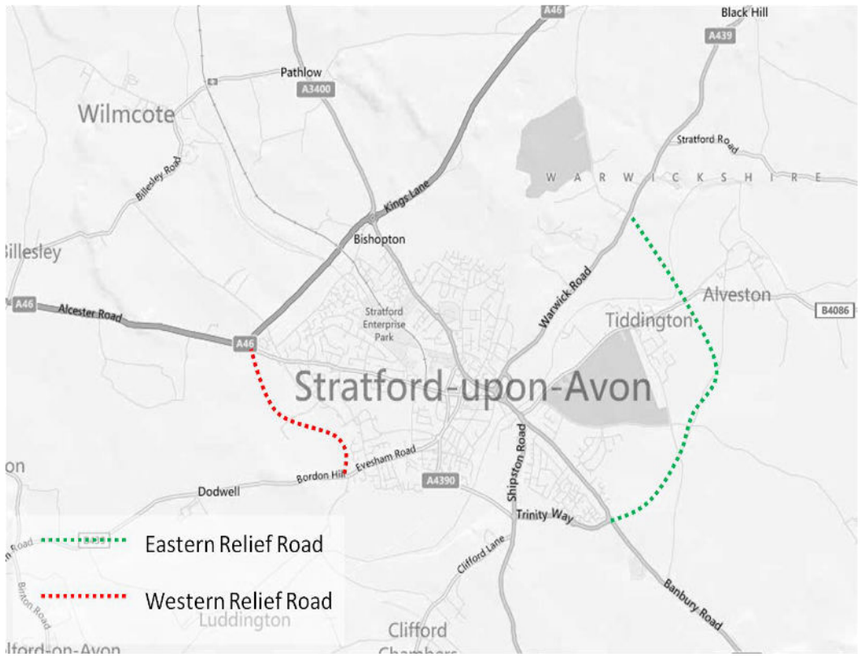
- 2028 Reference plus outline Eastern Relief Road (ERR)
- 2028 Reference plus outline Western Relief Road (WRR)
- 2028 Reference plus Town Centre Improvements (TCI)

The outcome of these tests has been compared against the 2028 High Growth reference scenario. The purpose of using this scenario as the reference case is it represents a worst case growth scenario without a specific focus of growth in any one area that could potentially bias the outcome of the testing.

The alignment of the two roads has been informed through discussions with Warwickshire County Council (WCC). The Eastern Relief Road (ERR) runs East and North from Trinity Way to the A439 Warwick Road with junctions at Loxley Road and Tiddington Road. The Western Relief Road (WRR) runs between Evesham Road and Alcester Road.

The indicative alignment assumed for both roads is illustrated within the following figure:

Figure 7 - ERR & WRR Indicative Alignments



The scenario containing the „Town Centre" improvements has been derived by attempting to alleviate concerns around those areas identified as being severely impacted upon by future growth within the model. The basis for the mitigation is as a result of the recommendations of the earlier strategic transport assessment report. At this stage a number of indicative mitigation measures have been derived and tested to provide an overview of the potential benefits that a co-ordinated town centre mitigation strategy could unlock.

It is anticipated that detailed analysis would be required to ascertain the likely benefits and feasibility of each individual element of the indicative mitigation package. A summary of the key elements included within this indicative scenario is presented as follows:

- Signalisation/reconfiguration of the Evesham Road/Evesham Place roundabout
- Signalisation of the Gyratory
- Signalisation/reconfiguration of the Banbury Road/Shipston Road roundabout
- Signalisation/reconfiguration of the Tiddington Road/Swan's Nest Lane/Banbury Road junction
- High Street and Grove Road to become NB only
- Rother Street to become SB only
- Reconfiguration of the Birmingham Road/Windsor Street junction

A summary of the rationale behind the inclusion of each of the aforementioned schemes is provided within **Appendix F**.

9 Stage 4 - Results Analysis

9.1 Network Statistics

In line with previous analysis, high level results have been used to assess the overall level of network performance. However, the level of detail required within the comparisons is higher than the previous stage of analysis as it is intended to begin to identify potential mitigation measures that may be implemented alongside any growth strategy within the town of Stratford-upon-Avon.

Each scenario has been run and results collected 5 times per model period. A low number of runs have been selected due to the high level nature of the analysis. A significantly higher number of runs will be required when detailed analysis is to be undertaken.

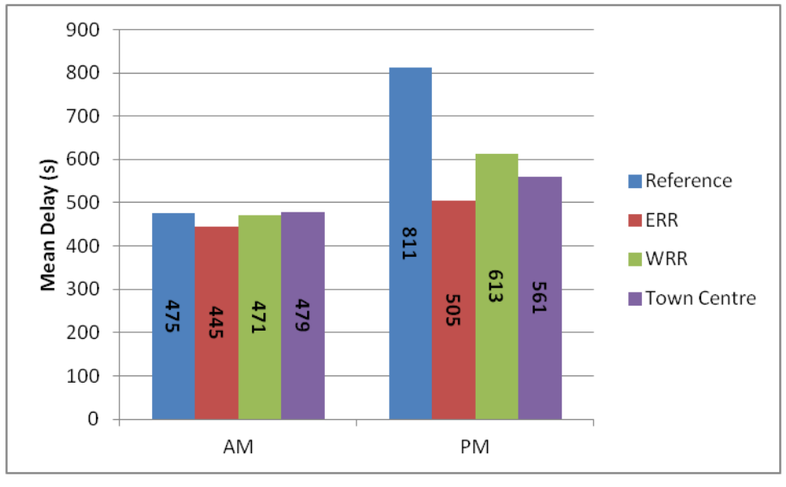
The first stage of the assessment has been to review a number of network performance indicators so that the effect of each of the schemes, on the overall level of network performance, can be quantified. The indicators used are as follows:

- **Mean delay** - calculated as the average journey time, in seconds, experienced by all vehicle types when travelling through the model network.
- **Total number of vehicles** - total number of vehicles that enter the model network within the simulation period.
- **Mean speed** - calculated as the cumulative average speed for all vehicles within the network, irrespective of the route the vehicles take through the model.

9.2 Mean Delay

The impact of the inclusion of the schemes on network mean delay is illustrated within the following Figure:

Figure 8 - Peak Hour Network Mean Delay (s)



Analysis of the impact of each of the schemes, on the overall level of delay, reveals that the ERR option performs significantly better than any other option during both AM and PM peak hours. The WRR and the TCI options demonstrate an overall reduction in mean delay within

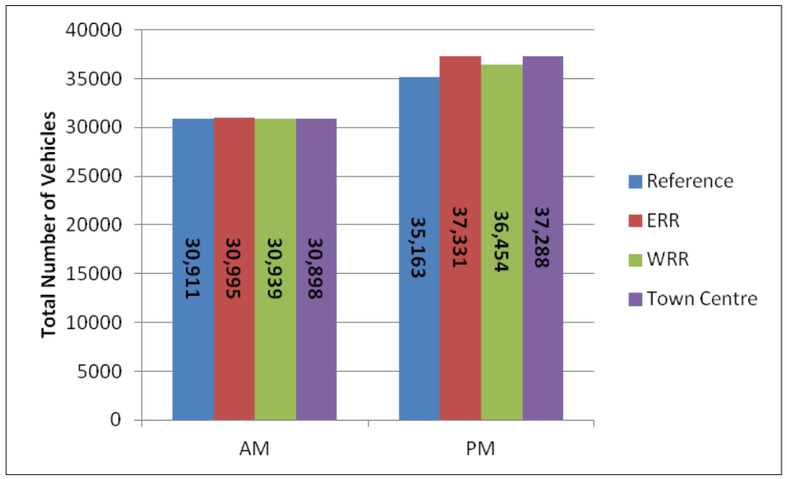
the PM but little change in the AM. This is not surprising given that the PM period contains significantly higher levels of congestion than the AM. It is interesting to note that the TCI results in a larger overall reduction in mean delay than the implementation of the WRR in the PM.

The ERR has the potential to provide additional capacity adjacent to areas of road network likely to come under the highest levels of stress (Banbury Road/Shipston Road, Evesham Place/Evesham Road). Because of this, it appears that the ERR provides the greatest level of reduction in delay when compared to the alternative scenarios. Furthermore, the potential for the ERR option to produce lower levels of delay by simply providing a quicker route for a larger proportion of trips should also be considered.

9.3 Total Number of Vehicles

The impact of the inclusion of the schemes on the total number of vehicles contained within each scenario is illustrated within the following Figure:

Figure 9 – Total Number of Vehicles



Analysis of the impact of each of the schemes, on the total number of vehicles, reveals that there is very little difference between any of the scenarios during the AM. This demonstrates that, despite the network being very congested during 2028, trips are able to enter onto the network irrespective of the scenario.

In the PM however, it can be seen that implementation of each of the scenarios results in more trips being released onto the model network. The lower number within the reference case can be assumed to indicate a higher number of unreleased vehicles. When observing the model running it is apparent that a large majority of the unreleased vehicles appear to originate from within the town centre. Whilst all three scenarios alleviate these issues both the ERR and the town centre improvements appear to achieve almost 1000 more trips within the simulation runs when compared to the WRR.

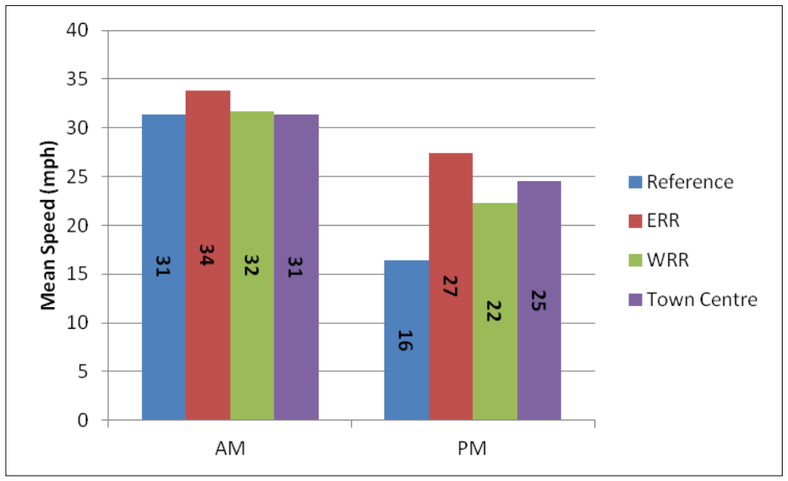
This could indicate that both are likely to provide relief to the town centre, whilst the TCI relieves congestion on the immediate network and allows more trips to travel through the area. The ERR provides an alternative route for vehicles which would otherwise travel through the town centre, thus space is created for the additional demand to be released onto the town centre network. Whilst a similar effect is seen from the implementation of the WRR it is not as significant. This may be because a number of viable alternative routes are available to vehicles approaching from the West to avoid the town centre. The WRR simply provides an additional town centre diversion, whereas the ERR provides the only route for vehicles travelling from East to North, which avoids either the Banbury Road/Shipston Road roundabout or the Evesham Road/Evesham Place roundabout.

Notably, all schemes facilitate a higher level of trips on the PM network with lower levels of average delay.

9.4 Mean Speed

The average speed of all vehicles travelling through the network has been collected and analysed across the scenarios. It can be assumed that a higher mean speed is indicative of traffic flowing faster through the network. The Network Mean Speed across each of the scenarios is presented within the following Figure:

Figure 10 - Network Mean Speed (mph)



Analysis of the previous figure reveals that during the AM peak hour, implementation of the ERR results in the largest increase in mean speed whilst there appears to be little difference between the other scenarios. This is in line with earlier analysis of the delay and vehicle statistics.

Within the PM peak, implementing each of the scenarios results in an increase in average speeds. Again, the ERR, results in the greatest improvement in conditions. Similarly, the TCI scheme results in a larger increases in speed than the WRR. This could be indicative of the town centre improvements affecting the speeds of more vehicles as it focuses on alleviating congestion within the town centre. Similarly the ERR reduces the propensity for congestion within the town centre. The WRR still results in significant improvements in the average speeds of vehicles within the model network.

9.5 Network Mean Speed

As with the initial Strategic Transport Assessment work, network mean speed plots have been produced for each scenario for the AM and PM peak hours. The performance of each of the

scenarios has then been compared to the network performance of the 2028 High growth reference network.

The plots for each of the 3 scenarios, AM and PM peak hour, have been provided within **Appendix E** of this report.

9.5.1 Eastern Relief Road AM Network Performance

The AM peak hour ERR network conditions have been presented within Figure 49 of Appendix E.

Analysis of the AM peak hour ERR network conditions reveals that a significant improvement in network conditions is achieved across the whole of the South-East quadrant of Stratford-upon-Avon. The previously low mean speeds along the Banbury Road NB, Tiddington Road SB, Shipston Road NB and Seven Meadows Road NB have all increased significantly.

Speeds on the inner town centre network and, in particular, the gyratory, have all increased and, in general, there appears to be significantly fewer instances of speeds dropping below 10 mph.

The only notable issue in the AM ERR scenario network performance is a reduction in speeds on the approaches to some of the new ERR junctions. These junctions are only indicative layouts within the model and it is likely that these issues could be overcome with more detailed design work.

9.5.2 Eastern Relief Road PM Network Performance

The PM peak hour ERR network conditions have been presented within Figure 50 of Appendix E.

Analysis of the PM peak hour ERR network conditions again reveals a significant improvement in network conditions across the whole of the South-East quadrant of Stratford-upon-Avon. The previously low mean speeds along the Banbury Road NB, Tiddington Road SB, Shipston Road NB and Seven Meadows Road NB have all increased significantly. Only a small section of Banbury Road NB has speeds of less than 5 mph whilst the remaining sections of network rarely present speeds of less than 20 mph.

Speeds on the inner town centre network and, in particular, the gyratory, have all increased and, in general, there appears to be significantly fewer instances of speed dropping below 5 mph.

The inner town centre network performance is still a concern as speeds on a number of sections still fail to exceed 10 mph and Rother Street is still particularly problematic with speeds rarely increasing. There is a notable reduction in the average speeds along the Trinity Way WB approach to the roundabout with Shipston Road. It is also interesting to note that a reduction in average hourly speeds on the Alcester Road WB approach to Wildmoor is present within the ERR scenario. Further analysis would be required to ascertain the rationale behind this although analysis of the change in flows around the area appear to indicate that an additional 200 vehicles are travelling westbound along the A46. This increase in flow results in an increase in traffic opposing the Alcester Rd WB entry arm and a subsequent increase queuing on this approach is also experienced. Such impacts are indicative of the wider implications of introducing such a infrastructure scheme that is likely to change route choice across the wider area. More detailed analysis of such effects will be required at a later stage should a decision be made to proceed with such a scheme.

9.5.3 Western Relief Road AM Network Performance

The AM peak hour WRR network conditions have been presented within Figure 51 of Appendix E.

Analysis of the AM peak hour WRR network conditions reveals that there are very few differences in the performance of the WRR network when compared to the 2028 high growth Reference case during the AM peak.

9.5.4 Western Relief Road PM Network Performance

The PM peak hour WRR network conditions have been presented within Figure 52 of Appendix E.

Analysis of the PM peak hour WRR network conditions again reveals that an improvement of the conditions within the town centre is likely. In particular, the number of instances where the speed drops below 5 mph is reduced considerably. In general, there also appears to be an improvement in the average speeds along Alcester Road EB, Birmingham Road SB and Warwick Road SB. Speeds on Banbury Road appear to reduce when compared to the Reference Case.

9.5.5 Town Centre Improvements AM Network Performance

The AM peak hour TCI network conditions have been presented within Figure 53 of Appendix E.

Analysis of the AM peak hour TCI network conditions reveals that an increase in the average speeds on the approach links to the Evesham Road/Evesham Place roundabout as well along Seven Meadows Road NB is achieved as a result of the improvements.

The average speed along the Banbury Road NB appears to have increased but this is accompanied by a reduction in speed along Tiddington Road and there is little change in the conditions along Shipston Road. The average speed along Clopton Bridge westbound has increased substantially which indicates that there is now additional capacity along this link that may not be fully realised by the adjacent signal arrangement. It is recommended that further investigation of the indicative signal arrangement between Tiddington Road, Shipston Road and Banbury Road should be undertaken to see if such a scheme is deliverable and whether additional improvements are achievable.

9.5.6 Town Centre Improvements PM Network Performance

The PM peak hour TCI network conditions have been presented within Figure 54 of Appendix E.

Analysis of the PM peak hour TCI network conditions again reveals that an improvement of the conditions within the town centre is likely. In particular, the number of instances where the speed drops below 5 mph is reduced considerably. Overall the TCI option appears to demonstrate the greatest level of improvement of PM peak town centre road network conditions of any of the three scenarios. There also appears to be an increase in the average speeds along Banbury Road NB, Warwick Road SB and Birmingham Road SB but this is

coupled with a reduction in the average Speeds along Alcester Road EB, Evesham Road and Shottery Road EB as well as Seven Meadows Road NB. This is because the schemes appear to throttle traffic at points just outside of the town centre which allows greater movement within the town centre itself.

A more detailed investigation should be undertaken to ascertain the true level of potential benefit that could be realised by the implementation of the town centre improvements tested within the initial modelling exercise.

10 Stage 4 - Summary and Conclusion

10.1 Summary

Using the Stratford-upon-Avon 2028 high growth scenario as the Reference Case, the following mitigation scenarios have been derived:

- 2028 Reference plus outline Eastern Relief Road (ERR)
- 2028 Reference plus outline Western Relief Road (WRR)
- 2028 Reference plus Town Centre Improvements (TCI)

Testing has revealed that all three scenarios have the potential to improve congestion within the Stratford-upon-Avon road network. The greatest benefits are revealed when assessing the performance of the mitigation measures during the PM peak hour as this is the hour when the network is under the greatest level of stress.

All three scenarios demonstrate provision of relief within the PM peak hour as each is able to accommodate greater levels of demand than the Reference Case with lower average journey times. Interestingly the ERR and TCI schemes appear to result in greater levels of demand being assigned within the model network than the WRR. This indicates that, although all three provide relief, the ERR and TCI are more likely to exert a greater influence on the town centre conditions than the WRR.

The ERR provides additional capacity for vehicles to reassign away from the town centre whilst the TCI scheme enables a greater volume of trips to pass through the town centre within the model network.

10.2 Stage 4 Conclusion

Whilst no single scheme demonstrates a solution to the problems likely to occur within Stratford-upon-Avon when future growth is applied, all schemes demonstrate that they have the potential to unlock additional benefits and extend the operational life of the existing road network.

Since all of the tests undertaken thus far demonstrate that the highest levels of stress on the network are to the South East and South of Stratford it is reasonable to conclude that implementation of the ERR is likely to unlock the greatest level of benefits.

The optimum solution is most likely to be the implementation of all three schemes in one form or another. Whilst this is unlikely to be achievable it is highly recommended that at least some elements of the TCI scenario are investigated further due to the potential that these schemes have to compliment either the ERR or WRR options should they be brought forward.

11 Stage 5 – Scenario 5 Testing

11.1 Introduction

The purpose of this Stage is to present the initial findings from the testing of a potential combined growth allocation and mitigation option within the Stratford-upon-Avon S-PARAMICS model.

11.2 Scenario 5

Results from a single scenario test are provided within this note, namely:

- Scenario F (8,000 dwellings across Stratford-on-Avon District) plus a 2,500 dwelling urban extension to the South East of Stratford-upon-Avon alongside an indicative Eastern Relief Road option, known as **Scenario 5**

The indicative Eastern Relief Road (ERR) is assumed to run along the eastern edge of Stratford-upon-Avon connecting Trinity Way, Tiddington Road and Warwick Road, and would require a new bridge across the River Avon.

The scenario has initially been tested within CITEware and then a S-PARAMICS Origin Destination (O-D) matrix is output from the CITEware model for assignment within the S-PARAMICS model. This process is covered in more detail within the Threshold Testing Report.

11.3 Stage 5 - Results Analysis

The mean speed plots resulting from the application of the CITEware Scenario 5 O-D matrices within the S-PARAMICS network are presented within Figure 51 and Figure 52 in **Appendix G** of this report.

11.4 Growth

The total growth predicted by the CITEware assessment, less internalisation, has been compared to the growth predicted through the analysis of the TEMPRO/NTEM factors within the following Table:

Table 16- CITEware/TEMPRO Forecast Comparisons – Scenario 5

Period	TEMPRO	CITEware	Difference
AM (07:00 to 09:00)	3831	5165	-1334
PM (16:00 to 18:00)	4998	5455	-457

The overall levels of growth predicted through the TEMPRO analysis, for both AM and PM periods is 17.31% and 16.91% respectively. Analysis of the previous table reveals that the CITEware „Scenario 5" testing predicts higher levels of growth than TEMPRO.

Because the level of growth predicted through TEMPRO is lower than CITEware it was necessary to reduce the overall level of traffic within the model, in order that a consistent level of growth can be maintained. This reduction was applied by adjusting the background

matrices by the difference in overall growth between TEMPRO predicted growth levels and the CITEware demand. Growth levels within matrix level four equates to 0 trips.

A comparison of the demands contained within the 2028 High Growth Scenario and the 2028 CITEware Scenario 5 is provided, by matrix level, for the AM and PM periods within the following tables:

Table 17 - 2028 AM Forecast Growth Comparisons – Scenario 5

Demand	(07:00 to 08:00)		(08:00 to 09:00)	
	TEMPRO	CITEware	TEMPRO	CITEware
Background	9534	8894	14730	14036
HGV	793	793	816	816
Com Dev	451	451	969	969
Growth (TEMPRO)	1840	0	1991	0
Growth (CITEware)	0	2481	0	2685
Total	**12618**	**12618**	**18505**	**18505**

Table 18 - 2028 PM Forecast Growth Comparisons – Scenario 5

Demand	(16:00 to 17:00)		(17:00 to 18:00)	
	TEMPRO	CITEware	TEMPRO	CITEware
Background	13993	13764	15404	15174
HGV	820	820	524	524
Com Dev	1139	1139	1177	1177
Growth (TEMPRO)	2493	0	2505	0
Growth (CITEware)	0	2721	0	2735
Total	**18443**	**18443**	**19610**	**19610**

11.5 2028 Scenario 5 AM Network Performance

The mean speed plots resulting from the application of the Scenario 5 matrices within the S-PARAMICS network are presented within Appendix G of this report, AM and PM peak hour plots have been presented within Figure 55 and Figure 56 respectively.

Analysis of the network performance when growth is allocated as per SDC Scenario 5 reveals a number of differences between the network conditions under the Scenario 5 growth allocation (Figure 55) compared to the previously tested and the general high growth option (Figure 23).

The most obvious impacts are the improvement in mean speed along the Banbury Road NB into Stratford as well as significant improvements along Shipston Road NB, the Gyratory and the Warwick Road SB. Average speeds in a number of areas within the town centre also appear to increase marginally. There appear to be few occasions where the implementation of Scenario 9 results in a reduction of average speeds when compared to the high growth scenario, There is one noticeable exception on the Shipston Road northbound approach to its junction with Clifford Lane. This is despite a considerably higher and more easterly focussed growth strategy. This further demonstrates the potential benefits that could be achievable through the implementation of the ERR.

11.6 2028 Scenario 5 PM Network Performance

Analysis of PM network conditions when Scenario 5 growth is allocated reveals that there are a number of significant benefits to implementing the combined growth and ERR mitigation strategy outlined within Scenario 5. Earlier strategic option testing has revealed a high propensity for network failure within the south east quadrant of the network whilst the 2028 High growth scenario also suffered from low speeds along Banbury Road NB as well as within the town centre, the gyratory and Warwick Road SB.

A number of these issues are completely removed by the allocation of Scenario 5. Conditions within the town centre have improved although the Rother Street/Evesham Place/Windsor Street areas still appear to experience very low average speeds indicating further mitigation is likely to be required within this area as well as problems at Shipston Road northbound approach to its junction with Clifford Lane and Trinity Way eastbound approach to Seven Meadows Road/Shipston Road roundabout.

11.7 Network Statistics

In addition to the analysis of the impact on Mean Speed, analysis has been undertaken to ascertain the impact on the overall network statistics when the Eastern Urban Extension is implemented alongside the ERR. The impact on the following measures have been assessed:

- **Mean delay** - calculated as the average journey time, in seconds, experienced by all vehicle types when travelling through the model network.
- **Total number of vehicles** - total number of vehicles that enter the model network within the simulation period.
- **Mean speed** - calculated as the cumulative average speed for all vehicles within the network, irrespective of the route the vehicles take through the model.

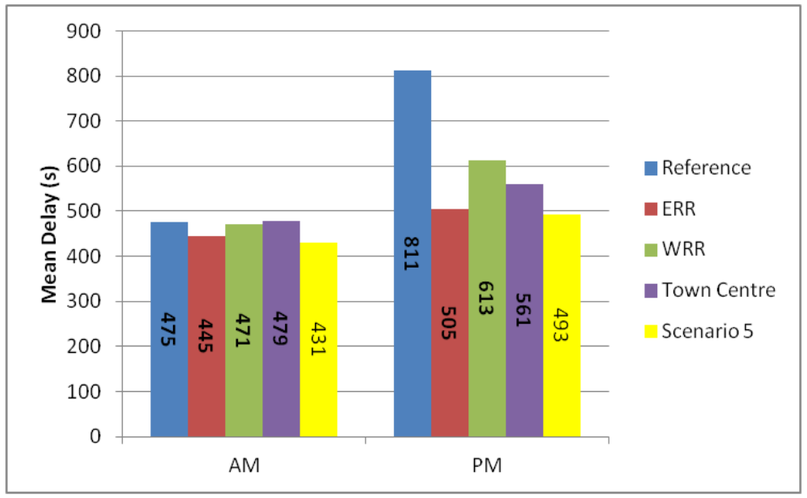
Comparisons have been made between Scenario 5 and the original Reference Case and mitigation models, namely:

- 2028 TEMPRO High Growth Reference Case
- 2028 Reference plus outline Eastern Relief Road (ERR)
- 2028 Reference plus outline Western Relief Road (WRR)
- 2028 Reference plus Town Centre Improvements (TCI)

11.7.1 Mean Delay

The impact of the inclusion of the schemes on network mean delay is illustrated within the following Figure:

Figure 11 - Peak Hour Network Mean Delay (s)



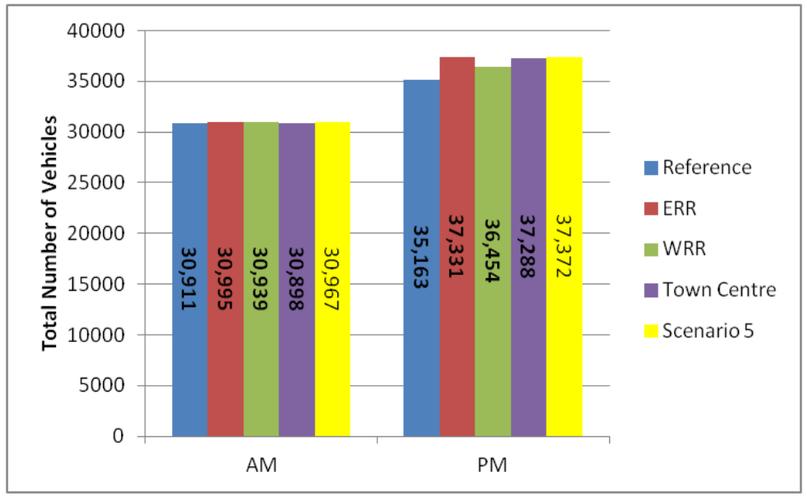
Analysis of the previous figure reveals there is further potential in Scenario 5 to reduce the level of delay on the network within both AM and PM model periods. It is interesting to note that whilst this reduction in comparable to the original ERR option within the PM period there is a slightly larger saving achieved within the AM period when considering the outputs from the original ERR Scenario test.

11.8 Total Number of Vehicles

The impact of the inclusion of the schemes on the total number of vehicles contained within each scenario is illustrated within the following Figure12

Analysis of Figure 12 demonstrates that there is little difference in the number of vehicles released during the AM period, indicating that the majority of trips must be released onto the network, whilst during the PM period Scenario 5 performs comparably to the earlier ERR and Town Centre Improvement (TCI) options.

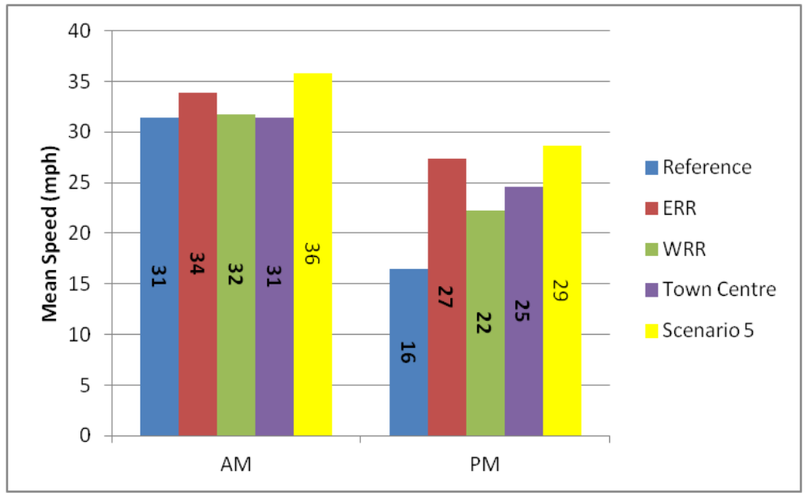
Figure 12 – Total Number of Vehicles



11.9 Mean Speed

The average speed of all vehicles travelling through the network has been collected and analysed across the scenarios. It can be assumed that a higher mean speed is indicative of traffic flowing faster through the network. The Network Mean Speed across each of the scenarios is presented within the following Figure:

Figure 13 - Network Mean Speed (mph)



Whilst previous analysis had already revealed that the ERR was the option most likely to unlock higher network mean speeds it is apparent from the previous figure that further improvements are achievable when coupling the ERR with a more focussed growth strategy in the form of the Eastern Urban Extension.

11.10 Scenario 5 Conclusion

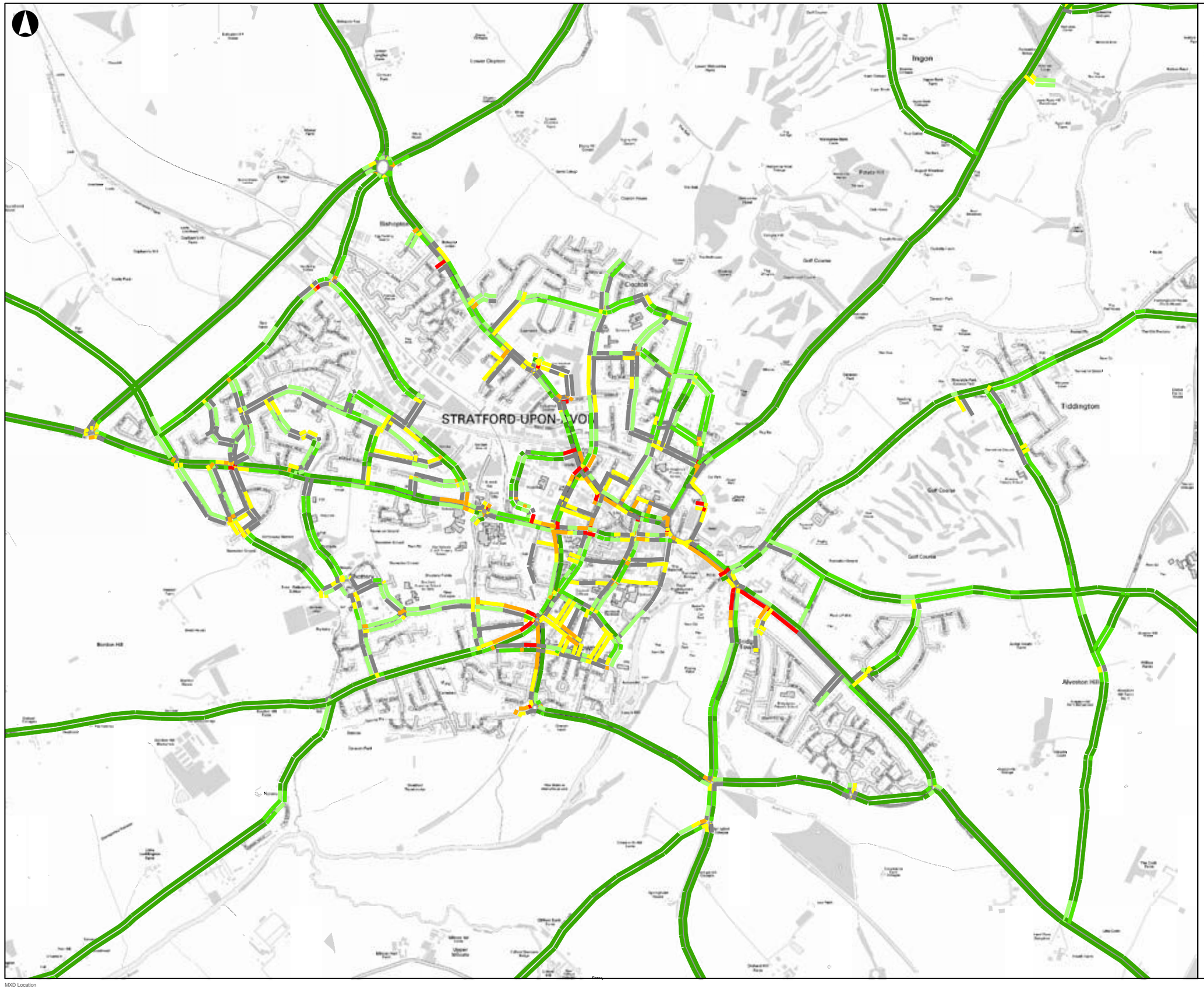
Analysis of the results obtained through the allocation of Scenario 5 growth alongside the implementation of an Eastern Relief Road (ERR) indicates that within the AM an increase in mean speeds is experienced across significant sections of the network when compared to the original 2028 high growth network conditions. Furthermore, the propensity for the network to lock up in the south east is removed entirely by the implementation of the ERR despite the fact that an additional 2500 dwellings are allocated within that area.

Aside from the impacts within the Windsor Street/Rother Street/Evesham Place area, alongside the Shipston Road/Clifford Lane junction the growth and mitigation strategy presented within Scenario 5 appears to largely maintain, and in some instances improve, overall network operation levels.

Analysis of the Network statistics also reveals that focussing a significant proportion of growth within the Eastern Urban extension will have the potential to draw traffic growth away from the Town Centre which means that despite the relatively stable number of total vehicles released onto the network, Scenario 5 Growth plus the ERR results in lower levels of mean delay and higher average speeds during both the AM and PM periods. These benefits are dependent upon a capped level of growth within the area being realised and should be investigated further before any firm conclusions are drawn but they do present an additional, interesting, benefit that may be unlocked through the allocation of a large proportion of growth within a specific area, especially when supported by new infrastructure, such as the ERR, in close proximity.

Appendix A

Threshold Analysis - Mean Speed Plots



Legend

Speeds Between

- 0 - 5 mph
- 5 - 10 mph
- 10 - 15 mph
- 15 - 20 mph
- 20 - 25 mph
- 25 - 30 mph
- above 30 mph

Issue	Date	By	Chkd	Appd
P1	13-06-12	MG	JE	JE

Metres

0 255 510 1,020

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Client

Warwickshire County Council

Job Title

Strategic Transport Assessment

S1-001 2011 AM
Mean Speed Plot

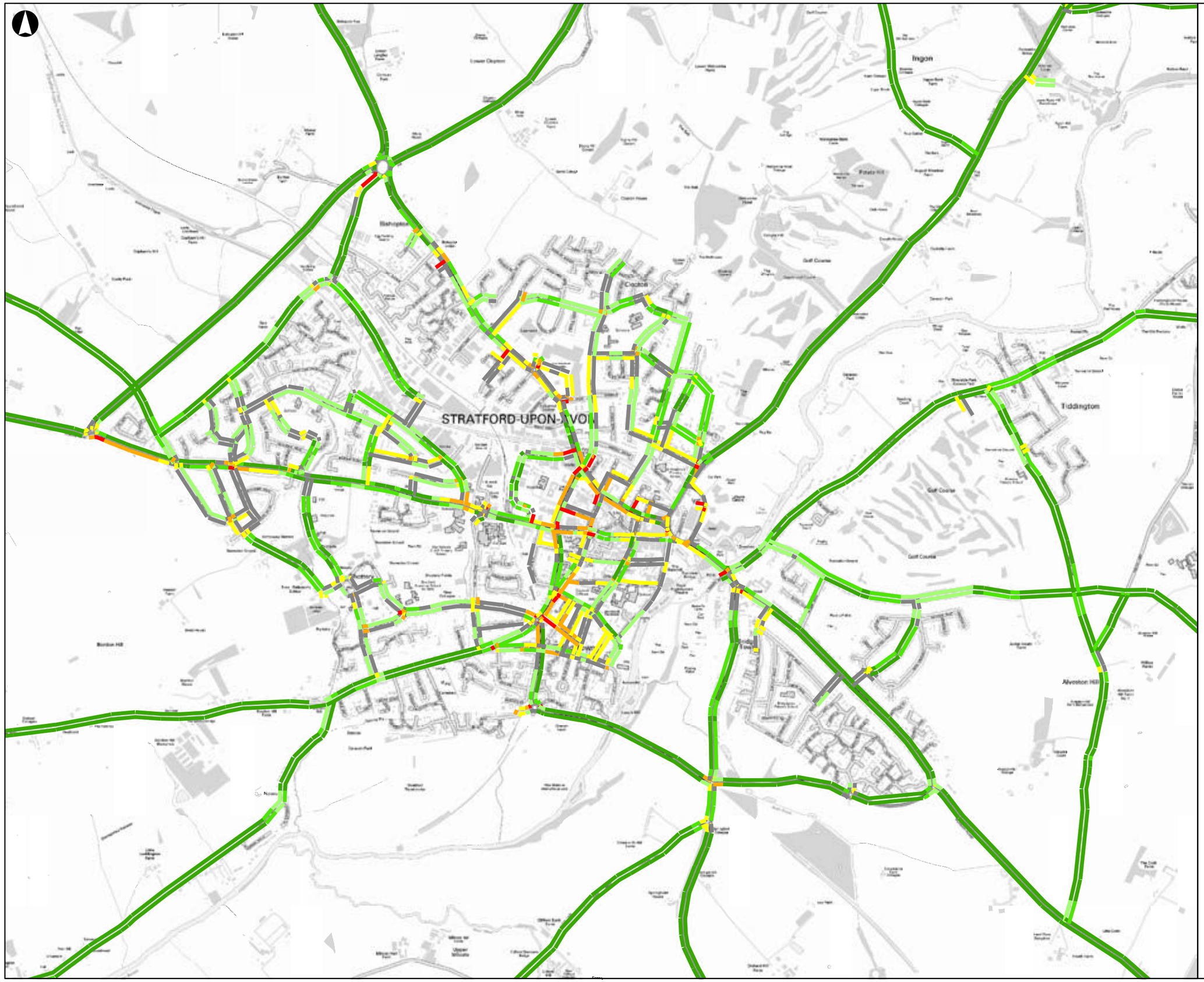
Scale at A3

NTS

Job No	Drawing Status
211439-19	**Information**

Drawing No	Issue
Figure 1	**P1**

MXD Location



Legend

Speeds Between

- 0 - 5 mph
- 5 - 10 mph
- 10 - 15 mph
- 15 - 20 mph
- 20 - 25 mph
- 25 - 30 mph
- above 30 mph

Issue	Date	By	Chkd	Appd
P1	13-06-12	MG	JE	JE

Metres

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Job Title

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Mean Speed Plot

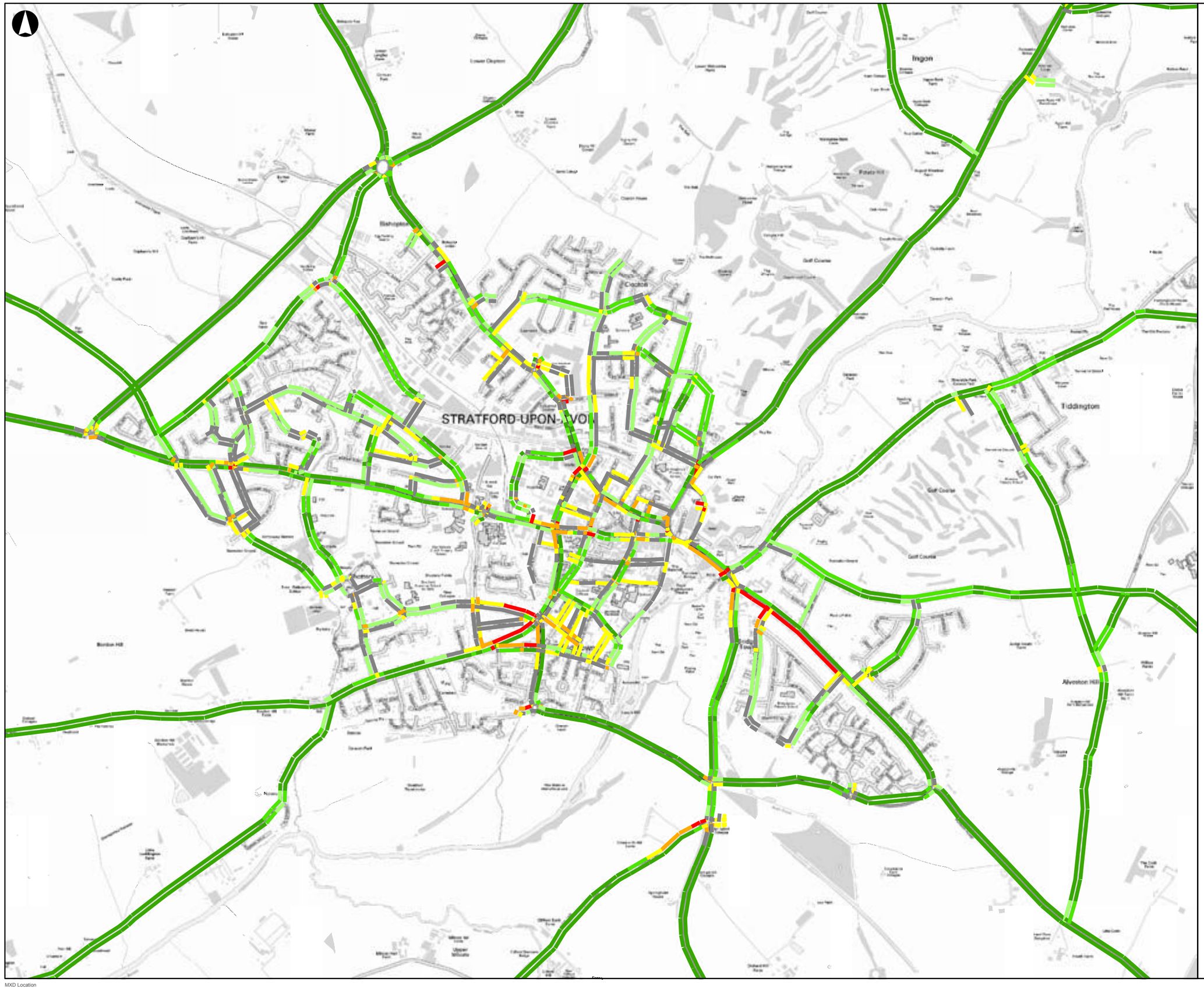
Scale at A3

NTS

Job No	Drawing Status
211439-19	**Information**

Drawing No	Issue
Figure 2	**P1**

MXD Location



Legend

Speeds Between

- 0 - 5 mph
- 5 - 10 mph
- 10 - 15 mph
- 15 - 20 mph
- 20 - 25 mph
- 25 - 30 mph
- above 30 mph

Issue	Date	By	Chkd	Appd
P1	13-06-12	MG	JE	JE

Metres

0 255 510 1,020

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Job Title

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S1-002 2015 AM
Mean Speed Plot

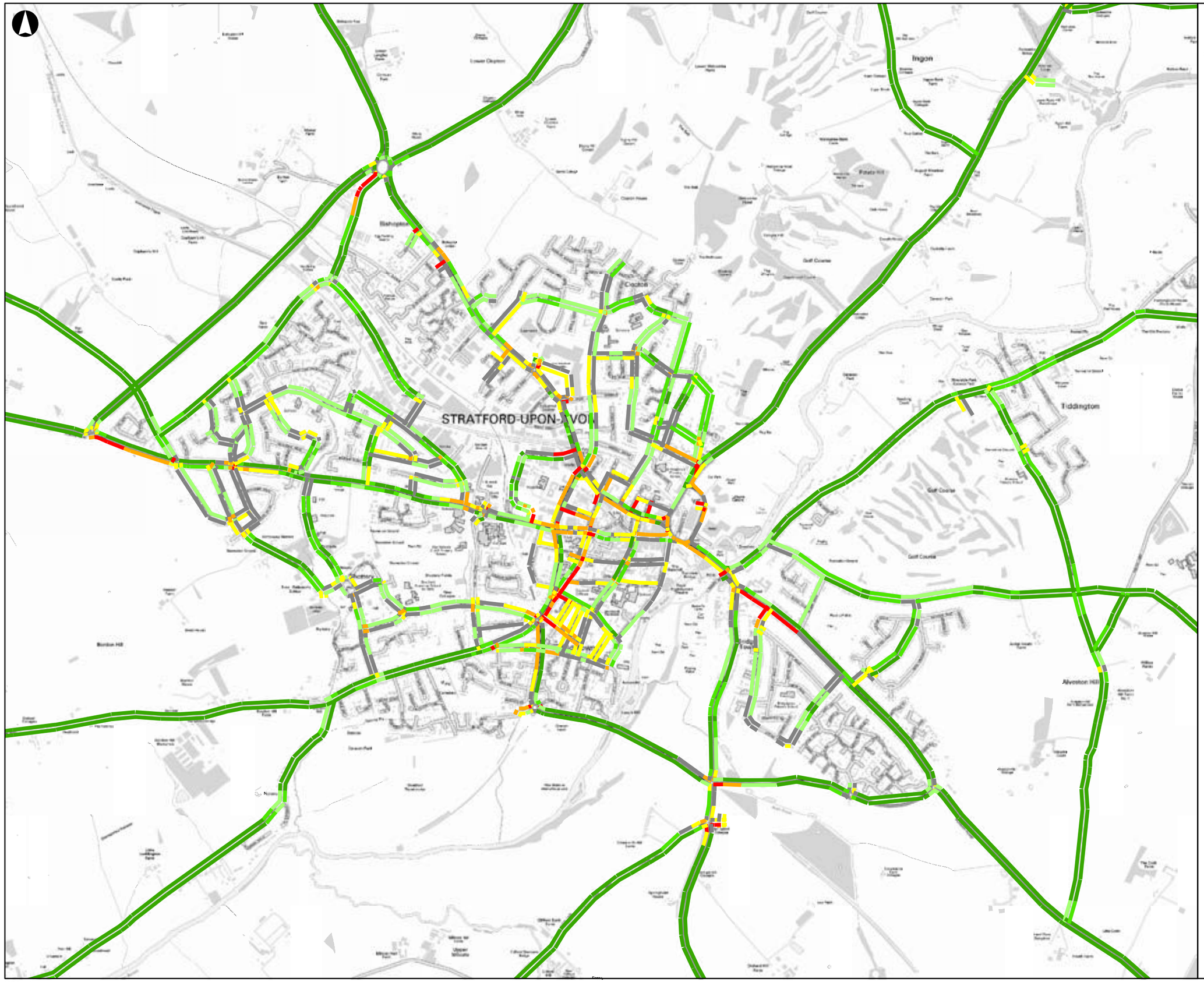
Scale at A3

NTS

Job No	Drawing Status
211439-19	**Information**

Drawing No	Issue
Figure 3	**P1**

MXD Location



Legend

Speeds Between

- 0 - 5 mph
- 5 - 10 mph
- 10 - 15 mph
- 15 - 20 mph
- 20 - 25 mph
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- above 30 mph

Issue	Date	By	Chkd	Appd
P1	13-06-12	MG	JE	JE

Metres

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Job Title

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S1-002 2015 PM
Mean Speed Plot

Scale at A3

NTS

Job No	Drawing Status
211439-19	**Information**

Drawing No	Issue
Figure 4	**P1**

MXD Location

Legend

Speeds Between

- 0 - 5 mph
- 5 - 10 mph
- 10 - 15 mph
- 15 - 20 mph
- 20 - 25 mph
- 25 - 30 mph
- above 30 mph

Issue	Date	By	Chkd	Appd
P1	13-06-12	MG	JE	JE

Metres

0 255 510 1,020

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Job Title

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S1-003 2017 AM
Mean Speed Plot

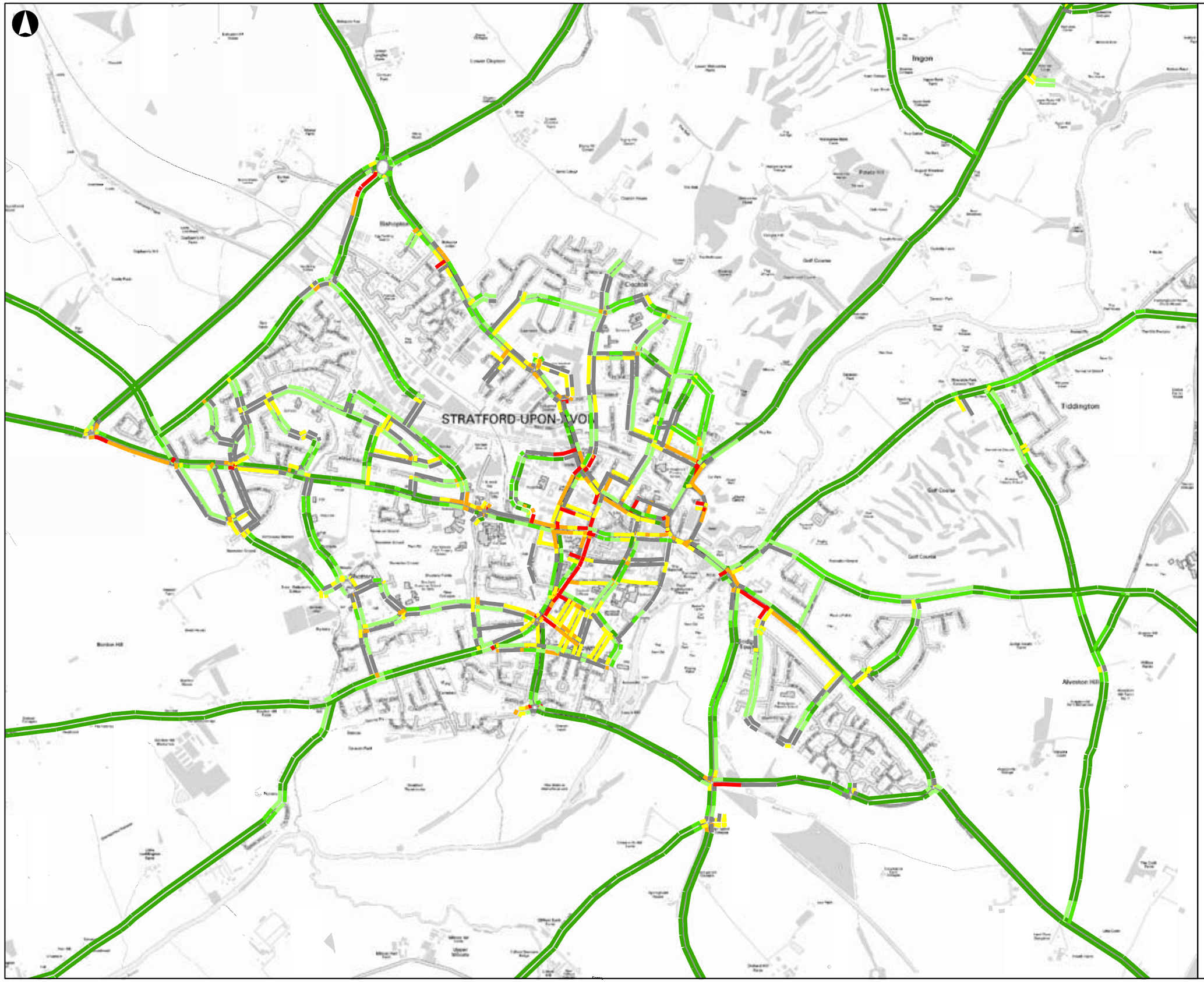
Scale at A3

NTS

Job No	Drawing Status
211439-19	**Information**

Drawing No	Issue
Figure 5	**P1**

MXD Location



Legend

Speeds Between

- 0 - 5 mph
- 5 - 10 mph
- 10 - 15 mph
- 15 - 20 mph
- 20 - 25 mph
- 25 - 30 mph
- above 30 mph

Issue	Date	By	Chkd	Appd
P1	13-06-12	MG	JE	JE

Metres

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Mean Speed Plot

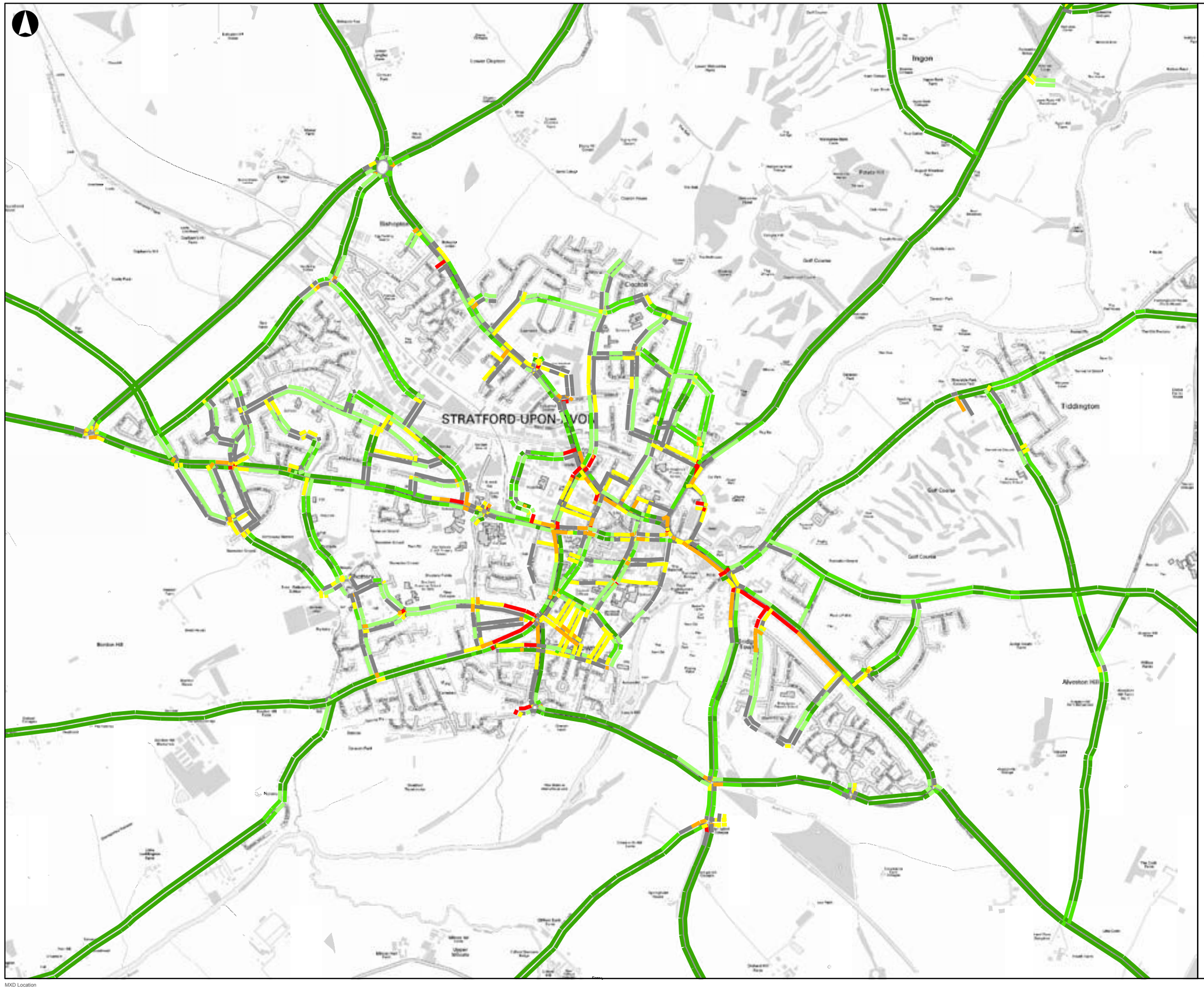
Scale at A3

NTS

Job No	Drawing Status
211439-19	**Information**

Drawing No	Issue
Figure 6	**P1**

MXD Location



Legend

Speeds Between

- 0 - 5 mph
- 5 - 10 mph
- 10 - 15 mph
- 15 - 20 mph
- 20 - 25 mph
- 25 - 30 mph
- above 30 mph

Issue	Date	By	Chkd	Appd
P1	13-06-12	MG	JE	JE

Metres

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Mean Speed Plot

Scale at A3

NTS

Job No	Drawing Status
211439-19	**Information**

Drawing No	Issue
Figure 7	**P1**

MXD Location

Legend

Speeds Between

- 0 - 5 mph
- 5 - 10 mph
- 10 - 15 mph
- 15 - 20 mph
- 20 - 25 mph
- 25 - 30 mph
- above 30 mph

Issue	Date	By	Chkd	Appd
P1	13-06-12	MG	JE	JE

Metres

0 255 510 1,020

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Mean Speed Plot

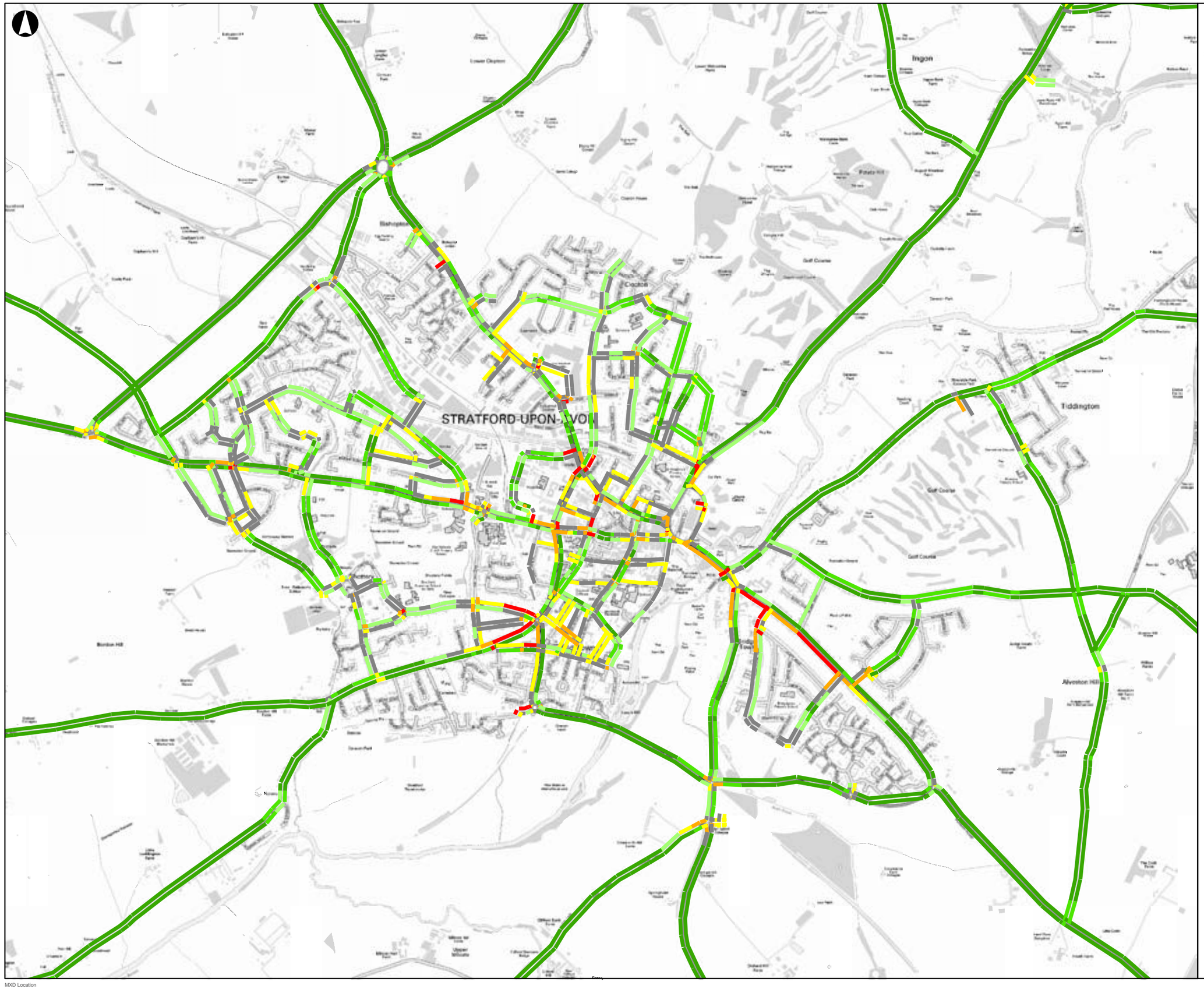
Scale at A3

NTS

Job No	Drawing Status
211439-19	**Information**

Drawing No	Issue
Figure 8	**P1**

MXD Location



Legend

Speeds Between

- 0 - 5 mph
- 5 - 10 mph
- 10 - 15 mph
- 15 - 20 mph
- 20 - 25 mph
- 25 - 30 mph
- above 30 mph

Issue	Date	By	Chkd	Appd
P1	13-06-12	MG	JE	JE

Metres

0 255 510 1,020

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Job Title

Strategic Transport Assessment

S1-005 A 2021 AM
Medium Growth
Mean Speed Plot

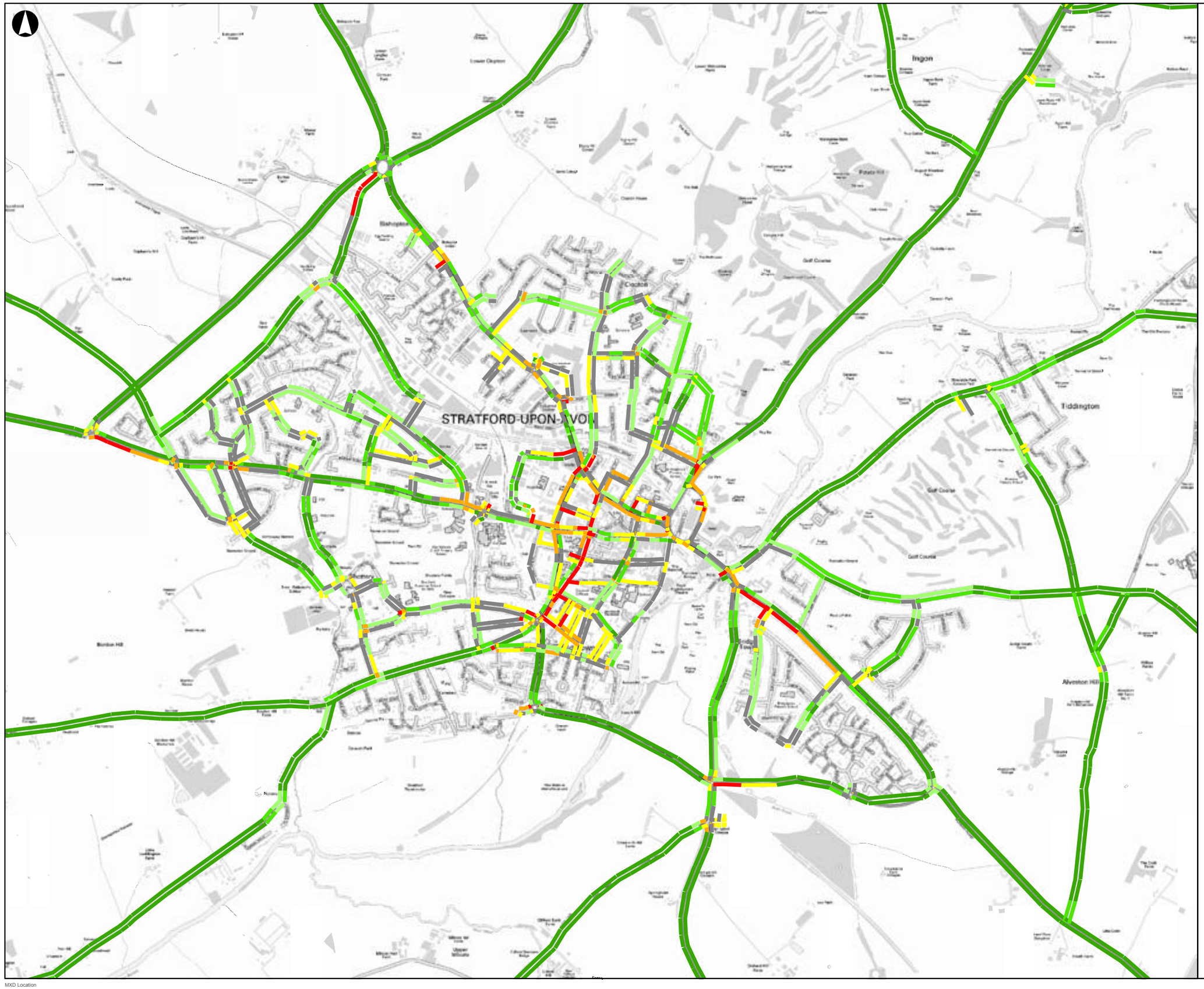
Scale at A3

NTS

Job No	Drawing Status
211439-19	**Information**

Drawing No	Issue
Figure 9	**P1**

MXD Location



Issue	Date	By	Chkd	Appd
P1	13-06-12	MG	JE	JE

Metres
0 255 510 1,020

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Job Title
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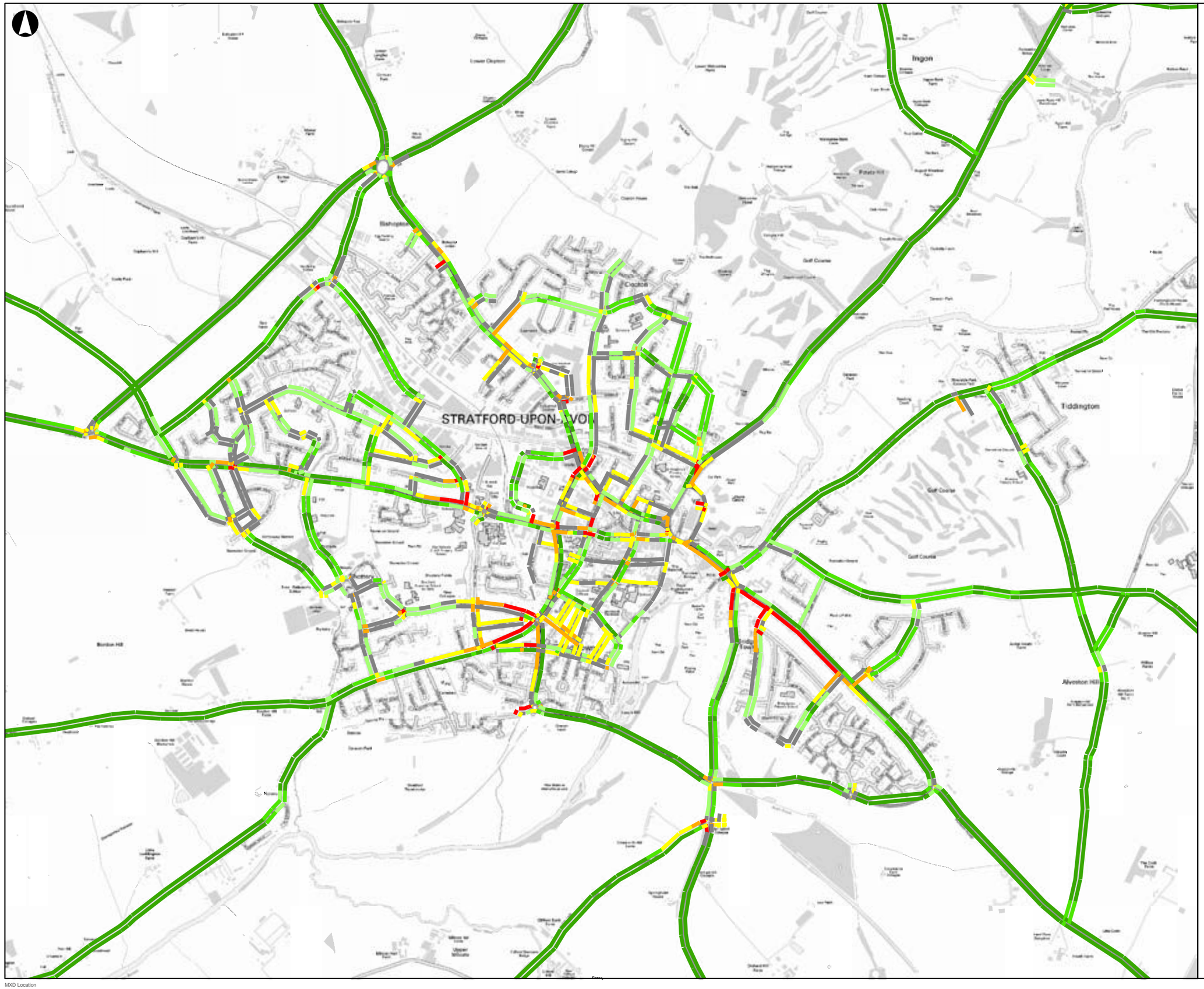
S1-005 A 2021 PM
Medium Growth
Mean Speed Plot

Scale at A3
NTS

Job No	Drawing Status
211439-19	**Information**

Drawing No	Issue
Figure 10	**P1**

MXD Location



Legend

Speeds Between

- 0 - 5 mph
- 5 - 10 mph
- 10 - 15 mph
- 15 - 20 mph
- 20 - 25 mph
- 25 - 30 mph
- above 30 mph

Issue	Date	By	Chkd	Appd
P1	13-06-12	MG	JE	JE

Metres

0 255 510 1,020

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Job Title

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S1-005 B 2021 AM
High Growth
Mean Speed Plot

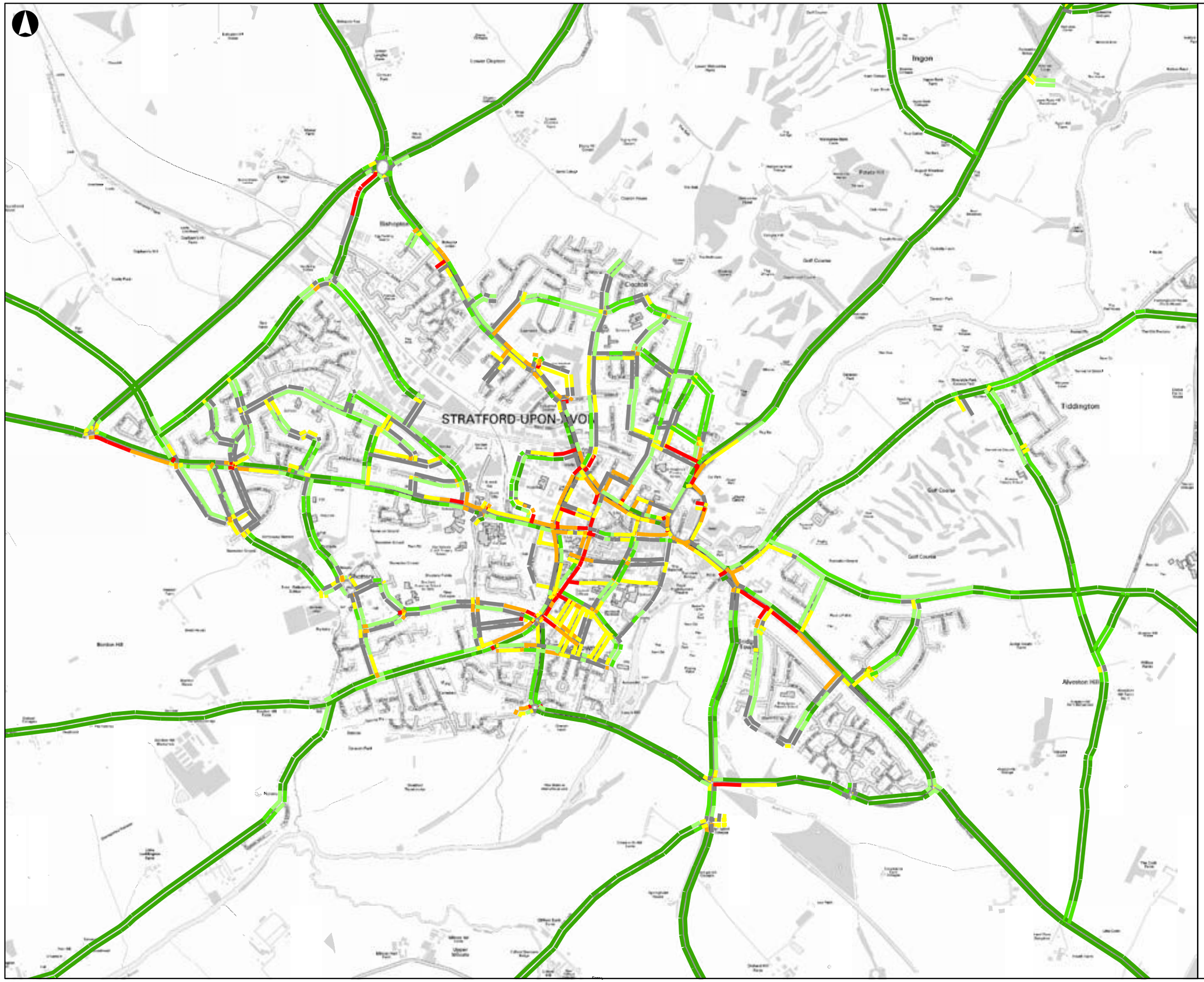
Scale at A3

NTS

Job No	Drawing Status
211439-19	**Information**

Drawing No	Issue
Figure 11	**P1**

MXD Location



Legend

Speeds Between

- 0 - 5 mph
- 5 - 10 mph
- 10 - 15 mph
- 15 - 20 mph
- 20 - 25 mph
- 25 - 30 mph
- above 30 mph

Issue	Date	By	Chkd	Appd
P1	13-06-12	MG	JE	JE

Metres

0 255 510 1,020

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Job Title

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S1-005 B 2021 PM
High Growth
Mean Speed Plot

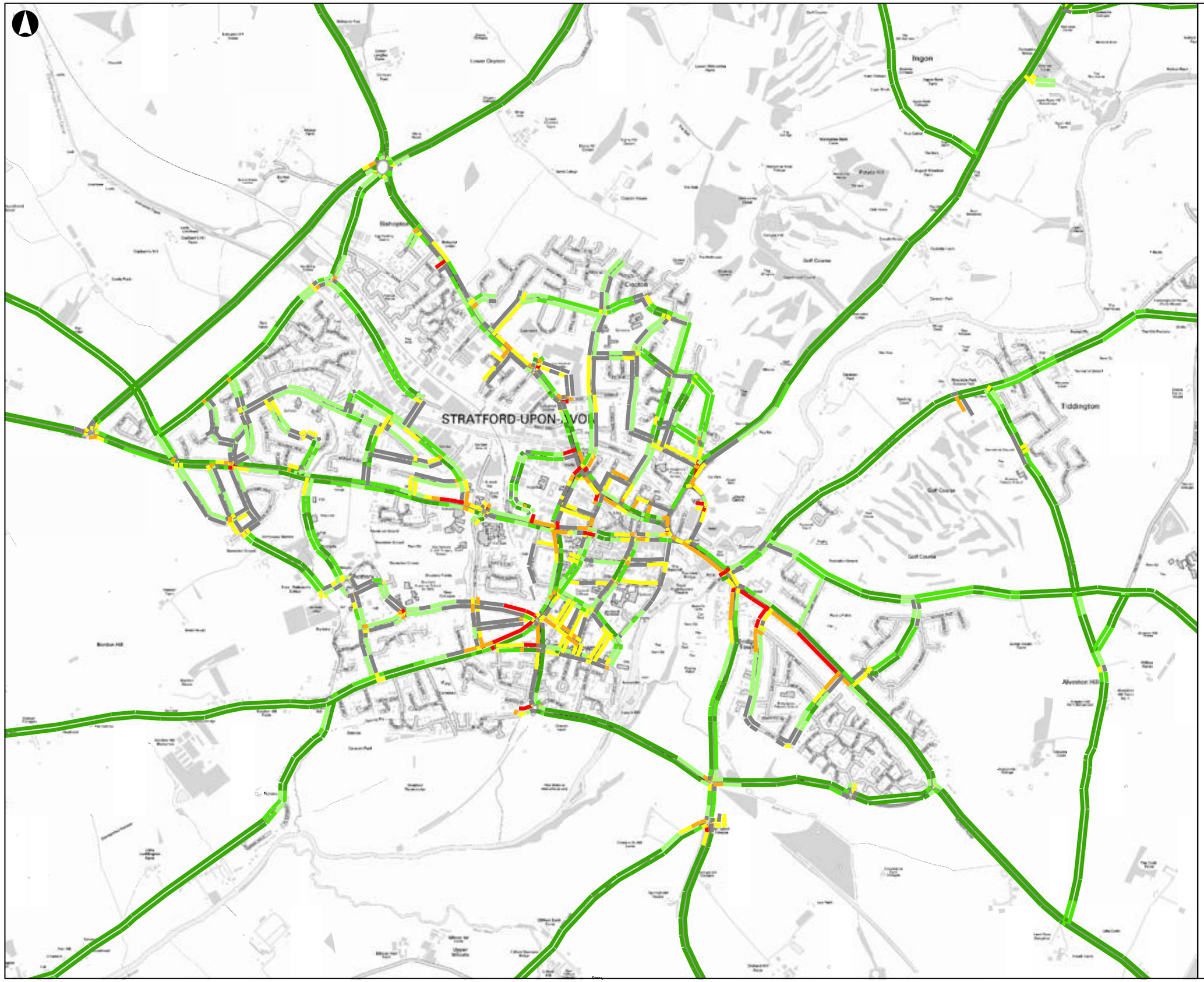
Scale at A3

NTS

Job No	Drawing Status
211439-19	**Information**

Drawing No	Issue
Figure 12	**P1**

MXD Location



Legend

Speeds Between

- 0 - 5 mph
- 5 - 10 mph
- 10 - 15 mph
- 15 - 20 mph
- 20 - 25 mph
- 25 - 30 mph
- above 30 mph

Issue	Date	By	Chkd	Appd
P1	13-06-12	MG	JE	JE

Metres

0 255 510 1,020

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Client

Warwickshire County Council

Job Title

Strategic Transport Assessment

S1-006 A 2023 AM
Medium Growth
Mean Speed Plot

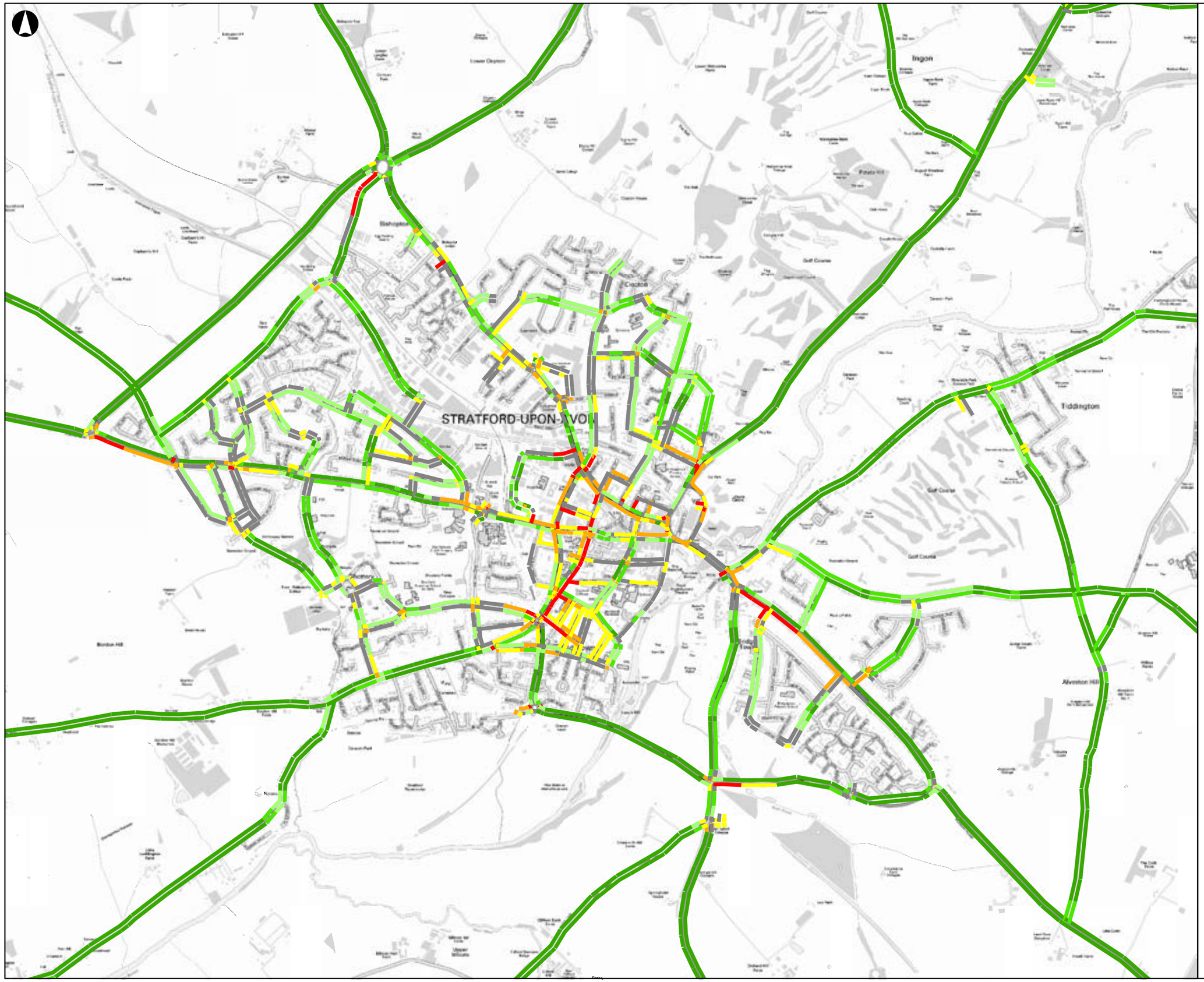
Scale at A3

NTS

Job No	Drawing Status
211439-19	**Information**

Drawing No	Issue
Figure 13	**P1**

MXD Location



Legend

Speeds Between

- 0 - 5 mph
- 5 - 10 mph
- 10 - 15 mph
- 15 - 20 mph
- 20 - 25 mph
- 25 - 30 mph
- above 30 mph

Issue	Date	By	Chkd	Appd
P1	13-06-12	MG	JE	JE

Metres

0 255 510 1,020

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Client

Warwickshire County Council

Job Title

Strategic Transport Assessment

S1-006 A 2023 PM
Medium Growth
Mean Speed Plot

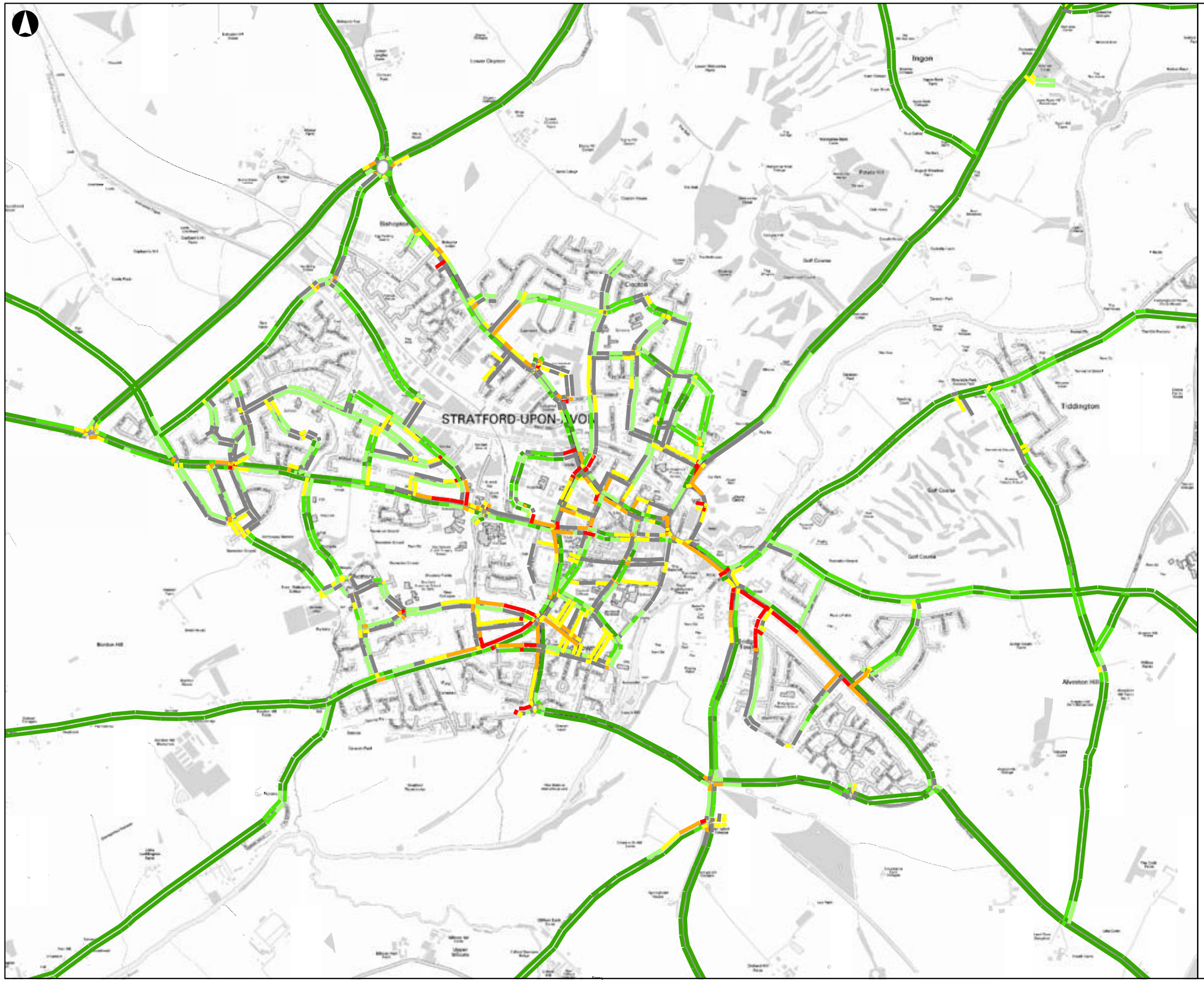
Scale at A3

NTS

Job No	Drawing Status
211439-19	**Information**

Drawing No	Issue
Figure 14	**P1**

MXD Location



Legend

Speeds Between

- 0 - 5 mph
- 5 - 10 mph
- 10 - 15 mph
- 15 - 20 mph
- 20 - 25 mph
- 25 - 30 mph
- above 30 mph

Issue	Date	By	Chkd	Appd
P1	13-06-12	MG	JE	JE

Metres

0 255 510 1,020

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Warwickshire County Council

Job Title

Strategic Transport Assessment

S1-006 B 2023 AM
High Growth
Mean Speed Plot

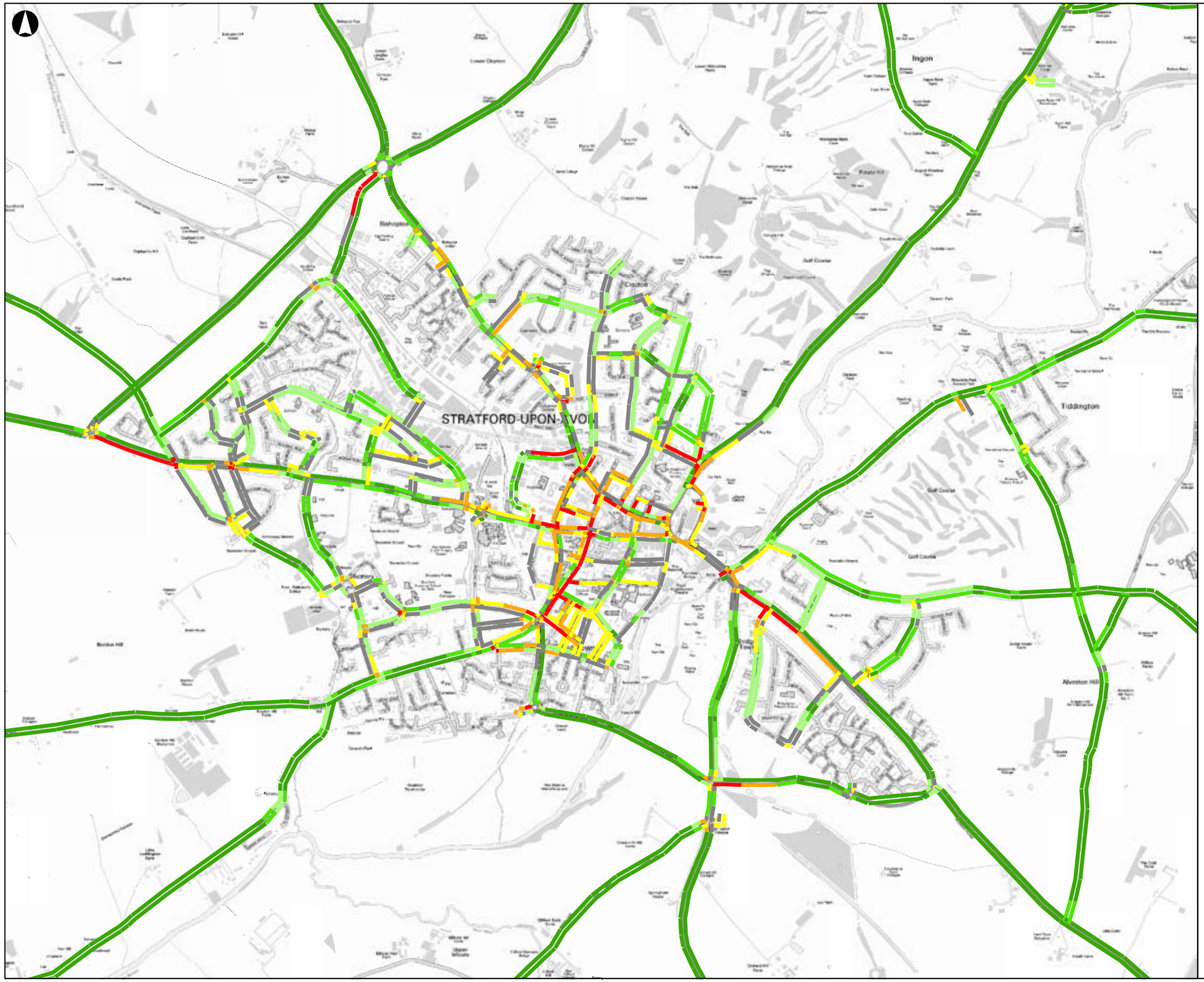
Scale at A3

NTS

Job No	Drawing Status
211439-19	**Information**

Drawing No	Issue
Figure 15	**P1**

MXD Location



Legend

Speeds Between

- 0 - 5 mph
- 5 - 10 mph
- 10 - 15 mph
- 15 - 20 mph
- 20 - 25 mph
- 25 - 30 mph
- above 30 mph

Issue	Date	By	Chkd	Appd
P1	13-06-12	MG	JE	JE

Metres

0 255 510 1,020

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Job Title

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S1-006 B 2023 PM
High Growth
Mean Speed Plot

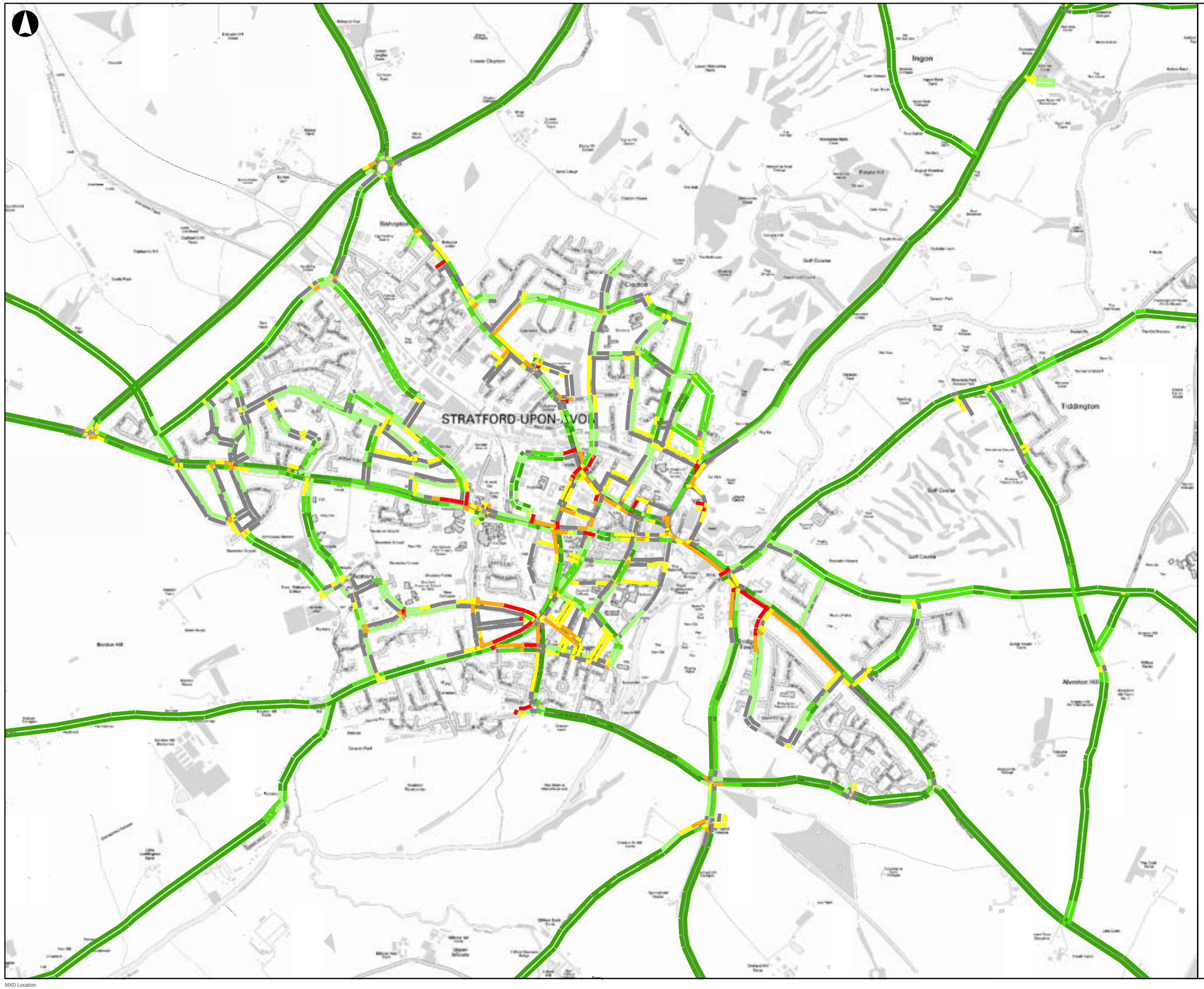
Scale at A3

NTS

Job No	Drawing Status
211439-19	**Information**

Drawing No	Issue
Figure 16	**P1**

MXD Location



Issue	Date	By	Chkd	Appd
P1	13-06-12	MG	JE	JE

Metres
0 255 510 1,020

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Job Title
Strategic Transport Assessment

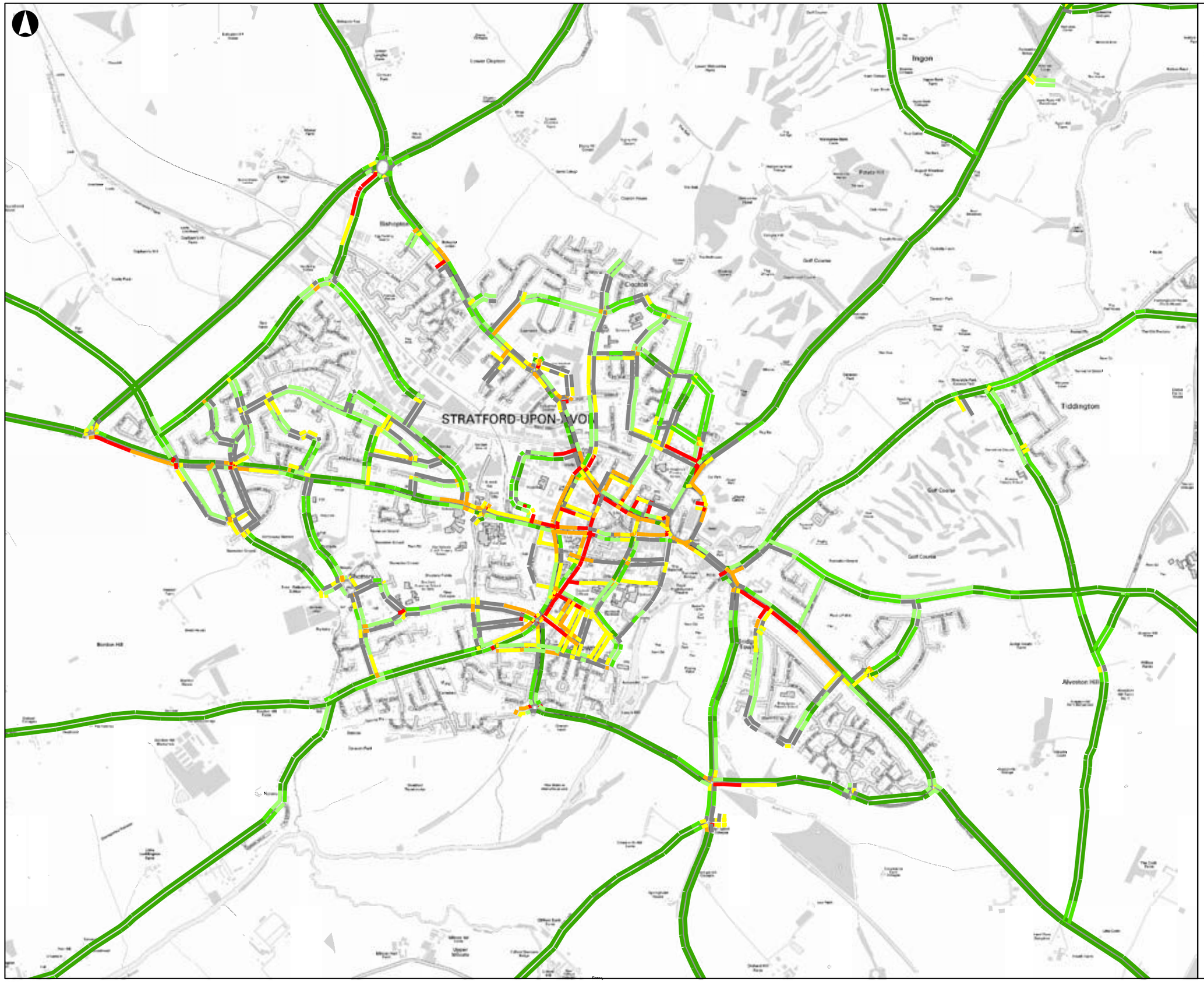
S1-007 A 2025 AM
Medium Growth
Mean Speed Plot

Scale at A3
NTS

Job No	Drawing Status
211439-19	**Information**

Drawing No	Issue
Figure 17	**P1**

MXD Location



Legend

Speeds Between

- 0 - 5 mph
- 5 - 10 mph
- 10 - 15 mph
- 15 - 20 mph
- 20 - 25 mph
- 25 - 30 mph
- above 30 mph

Issue	Date	By	Chkd	Appd
P1	13-06-12	MG	JE	JE

Metres

0 255 510 1,020

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Job Title

Strategic Transport Assessment

S1-007 A 2025 PM
Medium Growth
Mean Speed Plot

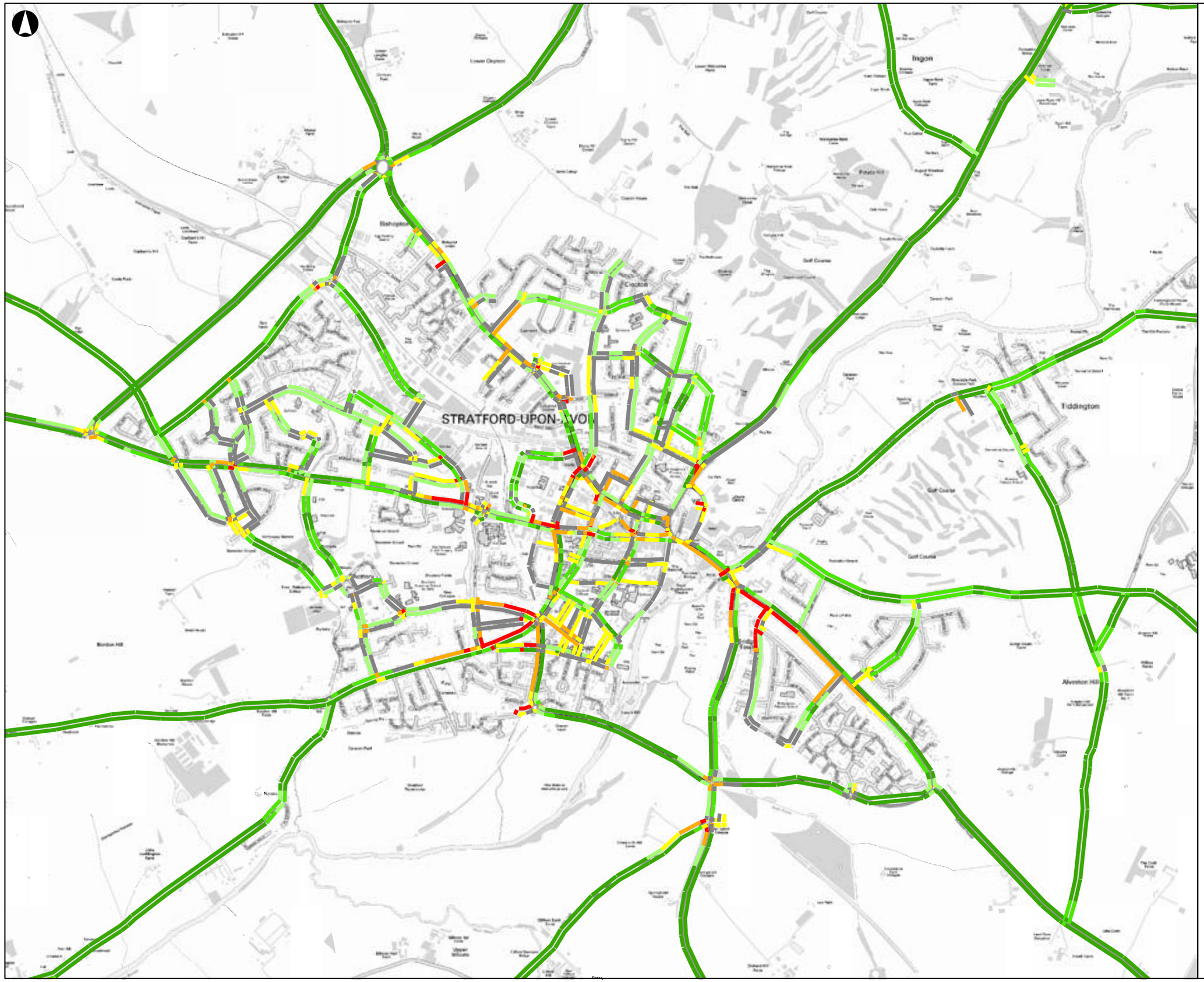
Scale at A3

NTS

Job No	Drawing Status
211439-19	**Information**

Drawing No	Issue
Figure 18	**P1**

MXD Location



Legend

Speeds Between

- 0 - 5 mph
- 5 - 10 mph
- 10 - 15 mph
- 15 - 20 mph
- 20 - 25 mph
- 25 - 30 mph
- above 30 mph

Issue	Date	By	Chkd	Appd
P1	13-06-12	MG	JE	JE

Metres

0 255 510 1,020

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Job Title

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High Growth
Mean Speed Plot

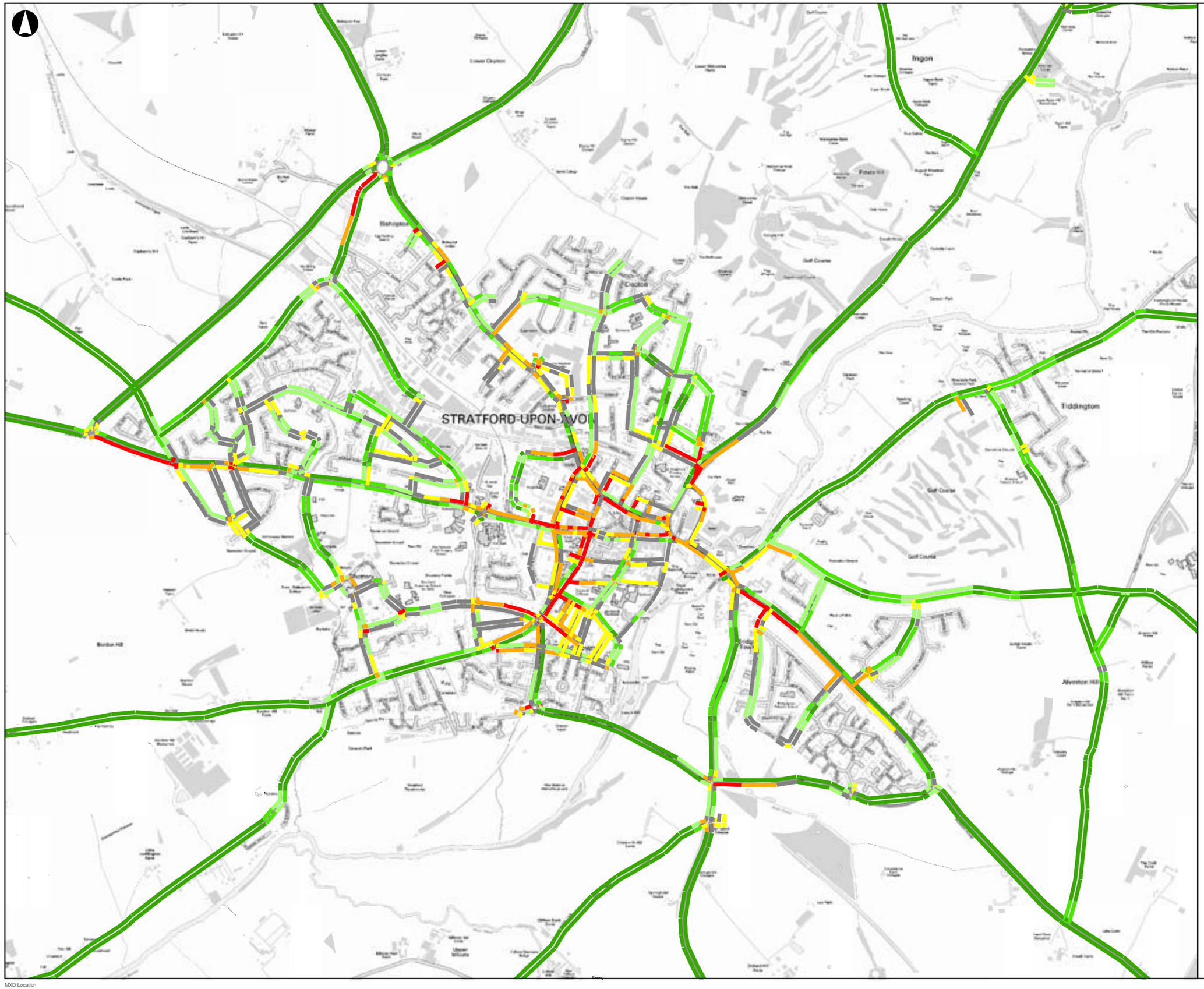
Scale at A3

NTS

Job No	Drawing Status
211439-19	**Information**

Drawing No	Issue
Figure 19	**P1**

MXD Location



Issue	Date	By	Chkd	Appd
P1	13-06-12	MG	JE	JE

Metres
0 255 510 1,020

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Job Title
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S1-007 B 2025 PM
High Growth
Mean Speed Plot

Scale at A3
NTS

Job No	Drawing Status
211439-19	**Information**

Drawing No	Issue
Figure 20	**P1**

MXD Location

Legend

Speeds Between

- 0 - 5 mph
- 5 - 10 mph
- 10 - 15 mph
- 15 - 20 mph
- 20 - 25 mph
- 25 - 30 mph
- above 30 mph

Issue	Date	By	Chkd	Appd
P1	13-06-12	MG	JE	JE

Metres

0 255 510 1,020

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Job Title

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S1-008 A 2028 AM
Medium Growth
Mean Speed Plot

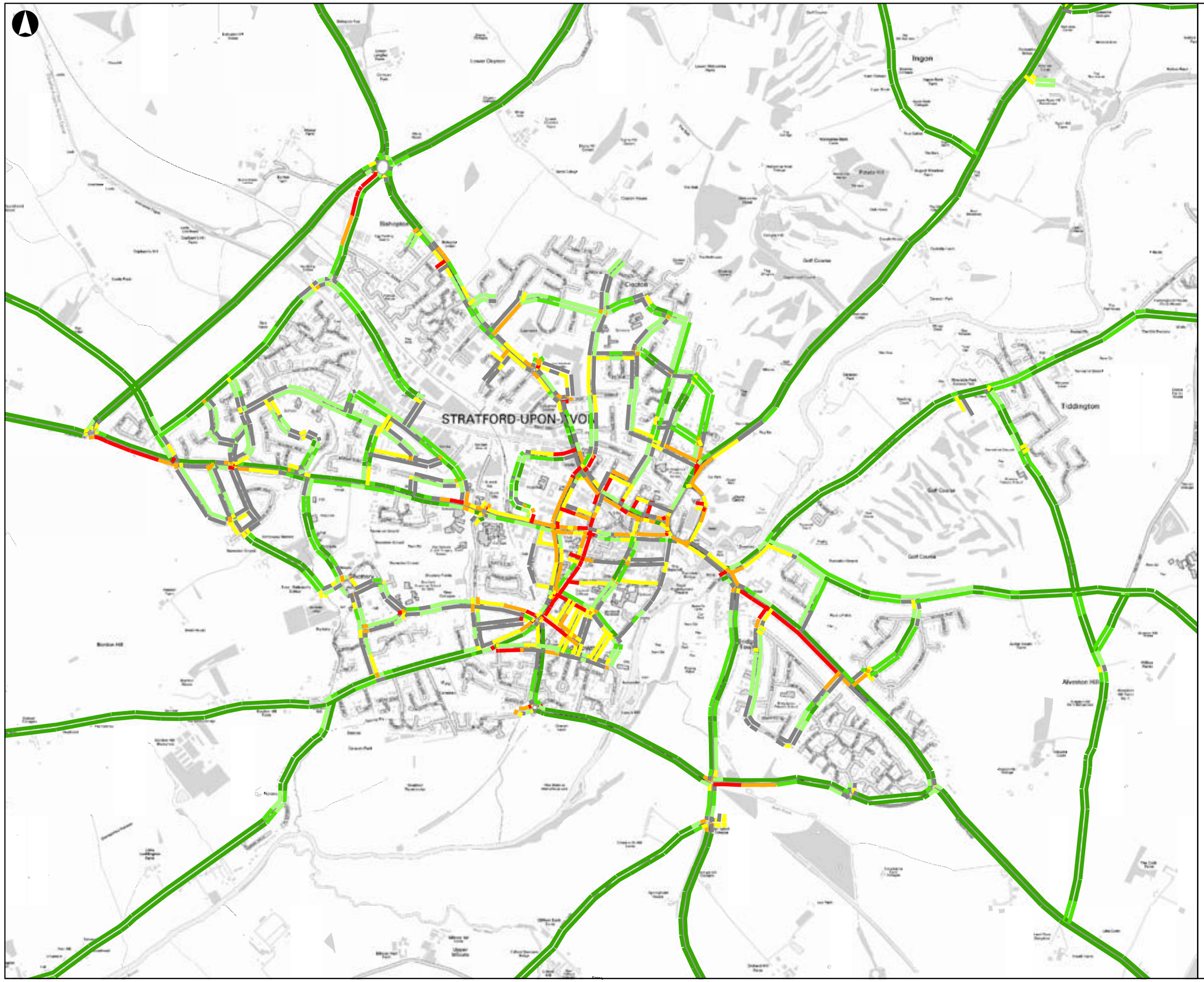
Scale at A3

NTS

Job No	Drawing Status
211439-19	**Information**

Drawing No	Issue
Figure 21	**P1**

MXD Location



Legend

Speeds Between

- 0 - 5 mph
- 5 - 10 mph
- 10 - 15 mph
- 15 - 20 mph
- 20 - 25 mph
- 25 - 30 mph
- above 30 mph

Issue	Date	By	Chkd	Appd
P1	13-06-12	MG	JE	JE

Metres

0 255 510 1,020

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Job Title

Strategic Transport Assessment

S1-008 A 2028 PM
Medium Growth
Mean Speed Plot

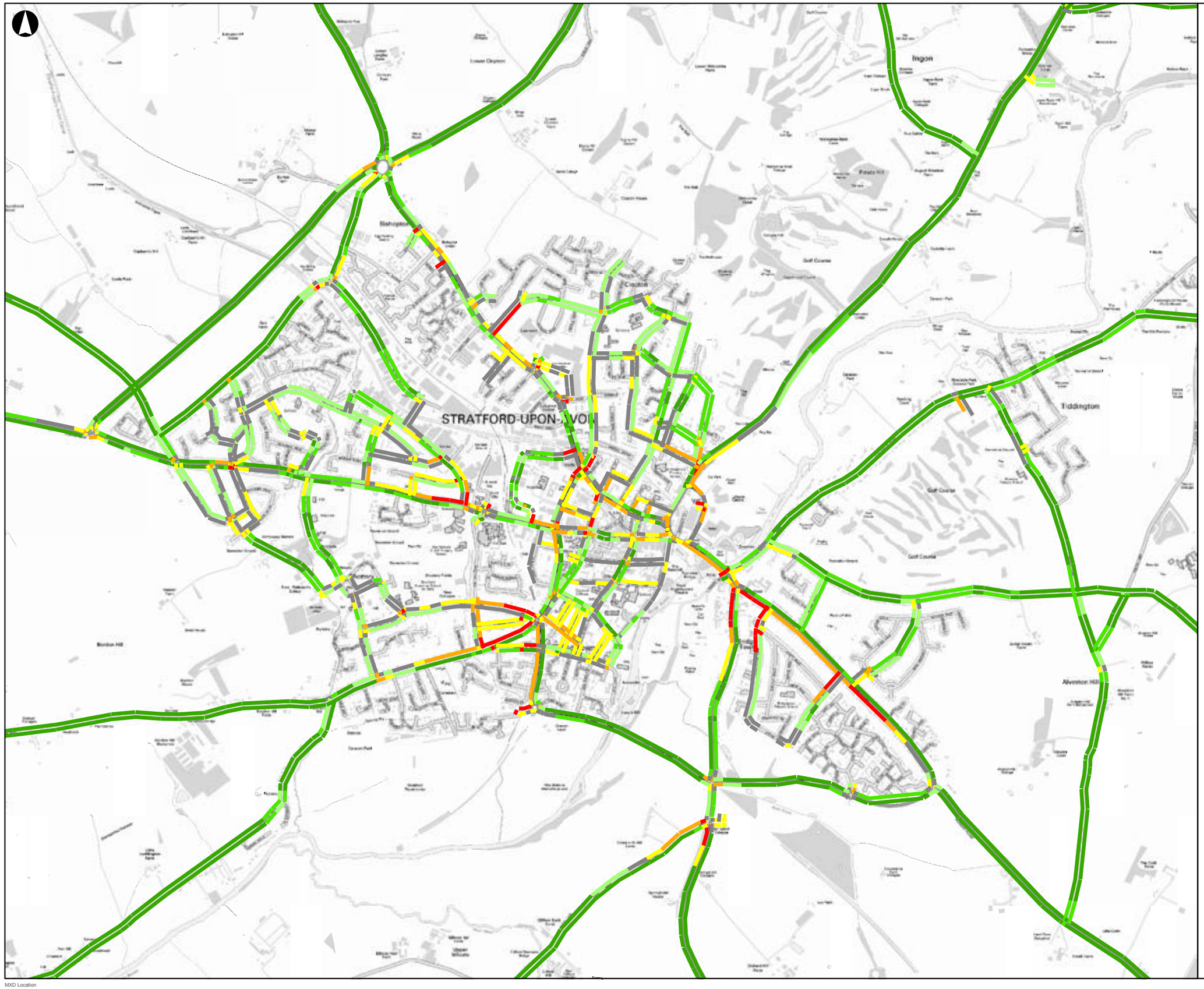
Scale at A3

NTS

Job No	Drawing Status
211439-19	**Information**

Drawing No	Issue
Figure 22	**P1**

MXD Location



Legend

Speeds Between

- 0 - 5 mph
- 5 - 10 mph
- 10 - 15 mph
- 15 - 20 mph
- 20 - 25 mph
- 25 - 30 mph
- above 30 mph

Issue	Date	By	Chkd	Appd
P1	13-06-12	MG	JE	JE

Metres

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Job Title

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High Growth
Mean Speed Plot

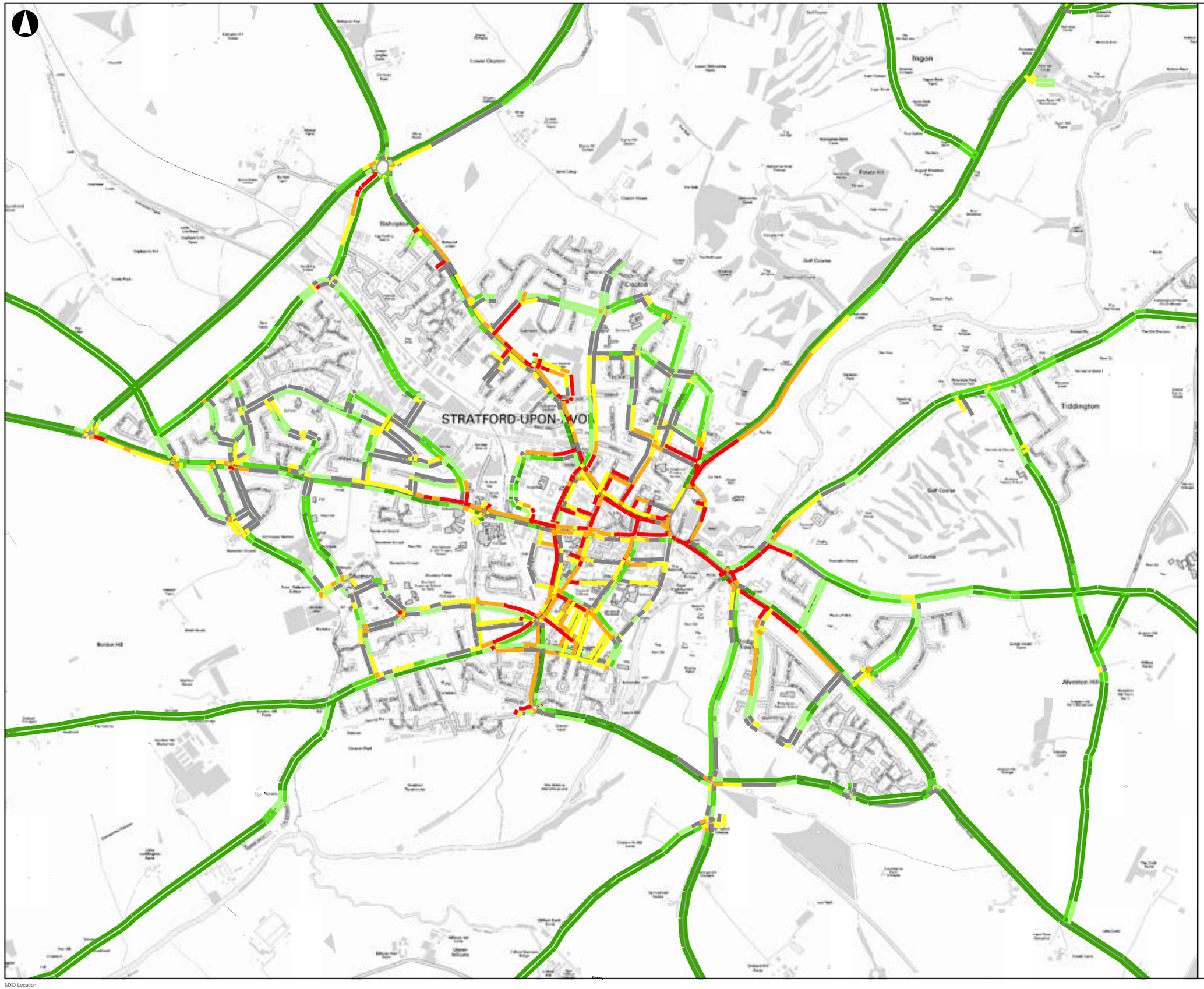
Scale at A3

NTS

Job No	Drawing Status
211439-19	**Information**

Drawing No	Issue
Figure 23	**P1**

MXD Location



Issue	Date	By	Chkd	Appd
P1	13-06-12	MG	JE	JE

Metres
0 255 510 1,020

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Job Title
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S1-008 B 2028 PM
High Growth
Mean Speed Plot

Scale at A3
NTS

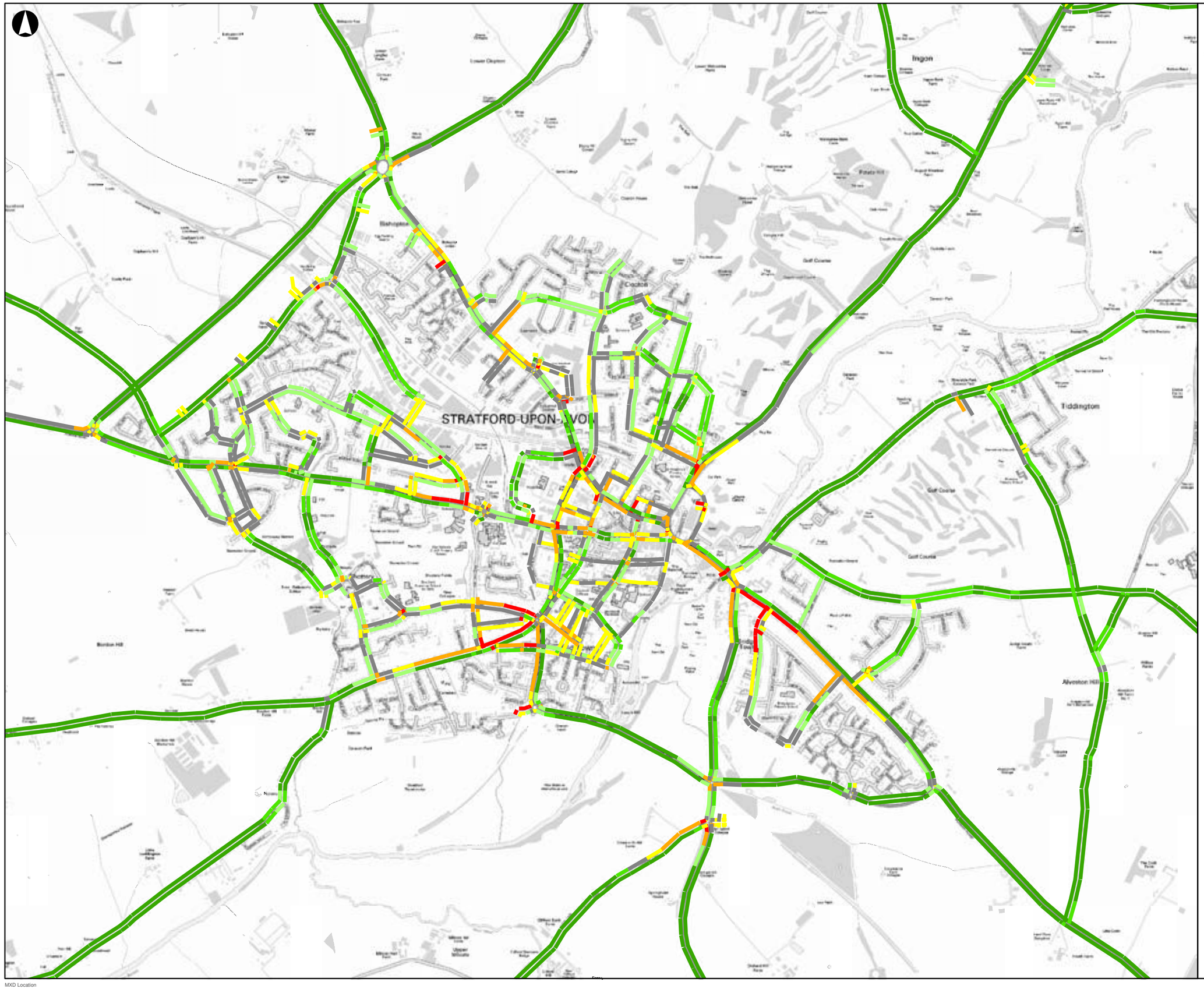
Job No	Drawing Status
211439-19	**Information**

Drawing No	Issue
Figure 24	**P1**

MXD Location

Appendix B

Broad Location Analysis - Mean Speed Plots



Legend

Speeds Between

- 0 - 5 mph
- 5 - 10 mph
- 10 - 15 mph
- 15 - 20 mph
- 20 - 25 mph
- 25 - 30 mph
- above 30 mph

Issue	Date	By	Chkd	Appd
P1	13-06-12	MG	JE	JE

Metres

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High Growth
Mean Speed Plot

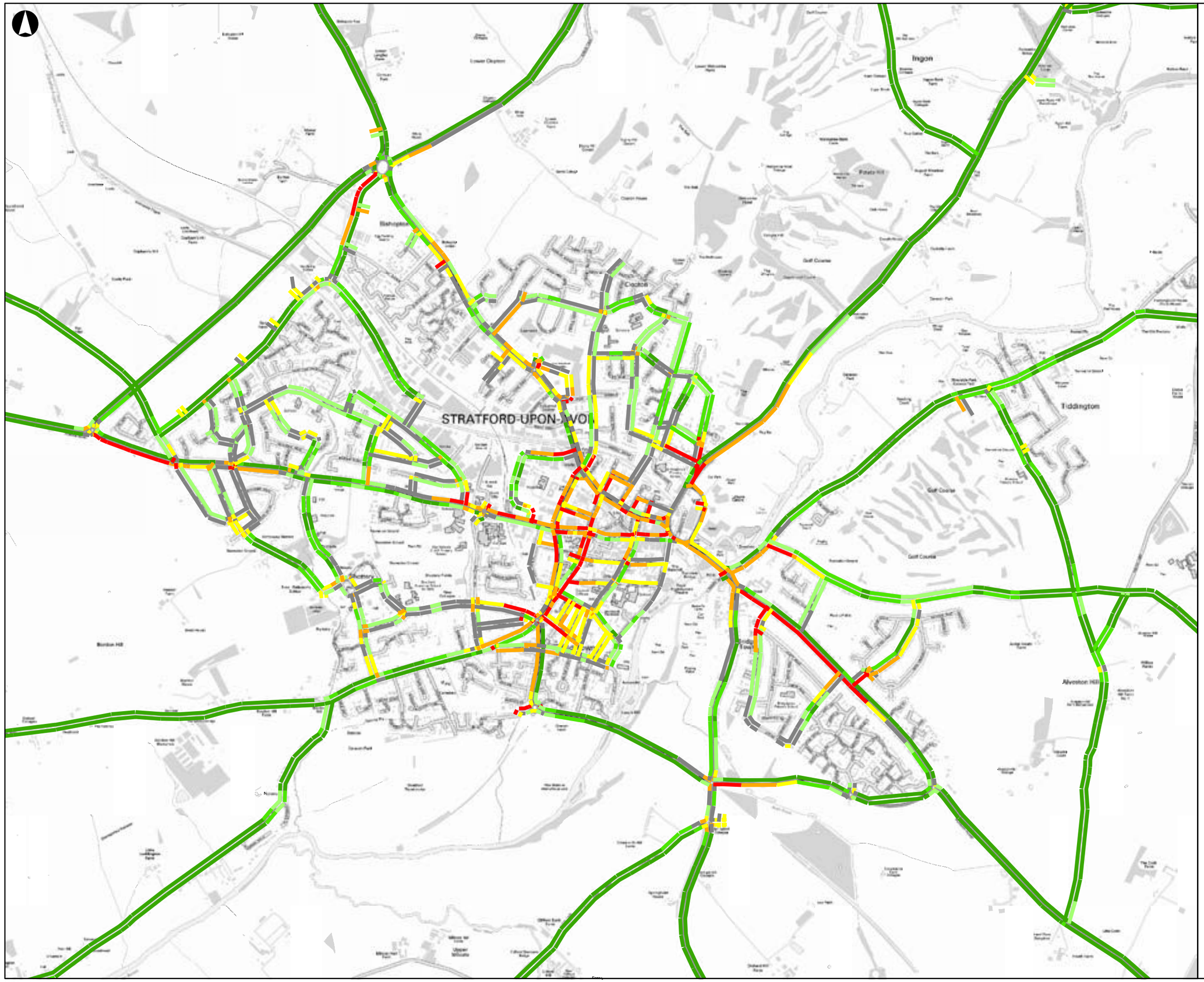
Scale at A3

NTS

Job No	Drawing Status
211439-19	**Information**

Drawing No	Issue
Figure 25	**P1**

MXD Location



Legend

Speeds Between

- 0 - 5 mph
- 5 - 10 mph
- 10 - 15 mph
- 15 - 20 mph
- 20 - 25 mph
- 25 - 30 mph
- above 30 mph

Issue	Date	By	Chkd	Appd
P1	13-06-12	MG	JE	JE

Metres

0 255 510 1,020

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High Growth
Mean Speed Plot

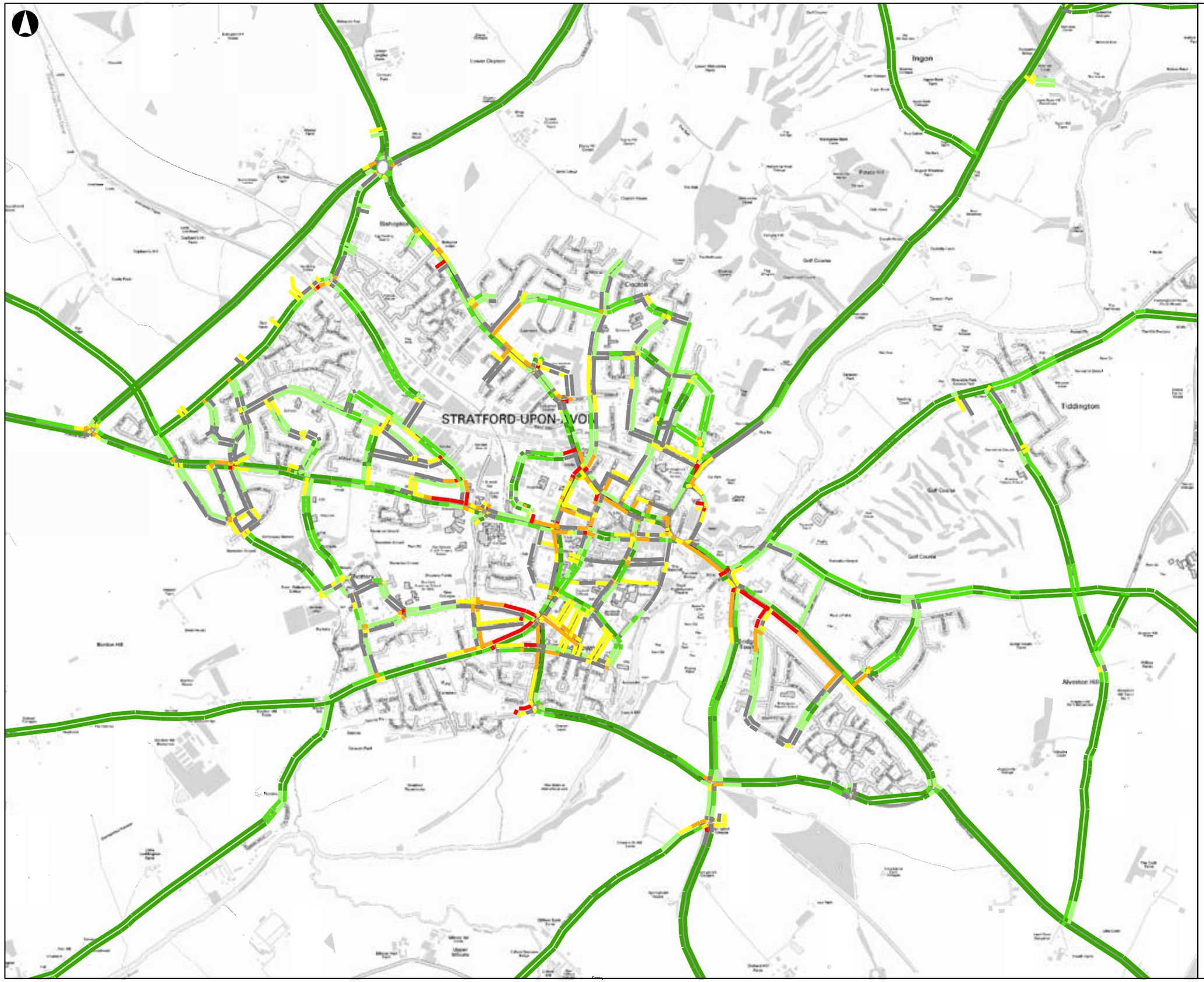
Scale at A3

NTS

Job No	Drawing Status
211439-19	**Information**

Drawing No	Issue
Figure 26	**P1**

MXD Location



Legend

Speeds Between

- 0 - 5 mph
- 5 - 10 mph
- 10 - 15 mph
- 15 - 20 mph
- 20 - 25 mph
- 25 - 30 mph
- above 30 mph

Issue	Date	By	Chkd	Appd
P1	13-06-12	MG	JE	JE

Metres

0 255 510 1,020

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Job Title

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S2-NORTH B 2028 AM
Medium Growth
Mean Speed Plot

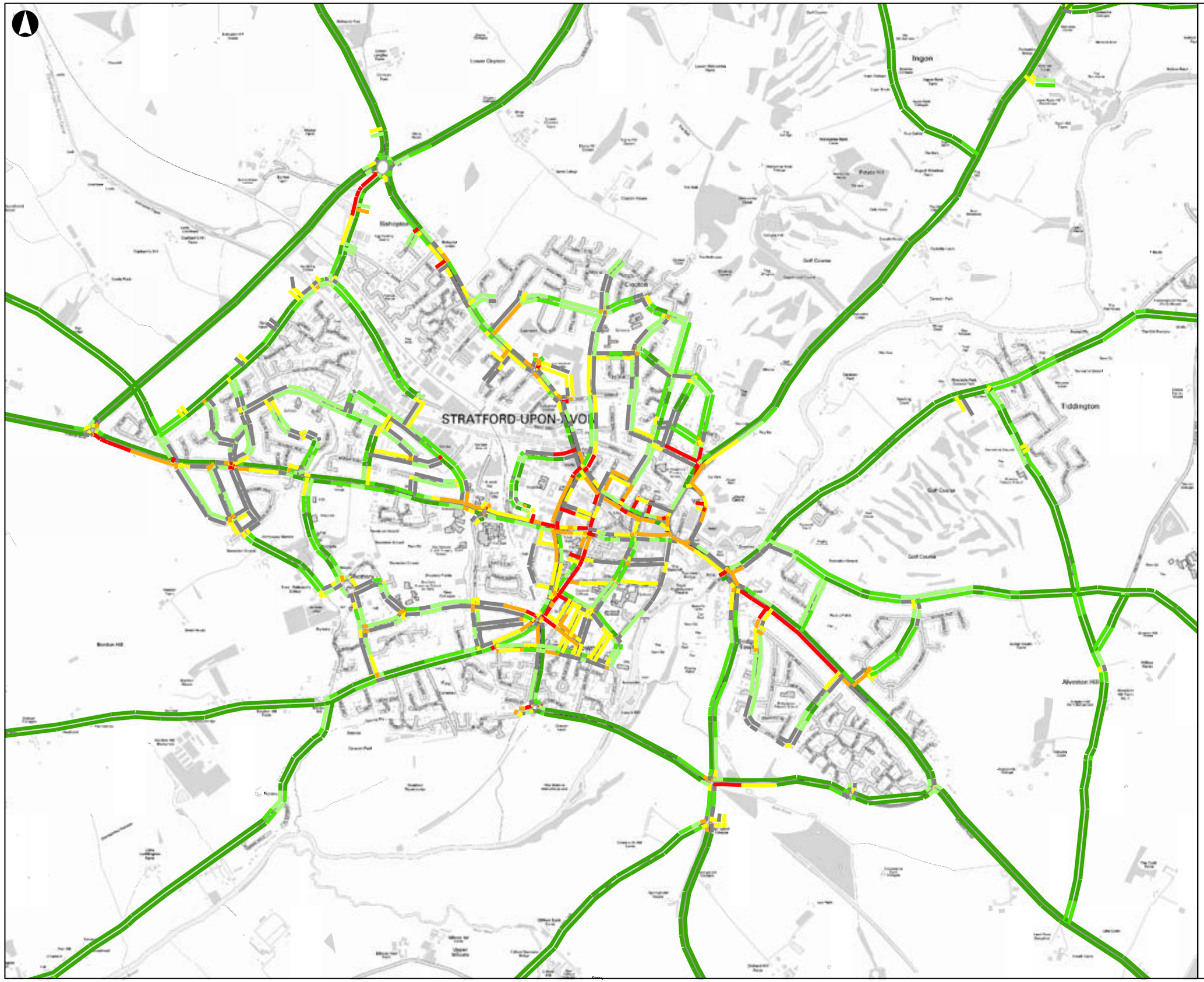
Scale at A3

NTS

Job No	Drawing Status
211439-19	**Information**

Drawing No	Issue
Figure 27	**P1**

MXD Location



Legend

Speeds Between

- 0 - 5 mph
- 5 - 10 mph
- 10 - 15 mph
- 15 - 20 mph
- 20 - 25 mph
- 25 - 30 mph
- above 30 mph

Issue	Date	By	Chkd	Appd
P1	13-06-12	MG	JE	JE

Metres

0 255 510 1,020

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Job Title

Strategic Transport Assessment

S2-NORTH B 2028 PM
Medium Growth
Mean Speed Plot

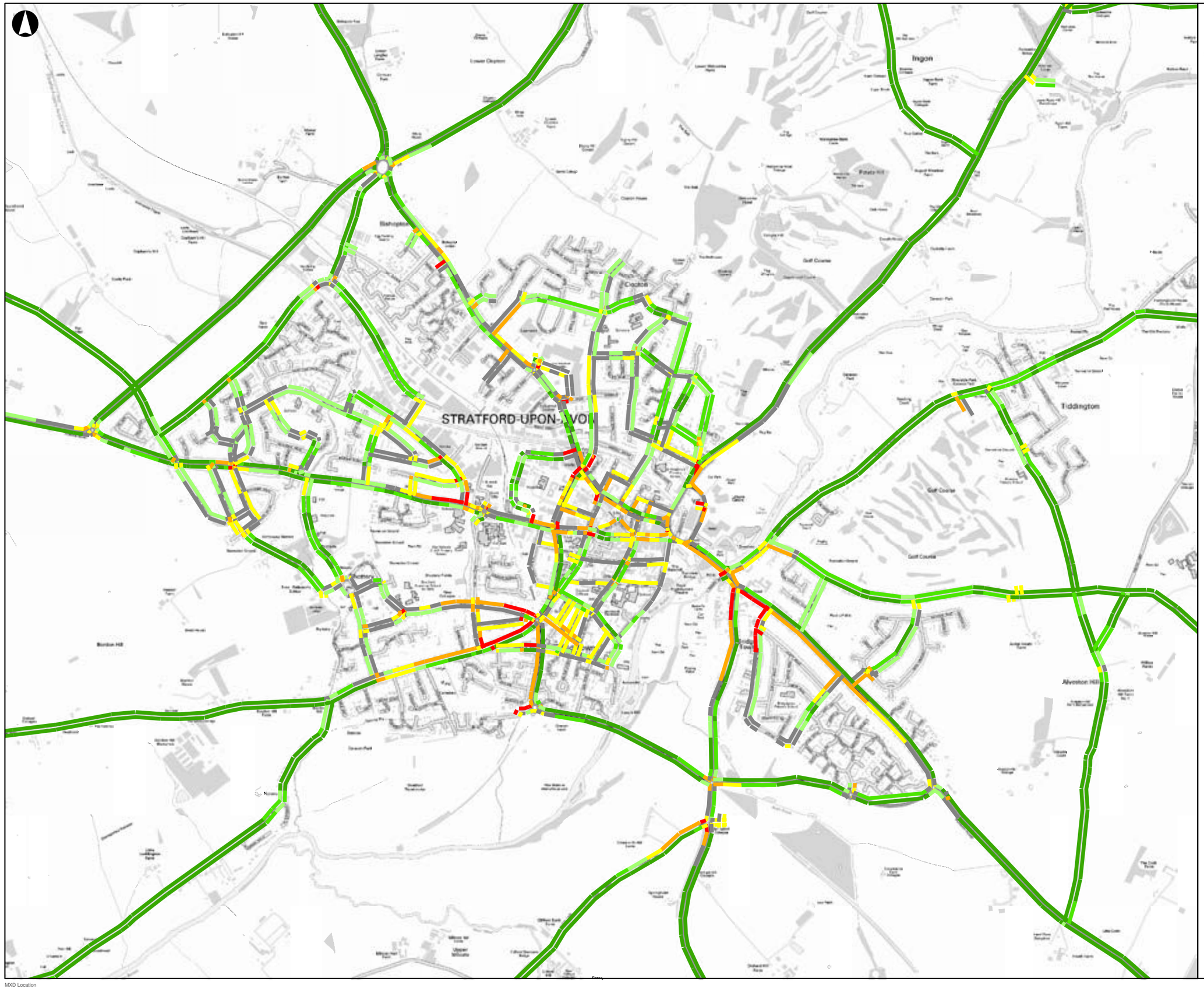
Scale at A3

NTS

Job No	Drawing Status
211439-19	**Information**

Drawing No	Issue
Figure 28	**P1**

MXD Location



Legend

Speeds Between

- 0 - 5 mph
- 5 - 10 mph
- 10 - 15 mph
- 15 - 20 mph
- 20 - 25 mph
- 25 - 30 mph
- above 30 mph

Issue	Date	By	Chkd	Appd
P1	13-06-12	MG	JE	JE

Metres

0 255 510 1,020

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Job Title

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S2-EAST A 2028 PM
HIGH Growth
Mean Speed Plot

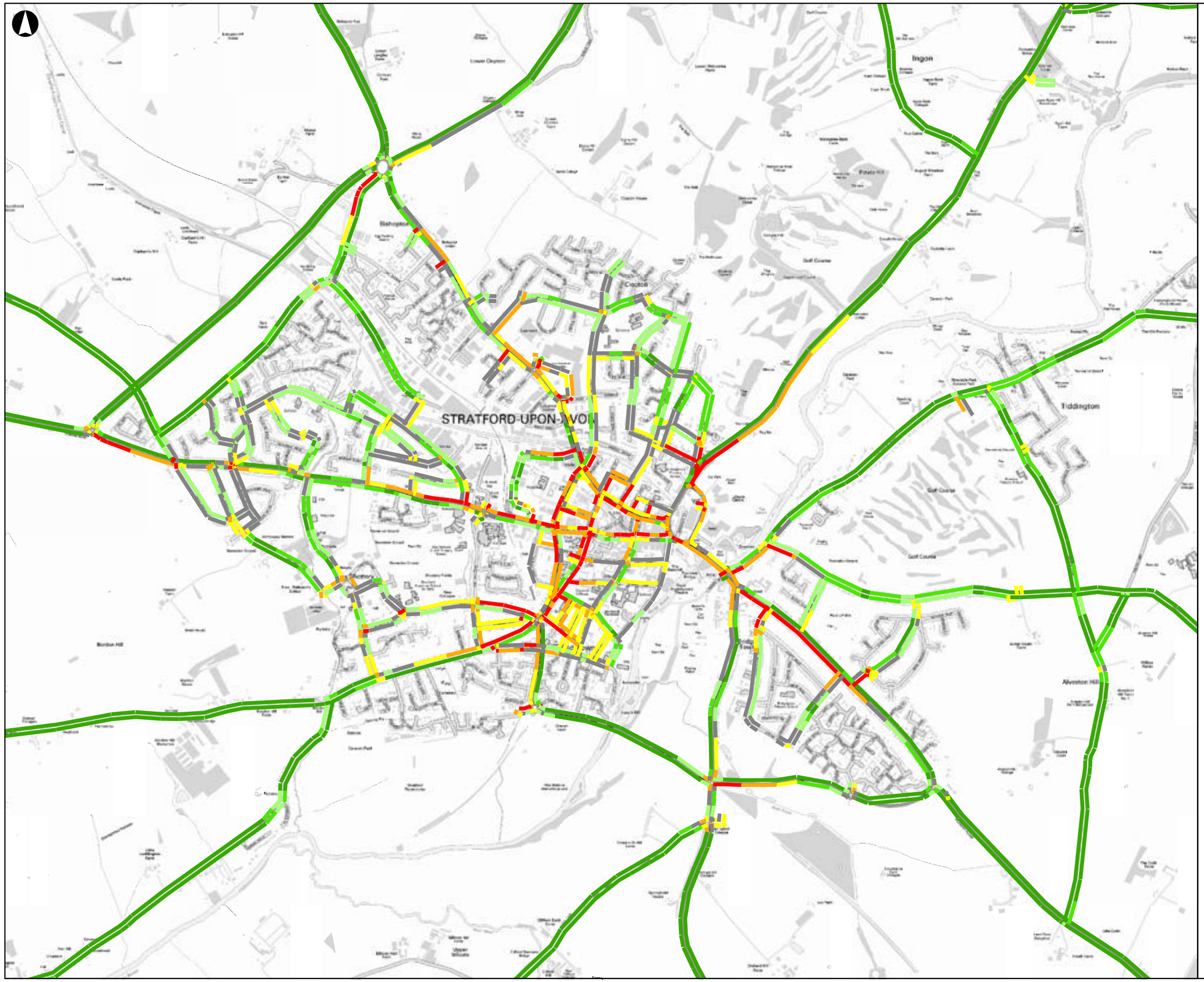
Scale at A3

NTS

Job No	Drawing Status
211439-19	**Information**

Drawing No	Issue
Figure 29	**P1**

MXD Location



Legend

Speeds Between

- 0 - 5 mph
- 5 - 10 mph
- 10 - 15 mph
- 15 - 20 mph
- 20 - 25 mph
- 25 - 30 mph
- above 30 mph

Issue	Date	By	Chkd	Appd
P1	13-06-12	MG	JE	JE

Metres

0 255 510 1,020

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Job Title

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HIGH Growth
Mean Speed Plot

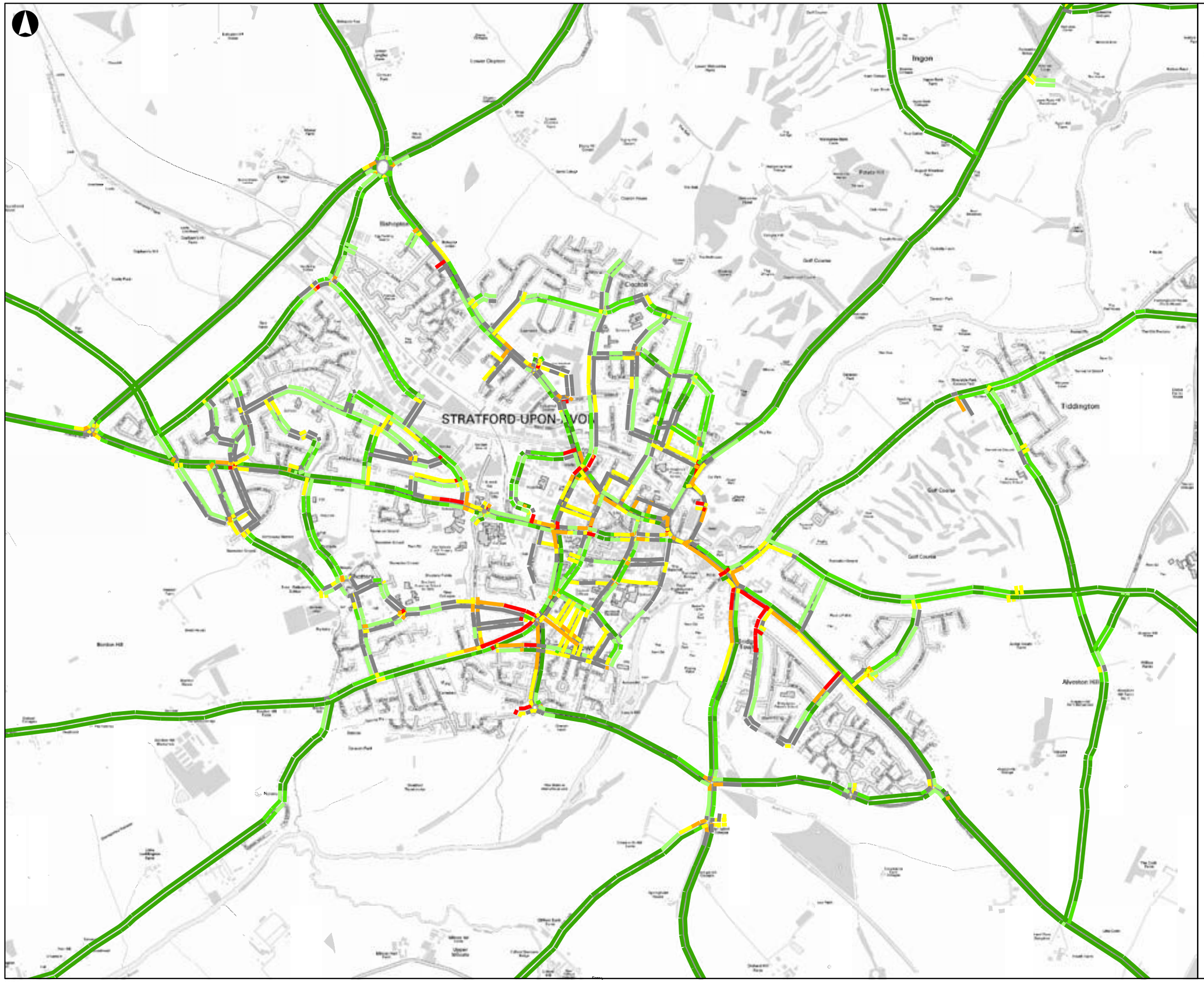
Scale at A3

NTS

Job No	Drawing Status
211439-19	**Information**

Drawing No	Issue
Figure 30	**P1**

MXD Location



Legend

Speeds Between

- 0 - 5 mph
- 5 - 10 mph
- 10 - 15 mph
- 15 - 20 mph
- 20 - 25 mph
- 25 - 30 mph
- above 30 mph

Issue	Date	By	Chkd	Appd
P1	13-06-12	MG	JE	JE

Metres

0 255 510 1,020

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Job Title

Strategic Transport Assessment

S2-EAST B 2028 AM
Medium Growth
Mean Speed Plot

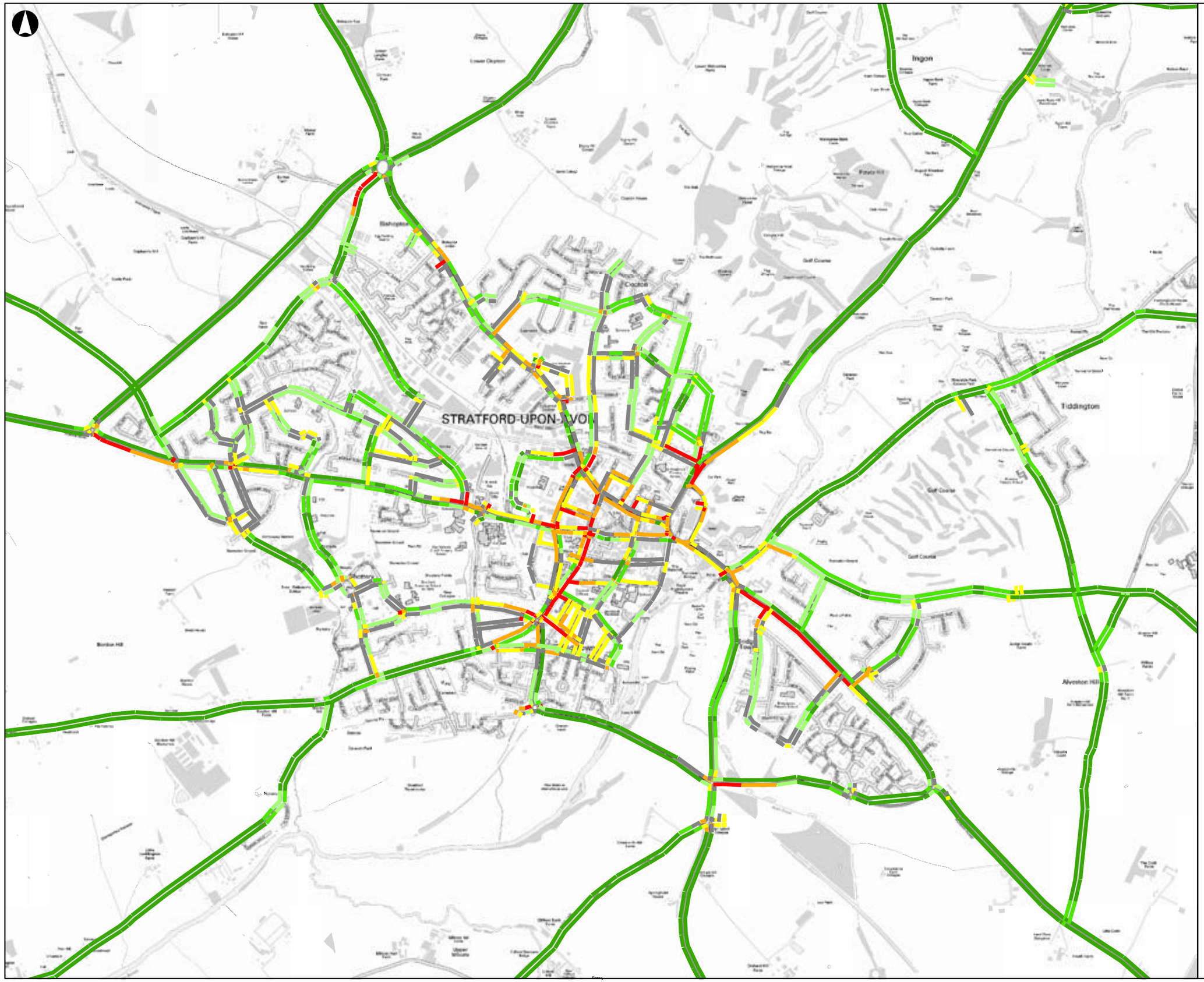
Scale at A3

NTS

Job No	Drawing Status
211439-19	**Information**

Drawing No	Issue
Figure 31	**P1**

MXD Location



Legend

Speeds Between

- 0 - 5 mph
- 5 - 10 mph
- 10 - 15 mph
- 15 - 20 mph
- 20 - 25 mph
- 25 - 30 mph
- above 30 mph

Issue	Date	By	Chkd	Appd
P1	13-06-12	MG	JE	JE

Metres

0 255 510 1,020

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Job Title

Strategic Transport Assessment

S2-EAST B 2028 PM
Medium Growth
Mean Speed Plot

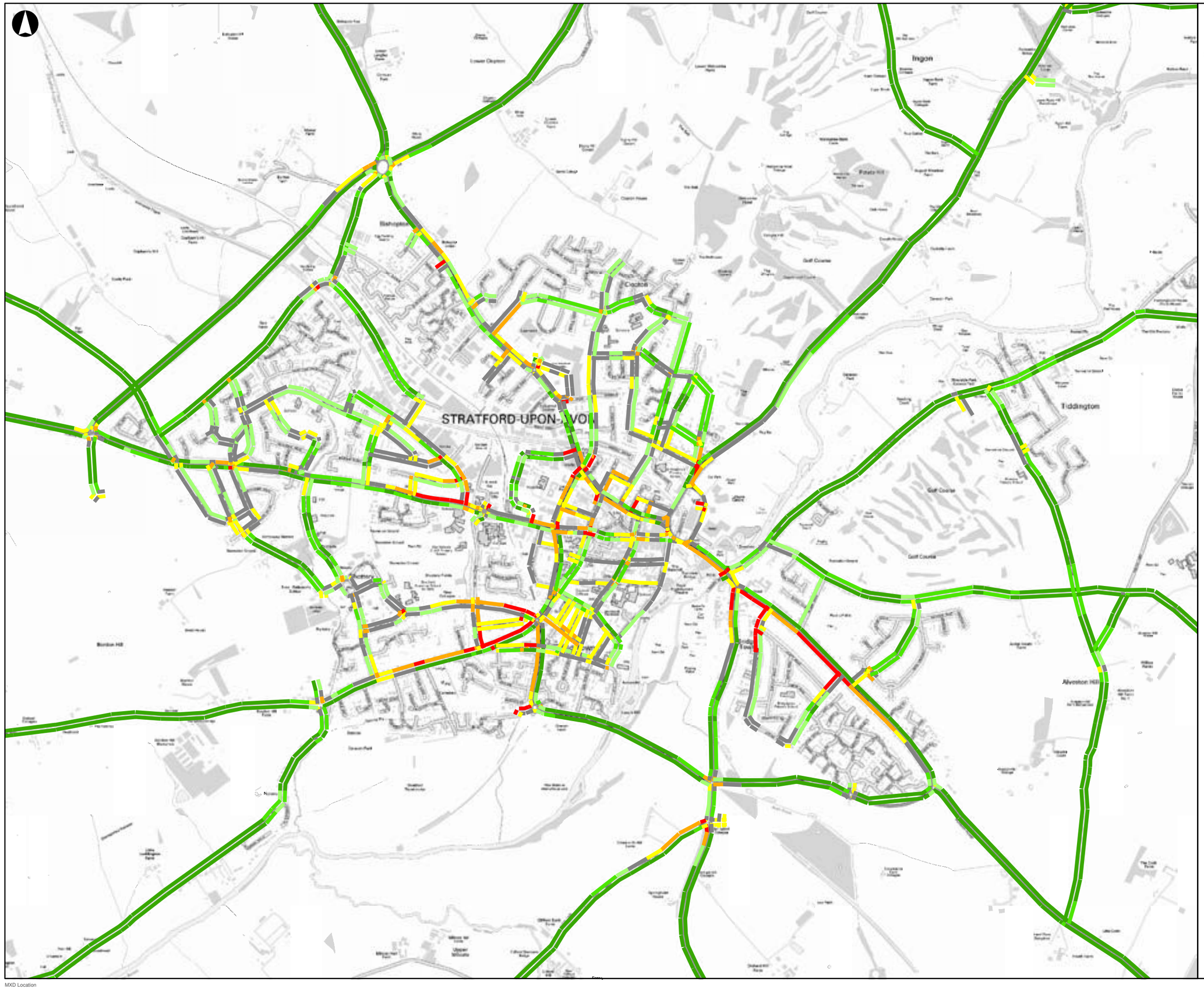
Scale at A3

NTS

Job No	Drawing Status
211439-19	**Information**

Drawing No	Issue
Figure 32	**P1**

MXD Location



Legend

Speeds Between

- 0 - 5 mph
- 5 - 10 mph
- 10 - 15 mph
- 15 - 20 mph
- 20 - 25 mph
- 25 - 30 mph
- above 30 mph

Issue	Date	By	Chkd	Appd
P1	13-06-12	MG	JE	JE

Metres

0 255 510 1,020

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Job Title

Strategic Transport Assessment

S2-WEST A 2028 AM
High Growth
Mean Speed Plot

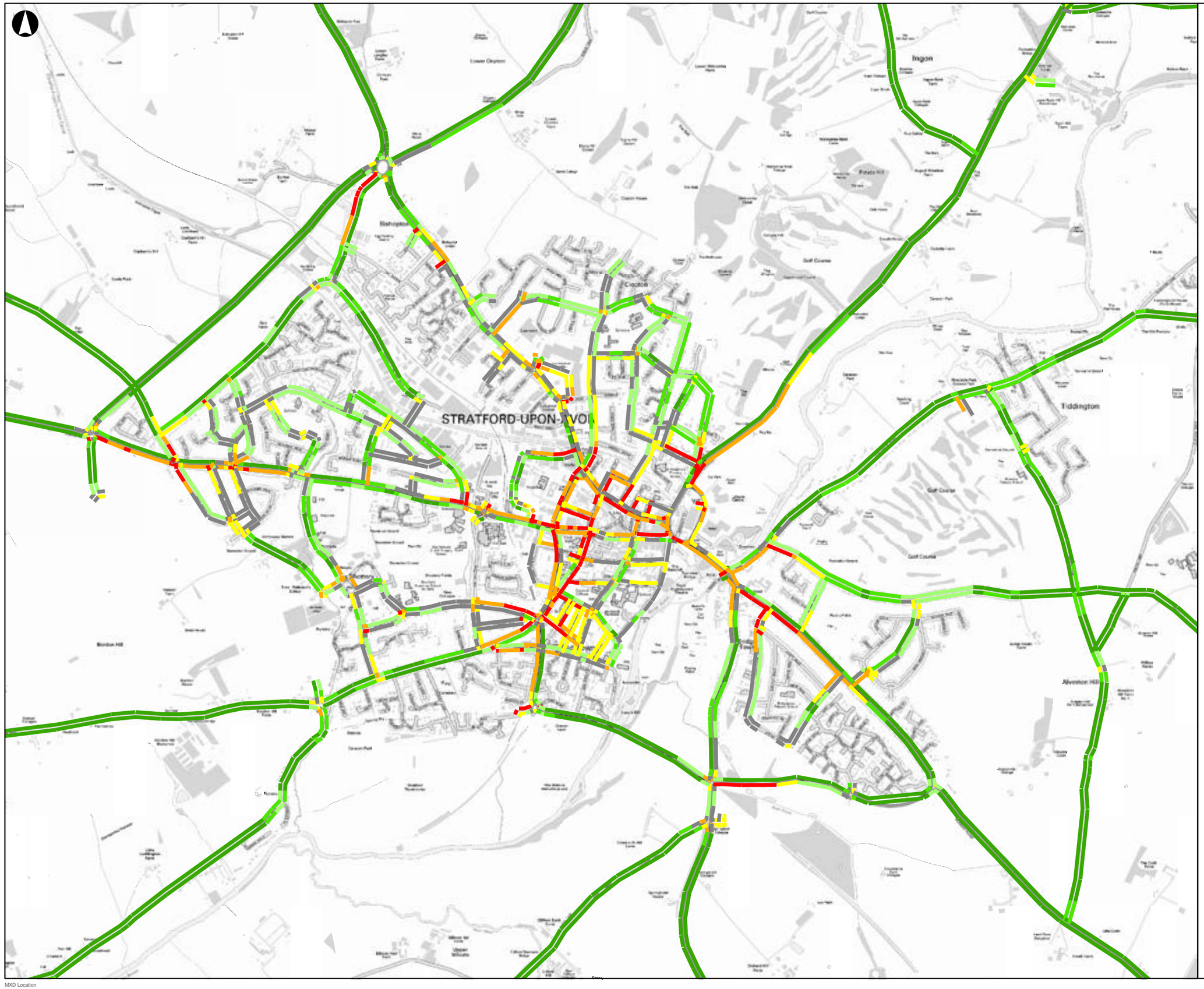
Scale at A3

NTS

Job No	Drawing Status
211439-19	**Information**

Drawing No	Issue
Figure 33	**P1**

MXD Location



Legend

Speeds Between

- 0 - 5 mph
- 5 - 10 mph
- 10 - 15 mph
- 15 - 20 mph
- 20 - 25 mph
- 25 - 30 mph
- above 30 mph

Issue	Date	By	Chkd	Appd
P1	13-06-12	MG	JE	JE

Metres
0 255 510 1,020

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High Growth
Mean Speed Plot

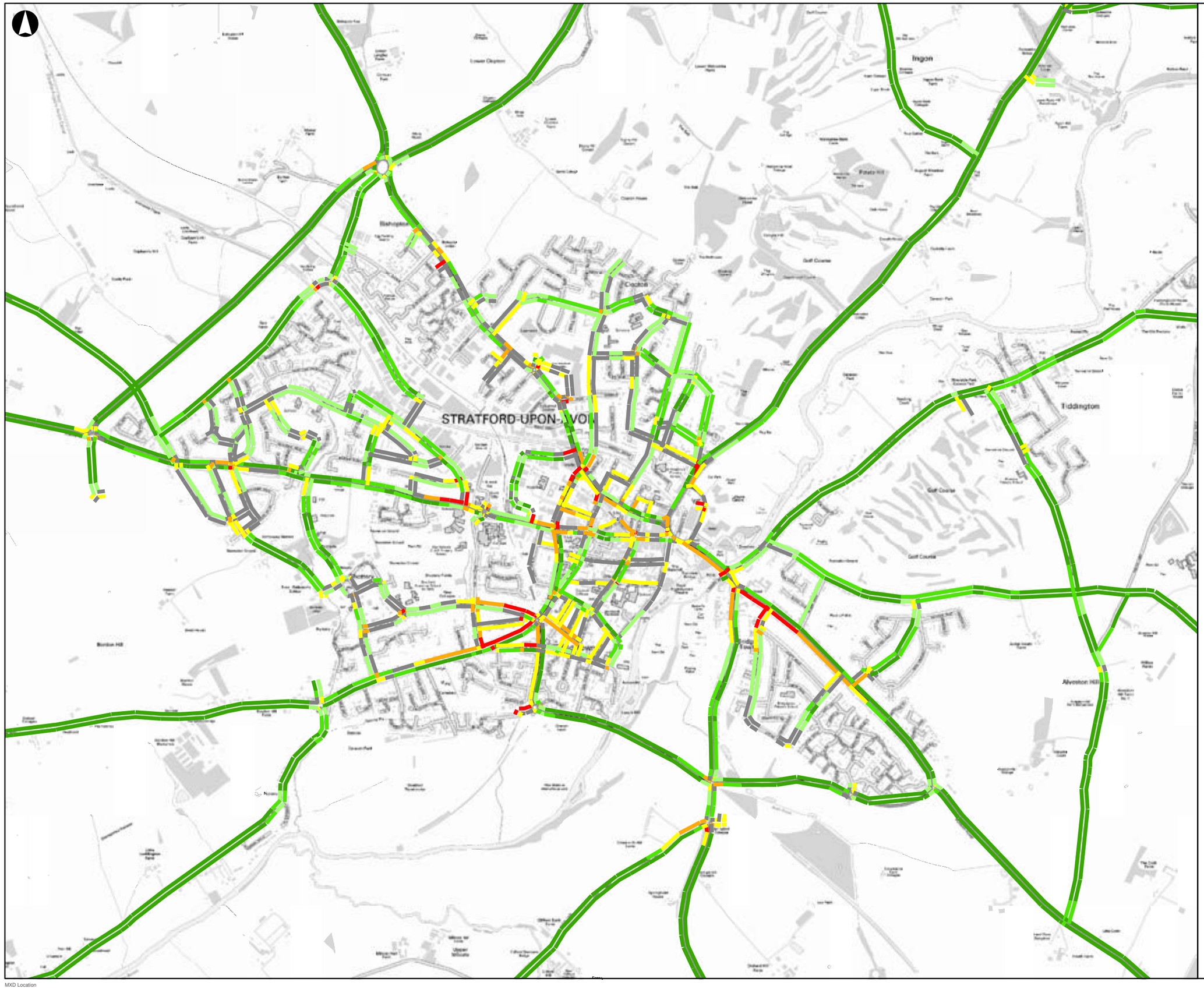
Scale at A3

NTS

Job No	Drawing Status
211439-19	**Information**

Drawing No	Issue
Figure 34	**P1**

MXD Location



Legend

Speeds Between

- 0 - 5 mph
- 5 - 10 mph
- 10 - 15 mph
- 15 - 20 mph
- 20 - 25 mph
- 25 - 30 mph
- above 30 mph

Issue	Date	By	Chkd	Appd
P1	13-06-12	MG	JE	JE

Metres

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Job Title

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Medium Growth
Mean Speed Plot

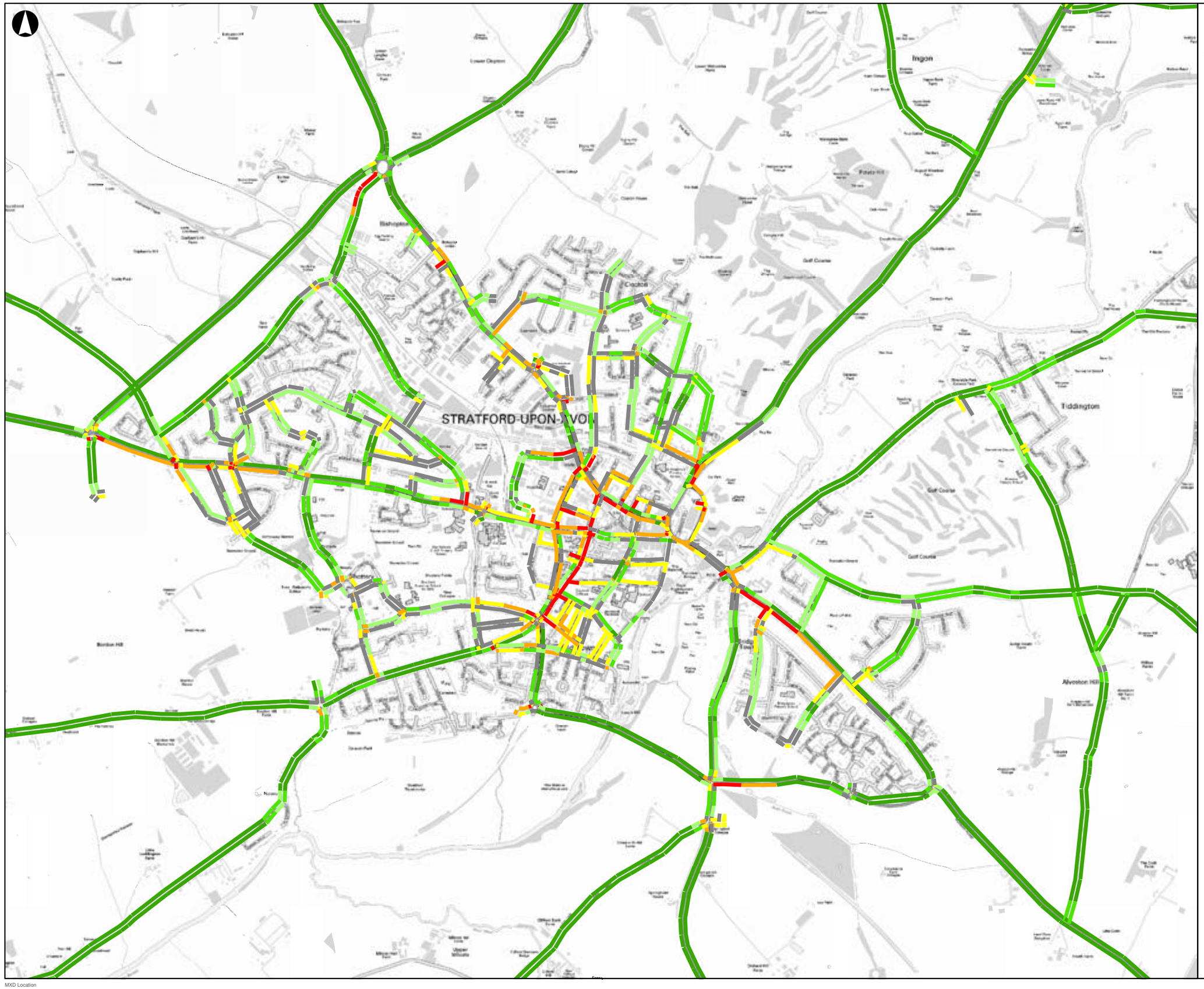
Scale at A3

NTS

Job No	Drawing Status
211439-19	**Information**

Drawing No	Issue
Figure 35	**P1**

MXD Location



Legend

Speeds Between

- 0 - 5 mph
- 5 - 10 mph
- 10 - 15 mph
- 15 - 20 mph
- 20 - 25 mph
- 25 - 30 mph
- above 30 mph

Issue	Date	By	Chkd	Appd
P1	13-06-12	MG	JE	JE

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Client

Warwickshire County Council

Job Title

Strategic Transport Assessment

S2-WEST B 2028 PM
Medium Growth
Mean Speed Plot

Scale at A3

NTS

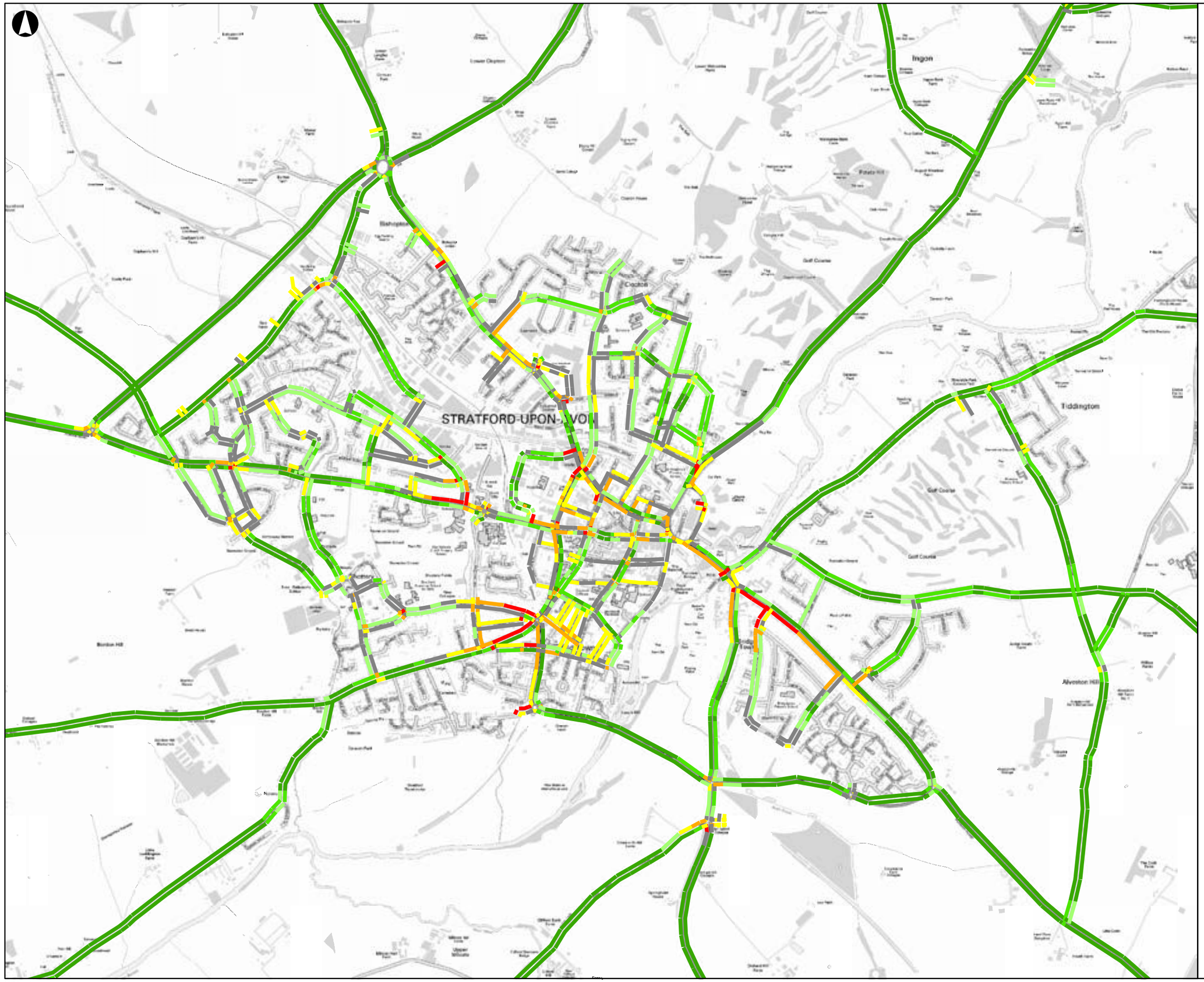
Job No	Drawing Status
211439-19	**Information**

Drawing No	Issue
Figure 36	**P1**

MXD Location

Appendix C

Development Only - Mean Speed Plots



Legend

Speeds Between

- 0 - 5 mph
- 5 - 10 mph
- 10 - 15 mph
- 15 - 20 mph
- 20 - 25 mph
- 25 - 30 mph
- above 30 mph

Issue	Date	By	Chkd	Appd
P1	13-06-12	MG	JE	JE

Metres

0 255 510 1,020

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Warwickshire County Council

Job Title

Strategic Transport Assessment

S2-NORTH C 2028 AM
Low Growth
Mean Speed Plot

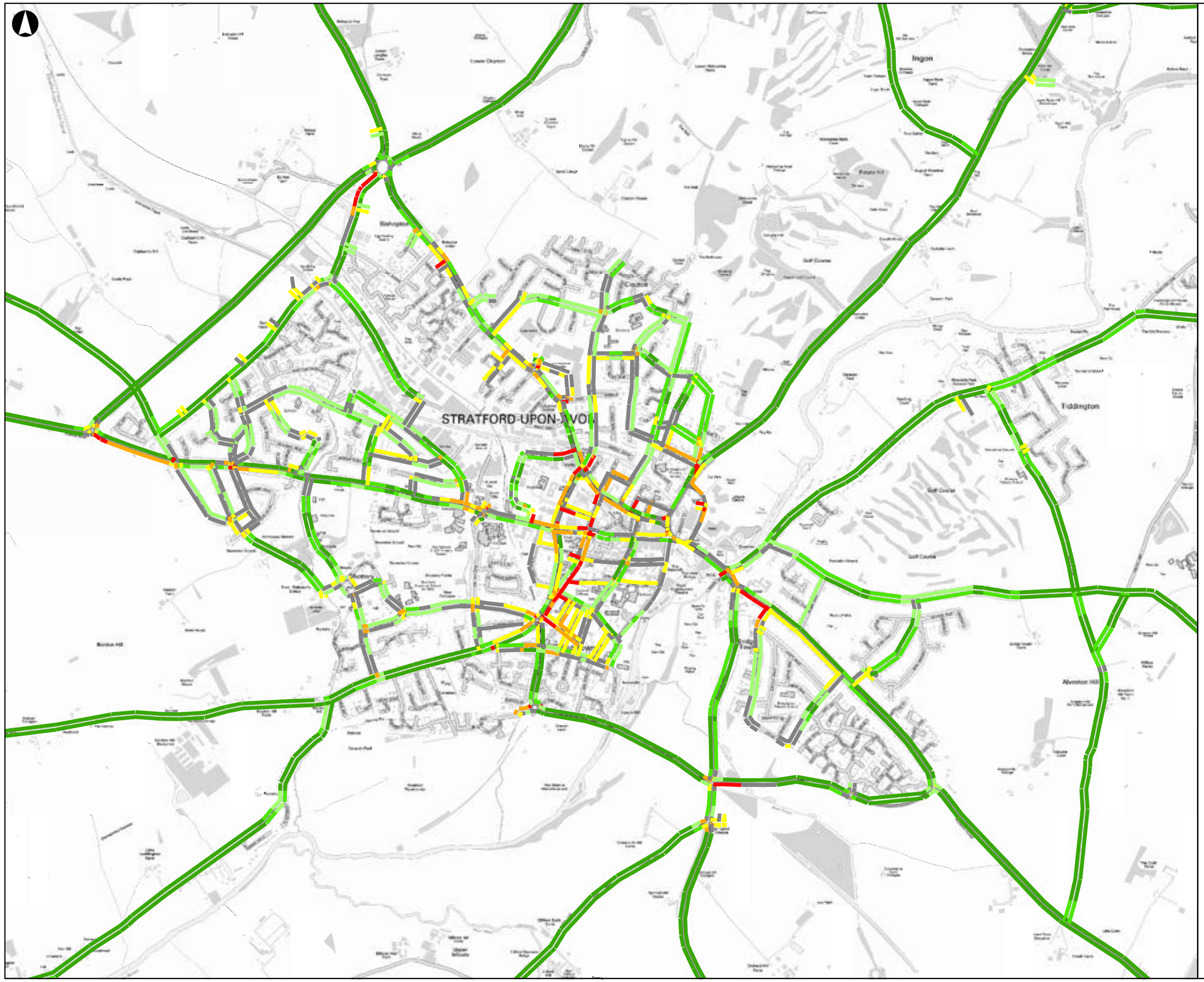
Scale at A3

NTS

Job No	Drawing Status
211439-19	**Information**

Drawing No	Issue
Figure 37	**P1**

MXD Location



Legend

Speeds Between

- 0 - 5 mph
- 5 - 10 mph
- 10 - 15 mph
- 15 - 20 mph
- 20 - 25 mph
- 25 - 30 mph
- above 30 mph

Issue	Date	By	Chkd	Appd
P1	13-06-12	MG	JE	JE

Metres

0 255 510 1,020

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Job Title

Strategic Transport Assessment

S2-NORTH C 2028 PM
Low Growth
Mean Speed Plot

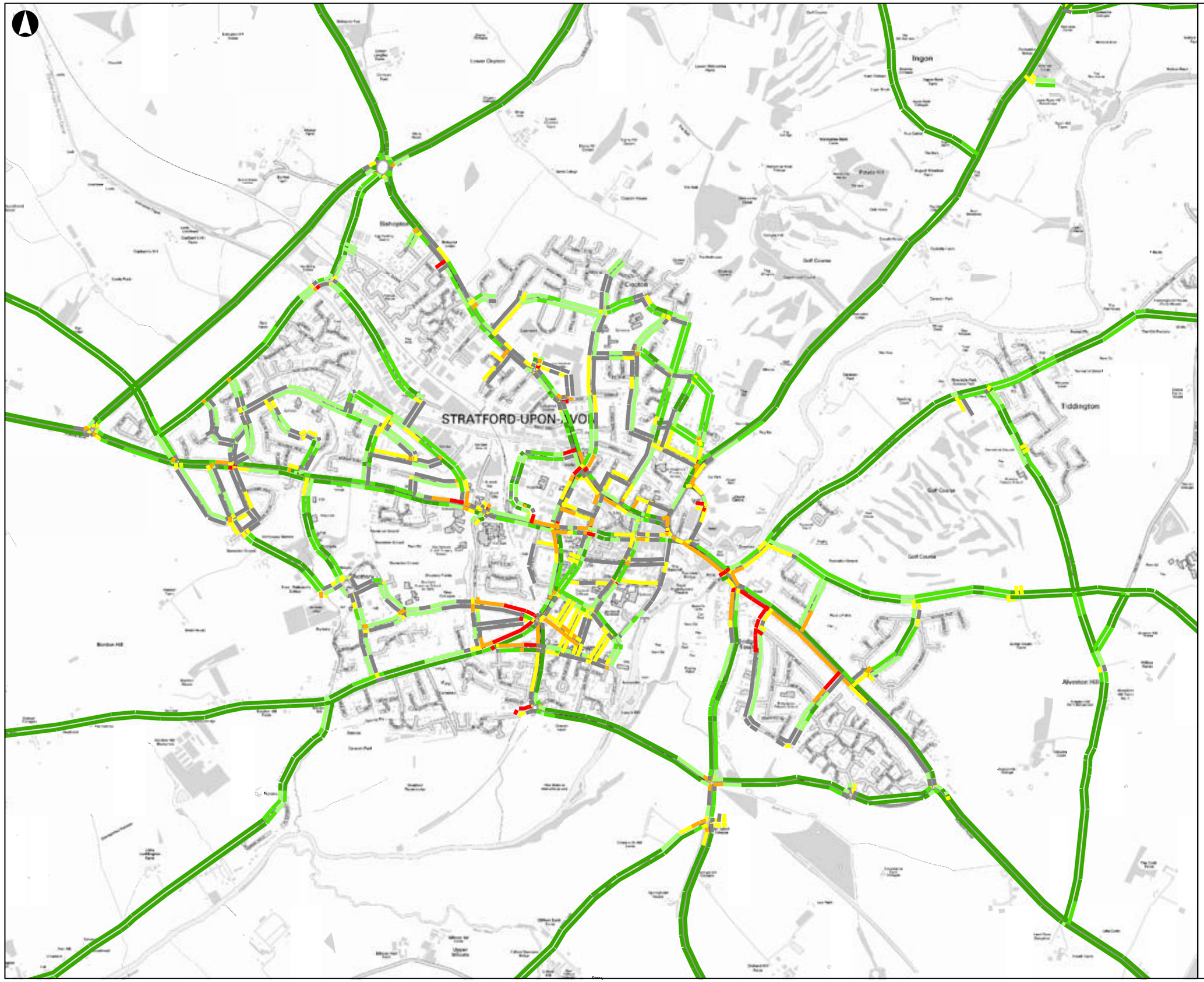
Scale at A3

NTS

Job No	Drawing Status
211439-19	**Information**

Drawing No	Issue
Figure 38	**P1**

MXD Location



Legend

Speeds Between

- 0 - 5 mph
- 5 - 10 mph
- 10 - 15 mph
- 15 - 20 mph
- 20 - 25 mph
- 25 - 30 mph
- above 30 mph

Issue	Date	By	Chkd	Appd
P1	13-06-12	MG	JE	JE

Metres

0 255 510 1,020

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Client

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Job Title

Strategic Transport Assessment

S2-EAST C 2028 AM
Low Growth
Mean Speed Plot

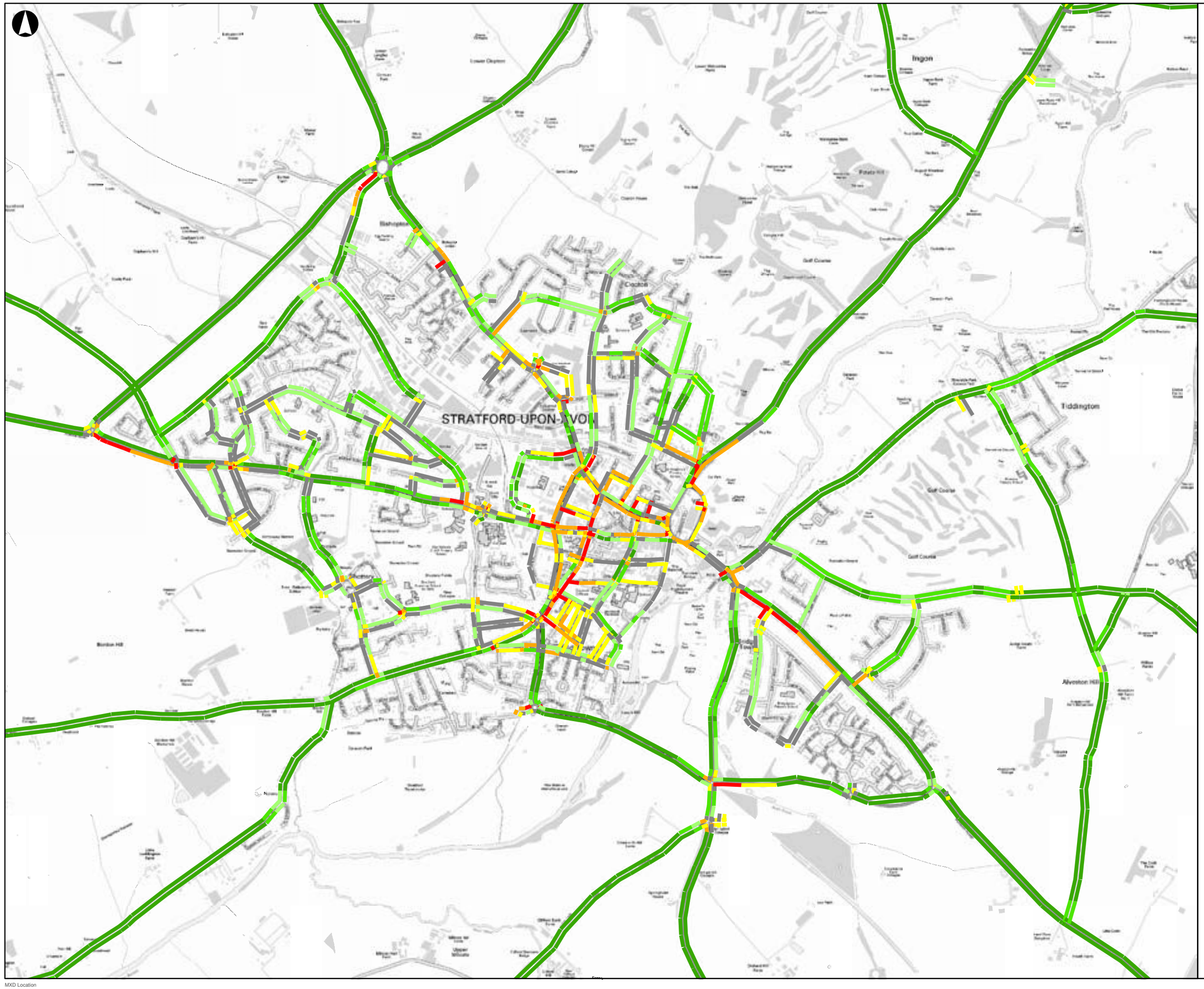
Scale at A3

NTS

Job No	Drawing Status
211439-19	**Information**

Drawing No	Issue
Figure 39	**P1**

MXD Location



Legend

Speeds Between

- 0 - 5 mph
- 5 - 10 mph
- 10 - 15 mph
- 15 - 20 mph
- 20 - 25 mph
- 25 - 30 mph
- above 30 mph

Issue	Date	By	Chkd	Appd
P1	13-06-12	MG	JE	JE

Metres

0 255 510 1,020

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S2-EAST C 2028 PM
Low Growth
Mean Speed Plot

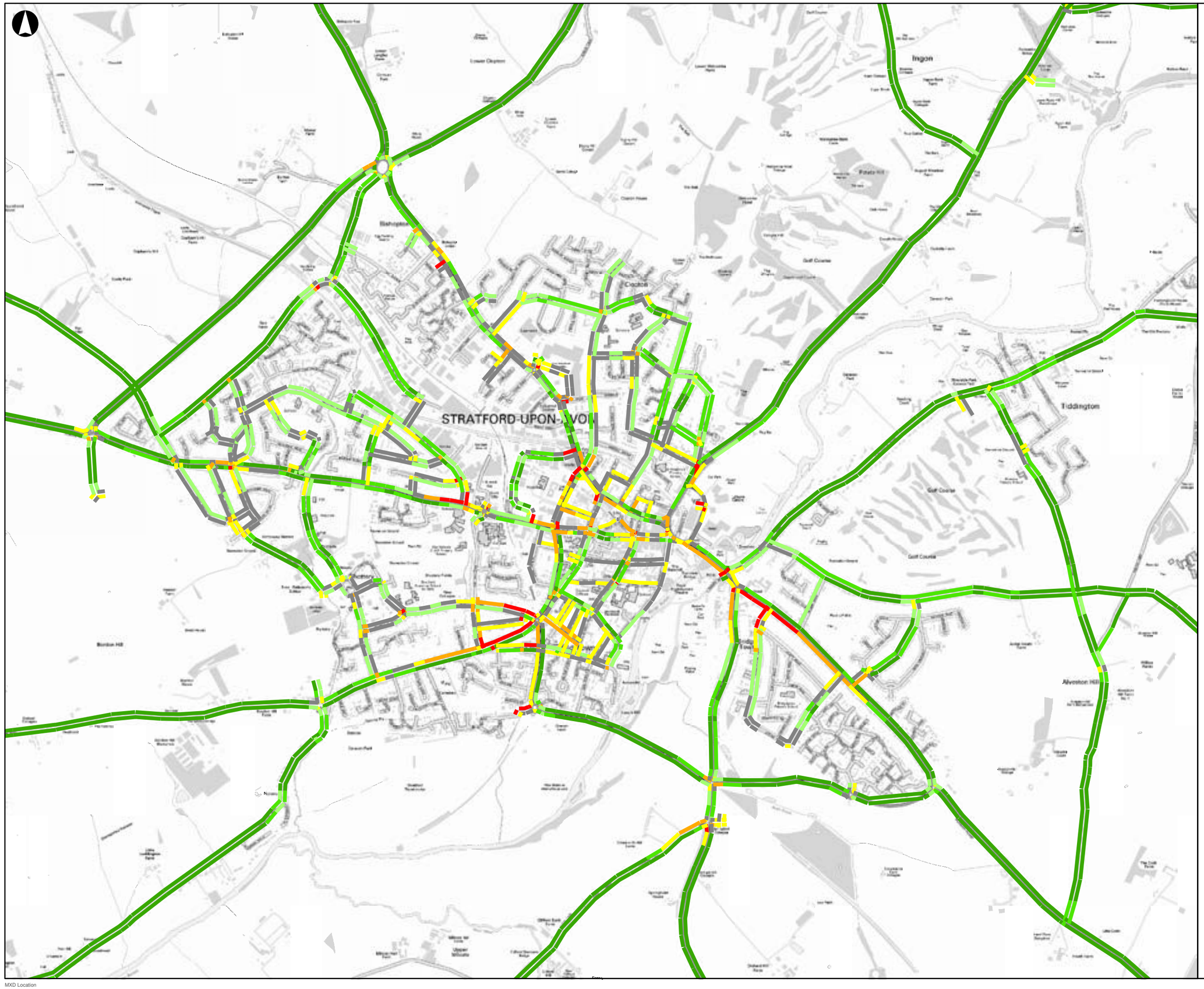
Scale at A3

NTS

Job No	Drawing Status
211439-19	**Information**

Drawing No	Issue
Figure 40	**P1**

MXD Location



Legend

Speeds Between

- 0 - 5 mph
- 5 - 10 mph
- 10 - 15 mph
- 15 - 20 mph
- 20 - 25 mph
- 25 - 30 mph
- above 30 mph

Issue	Date	By	Chkd	Appd
P1	13-06-12	MG	JE	JE

Metres

0 255 510 1,020

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Job Title

Strategic Transport Assessment

S2-WEST B 2028 AM
Medium Growth
Mean Speed Plot

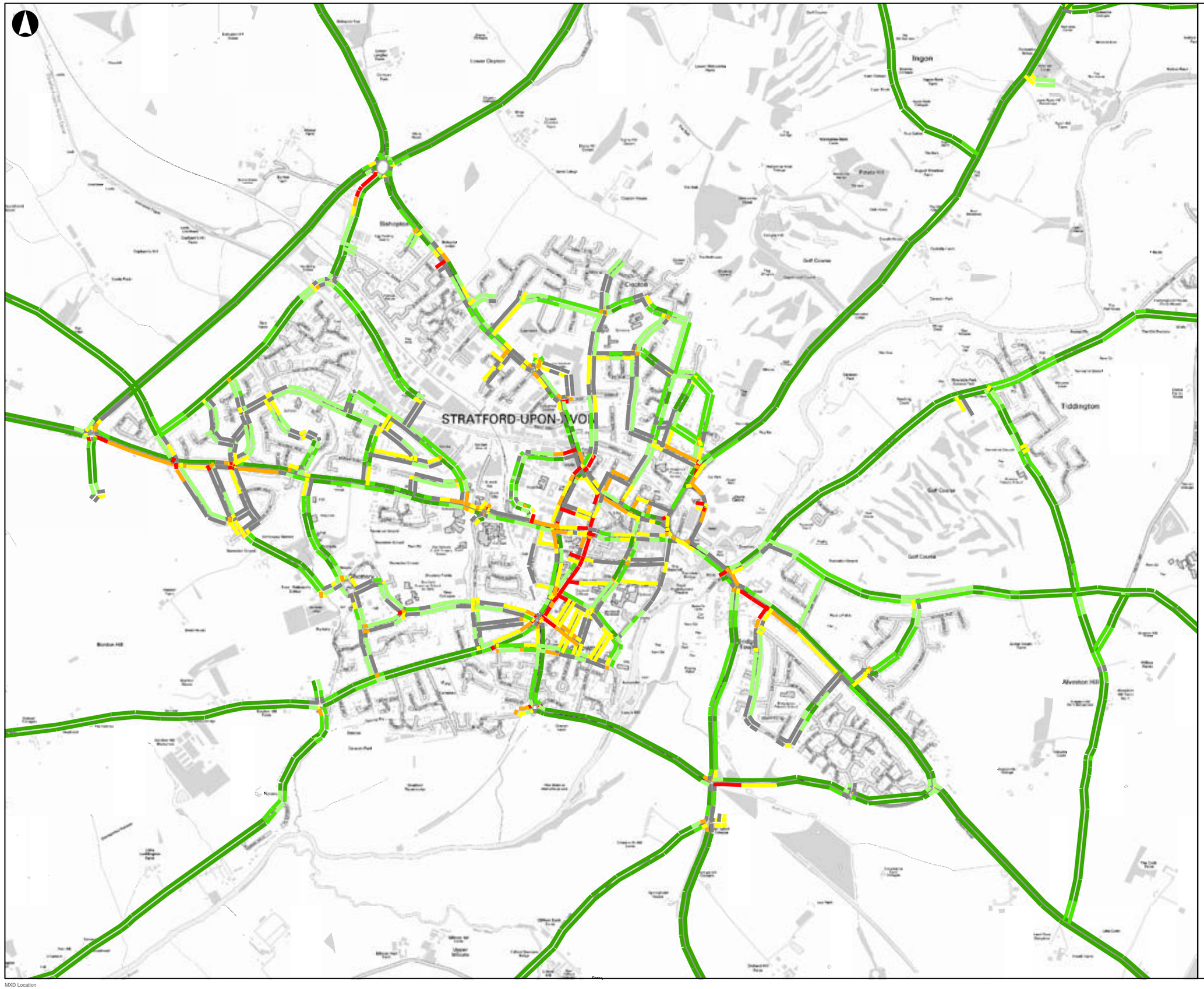
Scale at A3

NTS

Job No	Drawing Status
211439-19	**Information**

Drawing No	Issue
Figure 35	**P1**

MXD Location



Legend

Speeds Between

- 0 - 5 mph
- 5 - 10 mph
- 10 - 15 mph
- 15 - 20 mph
- 20 - 25 mph
- 25 - 30 mph
- above 30 mph

Issue	Date	By	Chkd	Appd
P1	13-06-12	MG	JE	JE

Metres

0 255 510 1,020

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Client

Warwickshire County Council

Job Title

Strategic Transport Assessment

S2-WEST C 2028 PM
Low Growth
Mean Speed Plot

Scale at A3

NTS

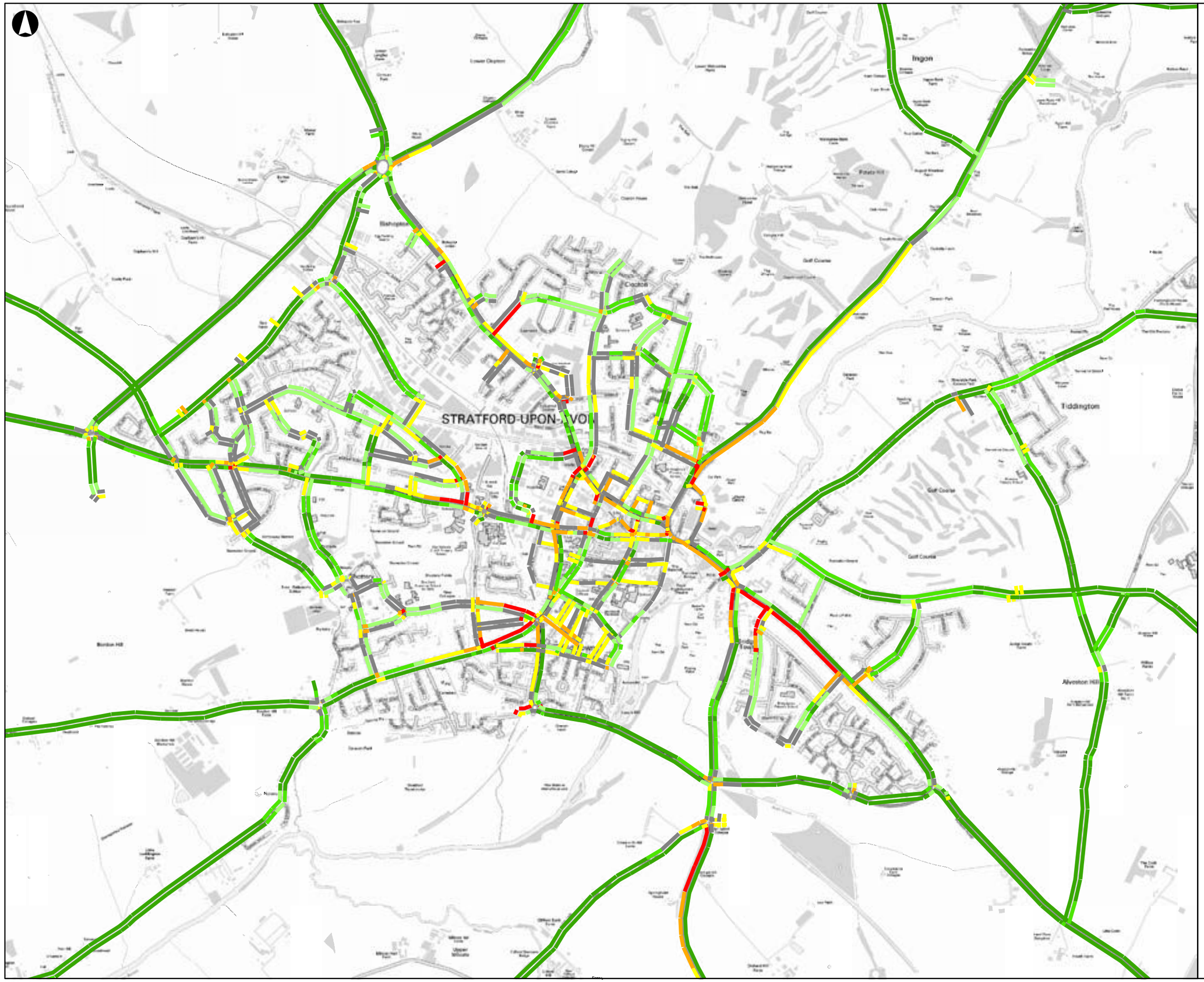
Job No	Drawing Status
211439-19	**Information**

Drawing No	Issue
Figure 42	**P1**

MXD Location

Appendix D

CITEware Analysis - Mean Speed Plots



Legend

Speeds Between

- 0 - 5 mph
- 5 - 10 mph
- 10 - 15 mph
- 15 - 20 mph
- 20 - 25 mph
- 25 - 30 mph
- above 30 mph

Issue	Date	By	Chkd	Appd
P1	13-06-12	MG	JE	JE

Metres

0 255 510 1,020

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Warwickshire County Council

Job Title

Strategic Transport Assessment

S3-001 F 2028 AM
High Growth
Mean Speed Plot

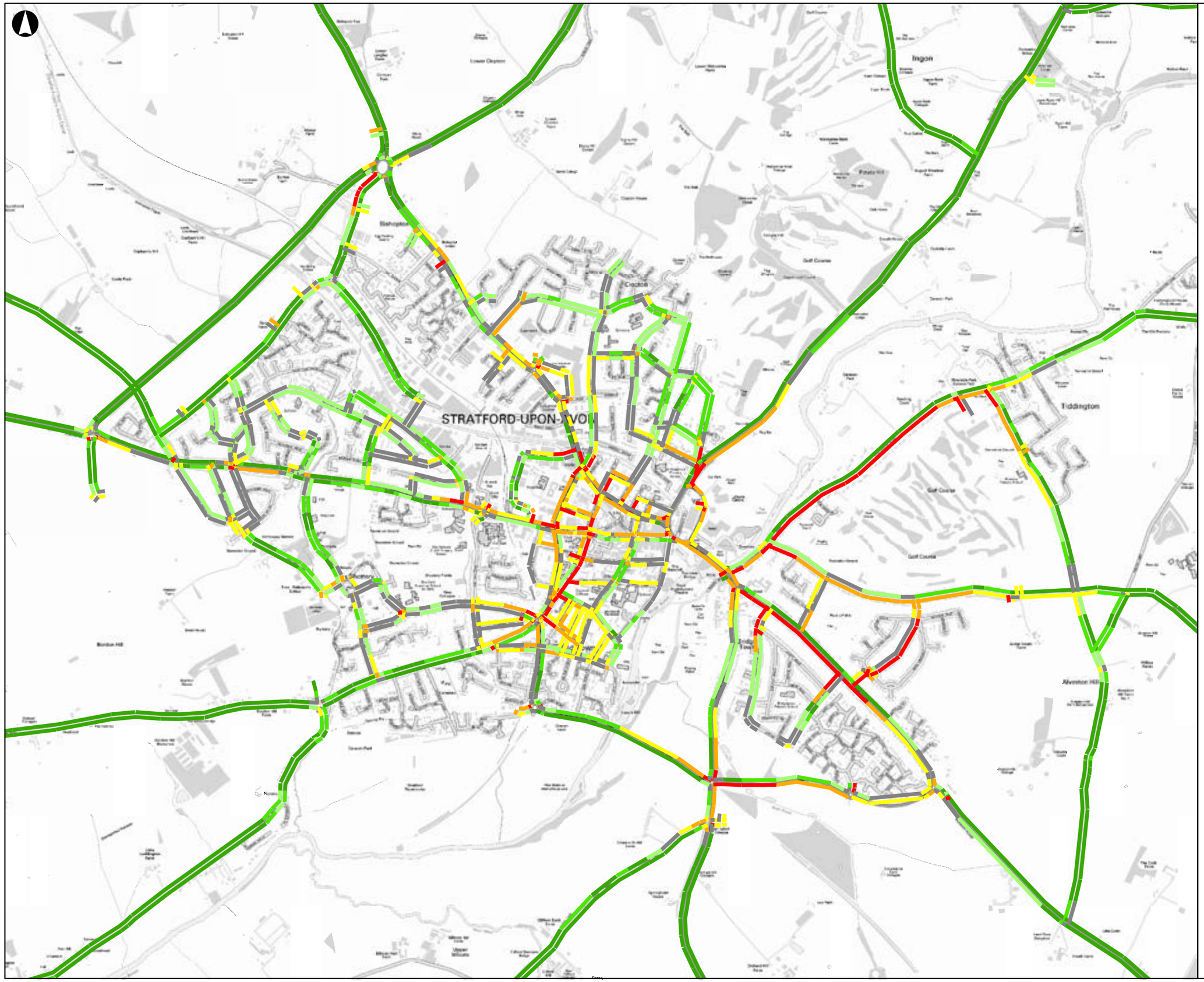
Scale at A3

NTS

Job No	Drawing Status
211439-19	**Information**

Drawing No	Issue
Figure 43	**P1**

MXD Location



Legend

Speeds Between

- 0 - 5 mph
- 5 - 10 mph
- 10 - 15 mph
- 15 - 20 mph
- 20 - 25 mph
- 25 - 30 mph
- above 30 mph

Issue	Date	By	Chkd	Appd
P1	13-06-12	MG	JE	JE

Metres

0 255 510 1,020

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Job Title

Strategic Transport Assessment

S3-001 F 2028 PM
High Growth
Mean Speed Plot

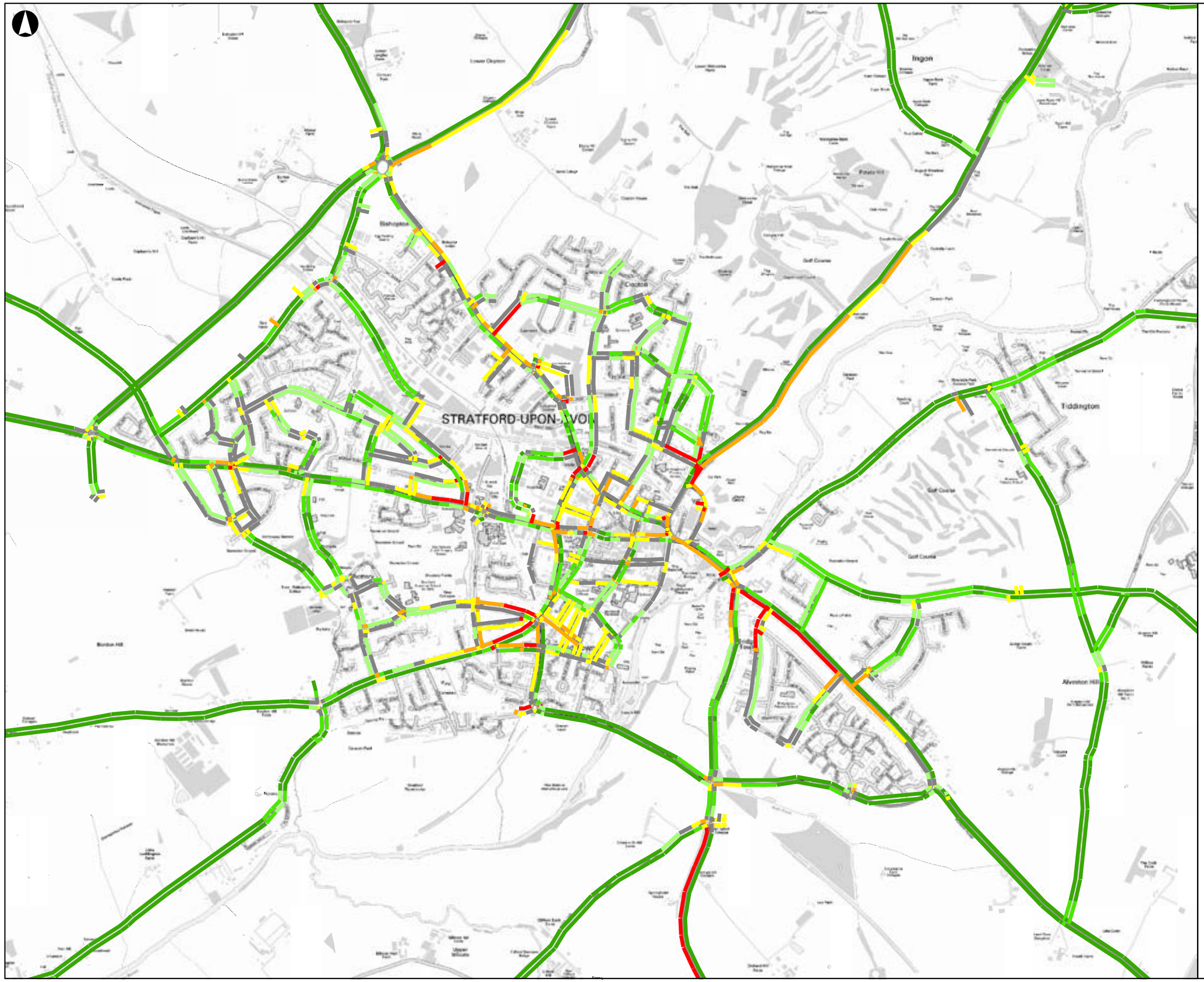
Scale at A3

NTS

Job No	Drawing Status
211439-19	**Information**

Drawing No	Issue
Figure 44	**P1**

MXD Location



Legend

Speeds Between

- 0 - 5 mph
- 5 - 10 mph
- 10 - 15 mph
- 15 - 20 mph
- 20 - 25 mph
- 25 - 30 mph
- above 30 mph

Issue	Date	By	Chkd	Appd
P1	24-07-12	MG	JE	JE

Metres

0 255 510 1,020

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Warwickshire County Council

Job Title

Strategic Transport Assessment

S3-002
Rural Brownfield AM
Mean Speed Plot

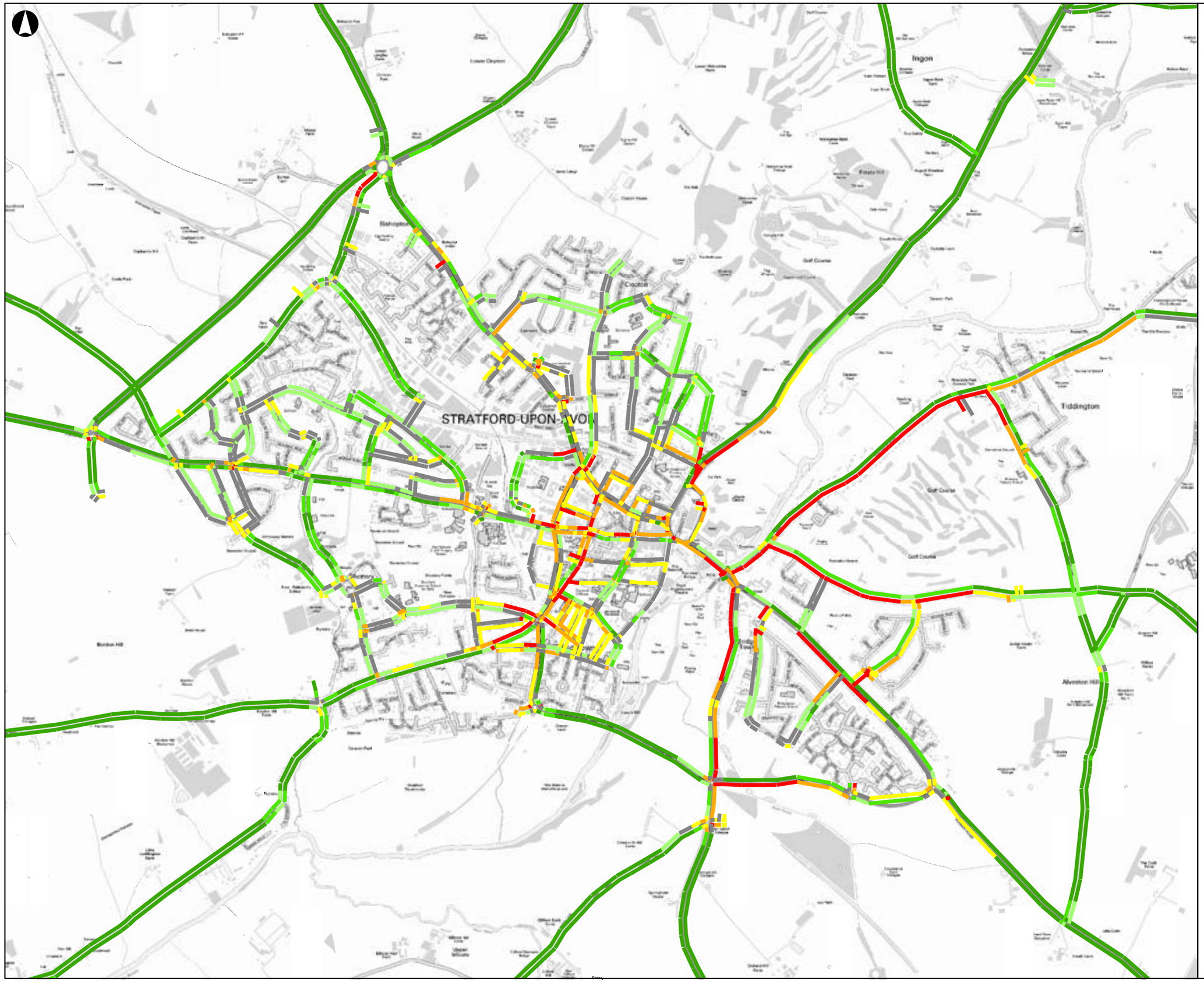
Scale at A3

NTS

Job No	Drawing Status
211439-19	**Information**

Drawing No	Issue
Figure 45	**P1**

MXD Location



Legend

Speeds Between

- 0 - 5 mph
- 5 - 10 mph
- 10 - 15 mph
- 15 - 20 mph
- 20 - 25 mph
- 25 - 30 mph
- above 30 mph

Issue	Date	By	Chkd	Appd
P1	24-07-12	MG	JE	JE

Metres

0 255 510 1,020

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Warwickshire County Council

Job Title

Strategic Transport Assessment

S3-002
Rural Brownfield PM
Mean Speed Plot

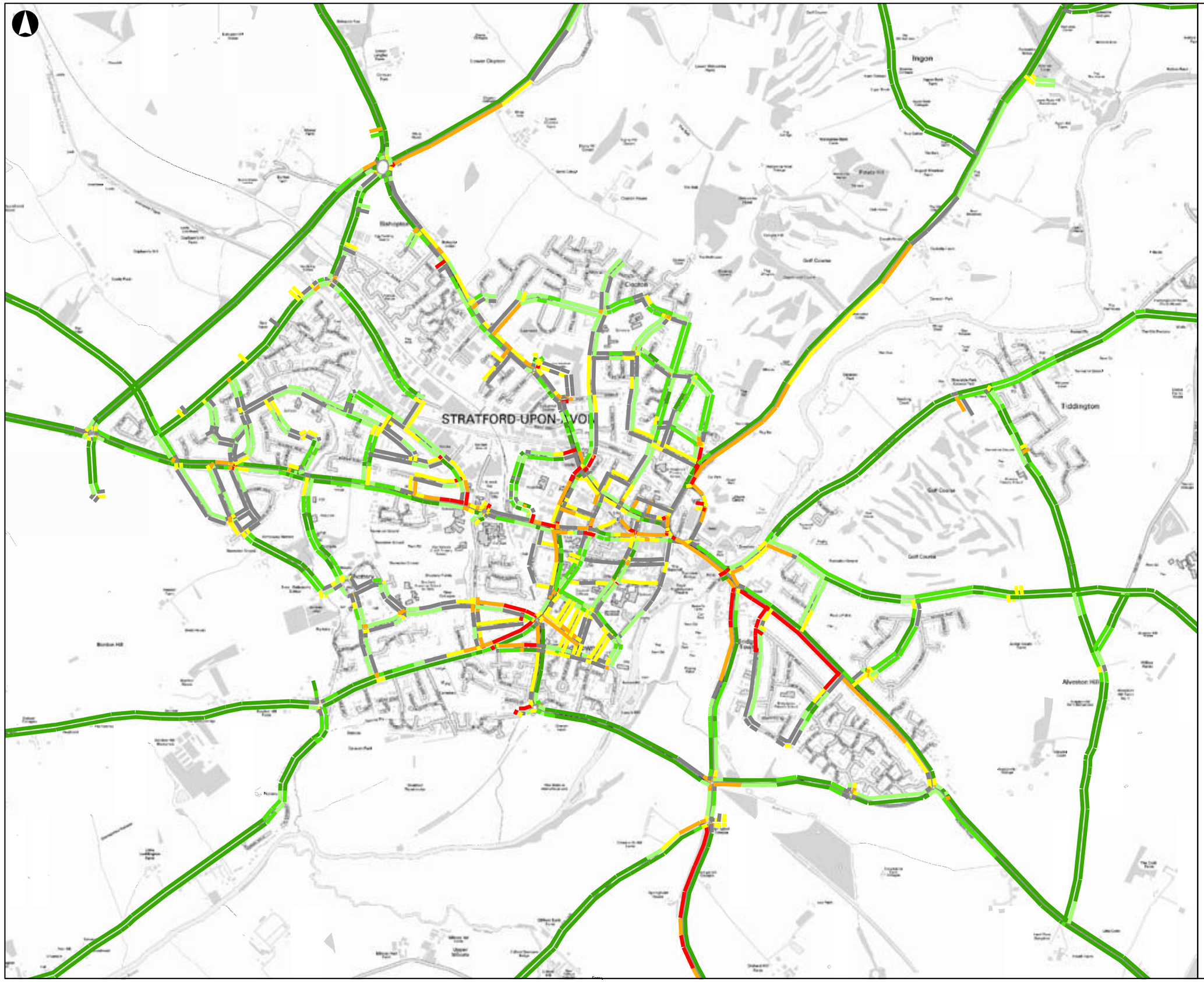
Scale at A3

NTS

Job No	Drawing Status
211439-19	**Information**

Drawing No	Issue
Figure 46	**P1**

MXD Location



Legend

Speeds Between

- 0 - 5 mph
- 5 - 10 mph
- 10 - 15 mph
- 15 - 20 mph
- 20 - 25 mph
- 25 - 30 mph
- above 30 mph

Issue	Date	By	Chkd	Appd
P1	24-07-12	MG	JE	JE

Metres

0 255 510 1,020

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Job Title

Strategic Transport Assessment

S3-003A
Gaydon Original Distribution AM
Mean Speed Plot

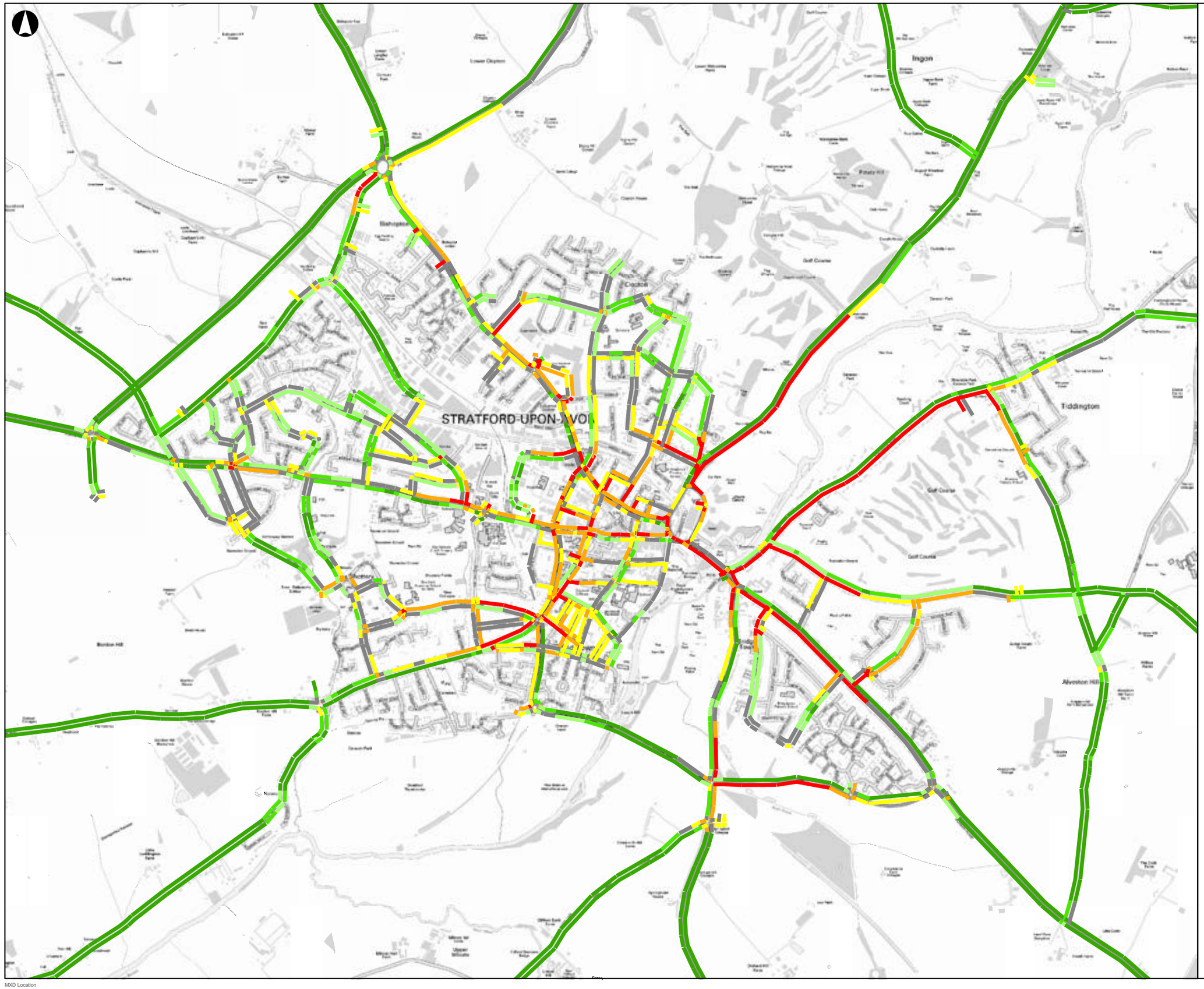
Scale at A3

NTS

Job No	Drawing Status
211439-19	**Information**

Drawing No	Issue
Figure 47	**P1**

MXD Location



Legend

Speeds Between

- 0 - 5 mph
- 5 - 10 mph
- 10 - 15 mph
- 15 - 20 mph
- 20 - 25 mph
- 25 - 30 mph
- above 30 mph

Issue	Date	By	Chkd	Appd
P1	24-07-12	MG	JE	JE

Metres

0 255 510 1,020

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Client

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Job Title

Strategic Transport Assessment

S3-003A
Gaydon Original Distribution PM
Mean Speed Plot

Scale at A3

NTS

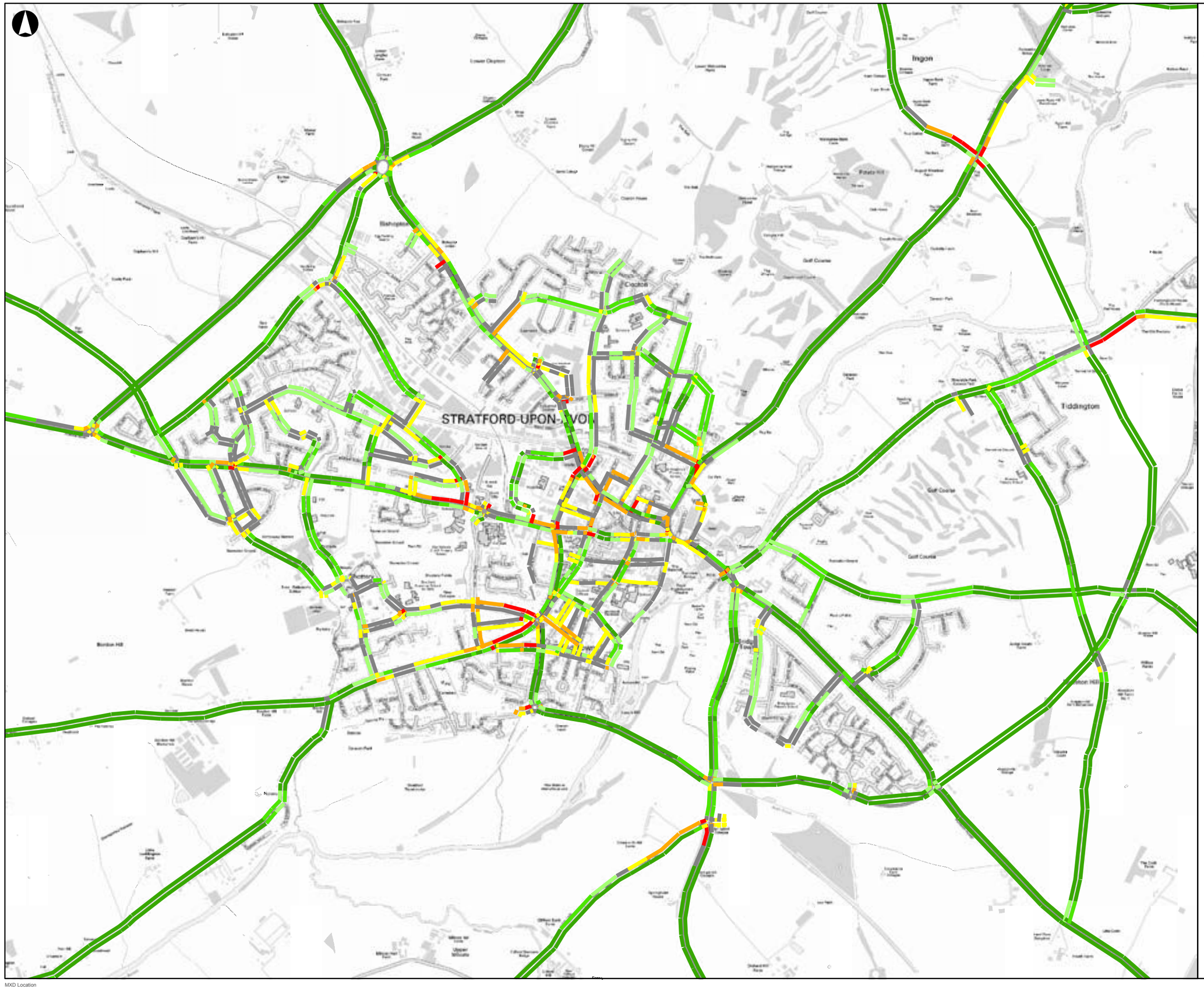
Job No	Drawing Status
211439-19	**Information**

Drawing No	Issue
Figure 48	**P1**

MXD Location

Appendix E

Mitigation Scheme Analysis
Mean Speed Plots



Legend

Speeds Between

- 0 - 5 mph
- 5 - 10 mph
- 10 - 15 mph
- 15 - 20 mph
- 20 - 25 mph
- 25 - 30 mph
- above 30 mph

Issue	Date	By	Chkd	Appd
P1	13-06-12	MG	JE	JE

Metres

0 255 510 1,020

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Client

Warwickshire County Council

Job Title

Strategic Transport Assessment

S4-EASTERN RELIEF ROAD A 2028 AM
High Growth
Mean Speed Plot

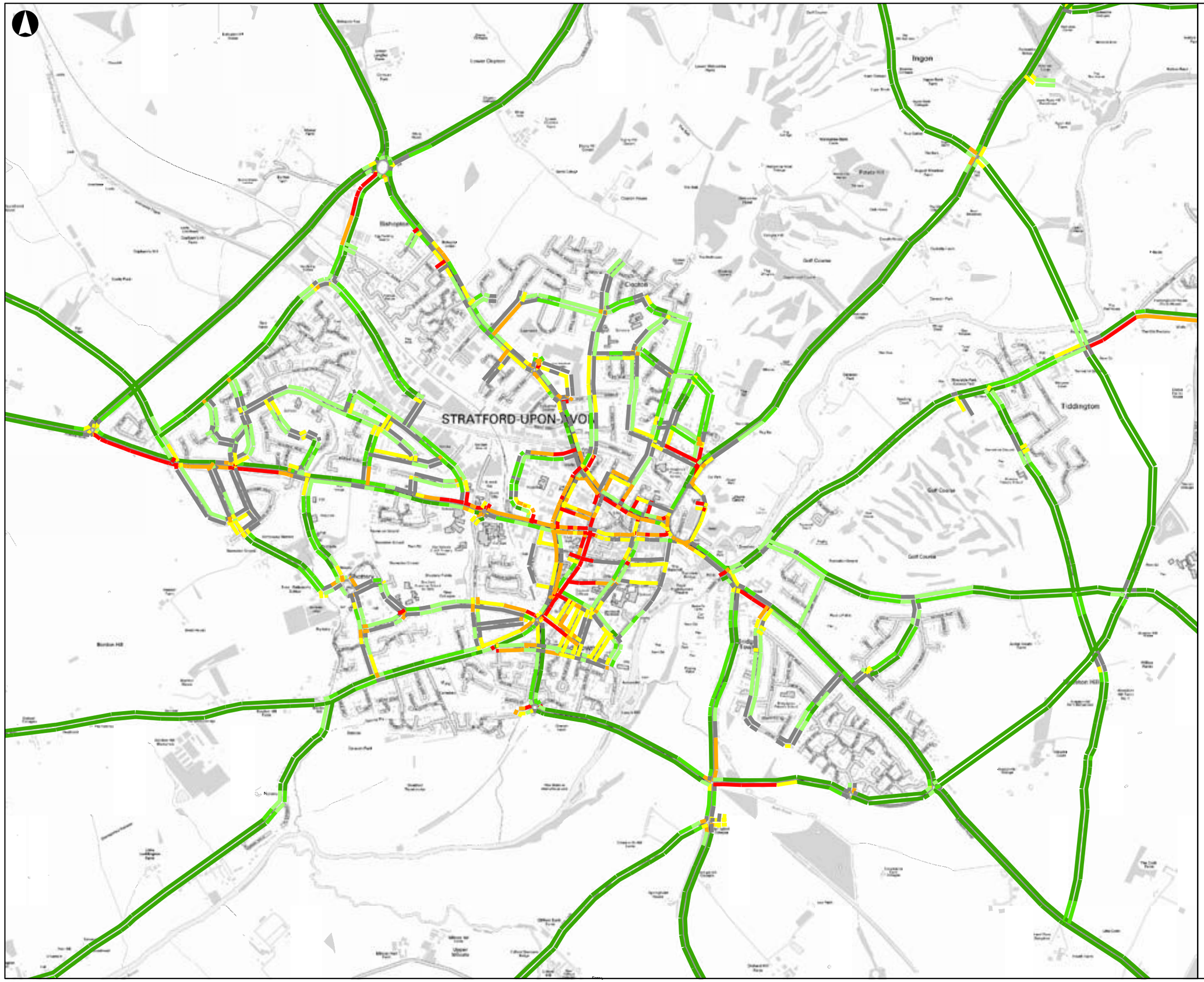
Scale at A3

NTS

Job No	Drawing Status
211439-19	**Information**

Drawing No	Issue
Figure 49	**P1**

MXD Location



Legend

Speeds Between

- 0 - 5 mph
- 5 - 10 mph
- 10 - 15 mph
- 15 - 20 mph
- 20 - 25 mph
- 25 - 30 mph
- above 30 mph

Issue	Date	By	Chkd	Appd
P1	13-06-12	MG	JE	JE

Metres

0 255 510 1,020

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Job Title

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S4-EASTERN RELIEF ROAD A 2028 PM
High Growth
Mean Speed Plot

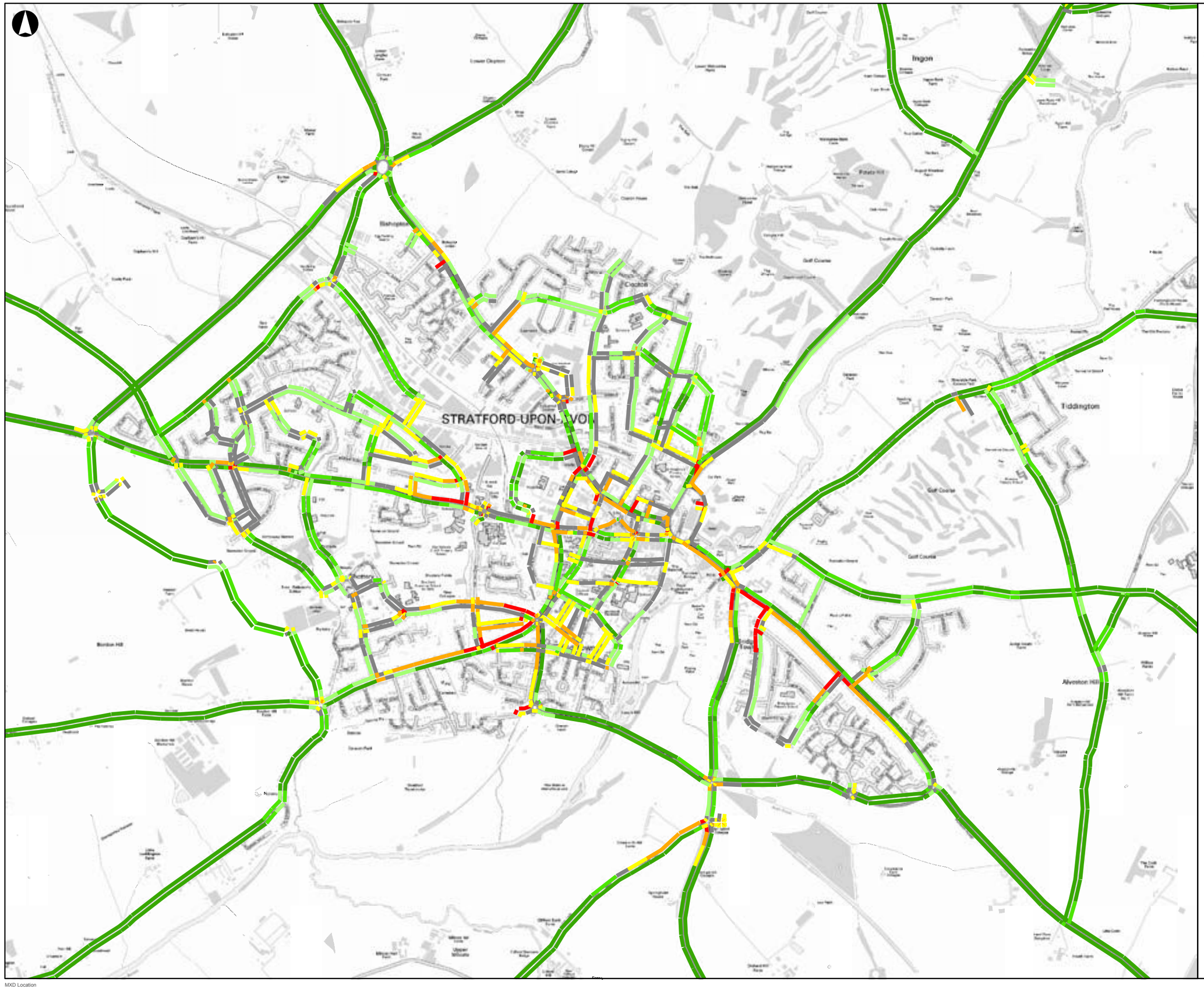
Scale at A3

NTS

Job No	Drawing Status
211439-19	**Information**

Drawing No	Issue
Figure 50	**P1**

MXD Location



Legend

Speeds Between

- 0 - 5 mph
- 5 - 10 mph
- 10 - 15 mph
- 15 - 20 mph
- 20 - 25 mph
- 25 - 30 mph
- above 30 mph

Issue	Date	By	Chkd	Appd
P1	13-06-12	MG	JE	JE

Metres

0 255 510 1,020

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Client

Warwickshire County Council

Job Title

Strategic Transport Assessment

S4-WESTERN RELIEF ROAD A 2028 AM
High Growth
Mean Speed Plot

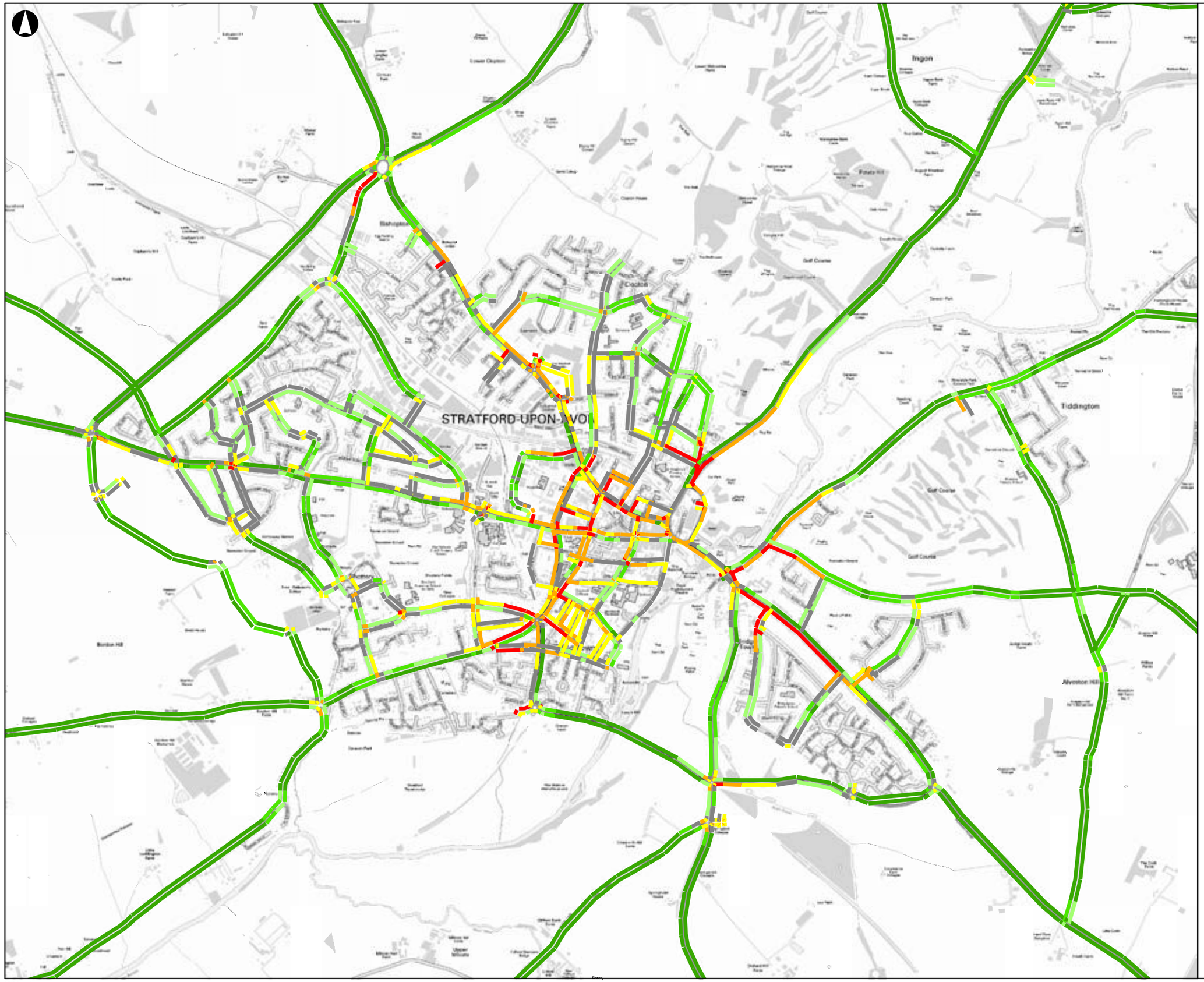
Scale at A3

NTS

Job No	Drawing Status
211439-19	**Information**

Drawing No	Issue
Figure 51	**P1**

MXD Location



Legend

Speeds Between

- 0 - 5 mph
- 5 - 10 mph
- 10 - 15 mph
- 15 - 20 mph
- 20 - 25 mph
- 25 - 30 mph
- above 30 mph

Issue	Date	By	Chkd	Appd
P1	13-06-12	MG	JE	JE

Metres

0 255 510 1,020

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Job Title

Strategic Transport Assessment

S4-WESTERN RELIEF ROAD A 2028 PM
High Growth
Mean Speed Plot

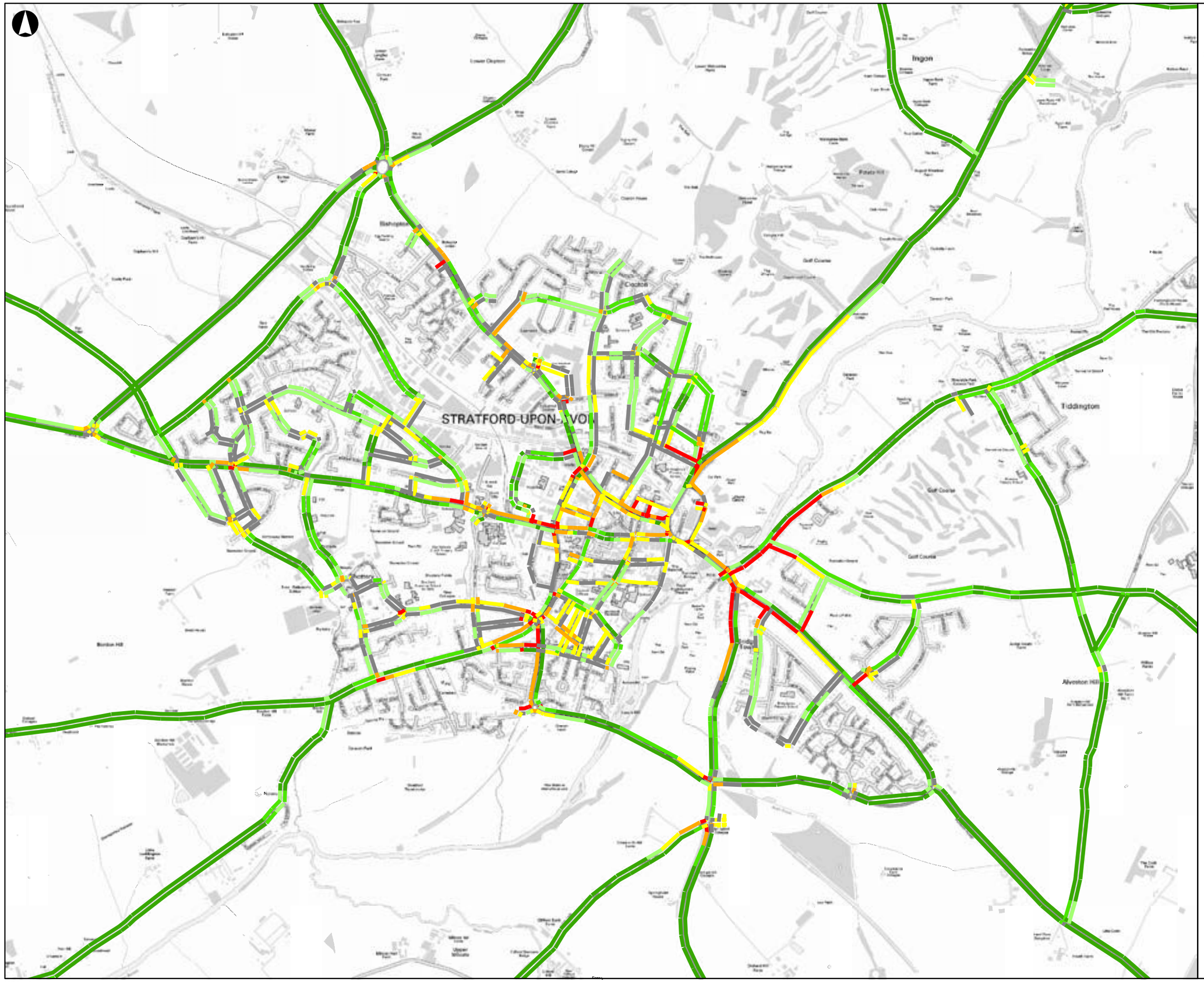
Scale at A3

NTS

Job No	Drawing Status
211439-19	**Information**

Drawing No	Issue
Figure 52	**P1**

MXD Location



Legend

Speeds Between

- 0 - 5 mph
- 5 - 10 mph
- 10 - 15 mph
- 15 - 20 mph
- 20 - 25 mph
- 25 - 30 mph
- above 30 mph

Issue	Date	By	Chkd	Appd
P1	13-06-12	MG	JE	JE

Metres

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Warwickshire County Council

Job Title

Strategic Transport Assessment

S4-TOWN CENTRE IMPROVEMENTS
A 2028 AM High Growth
Mean Speed Plot

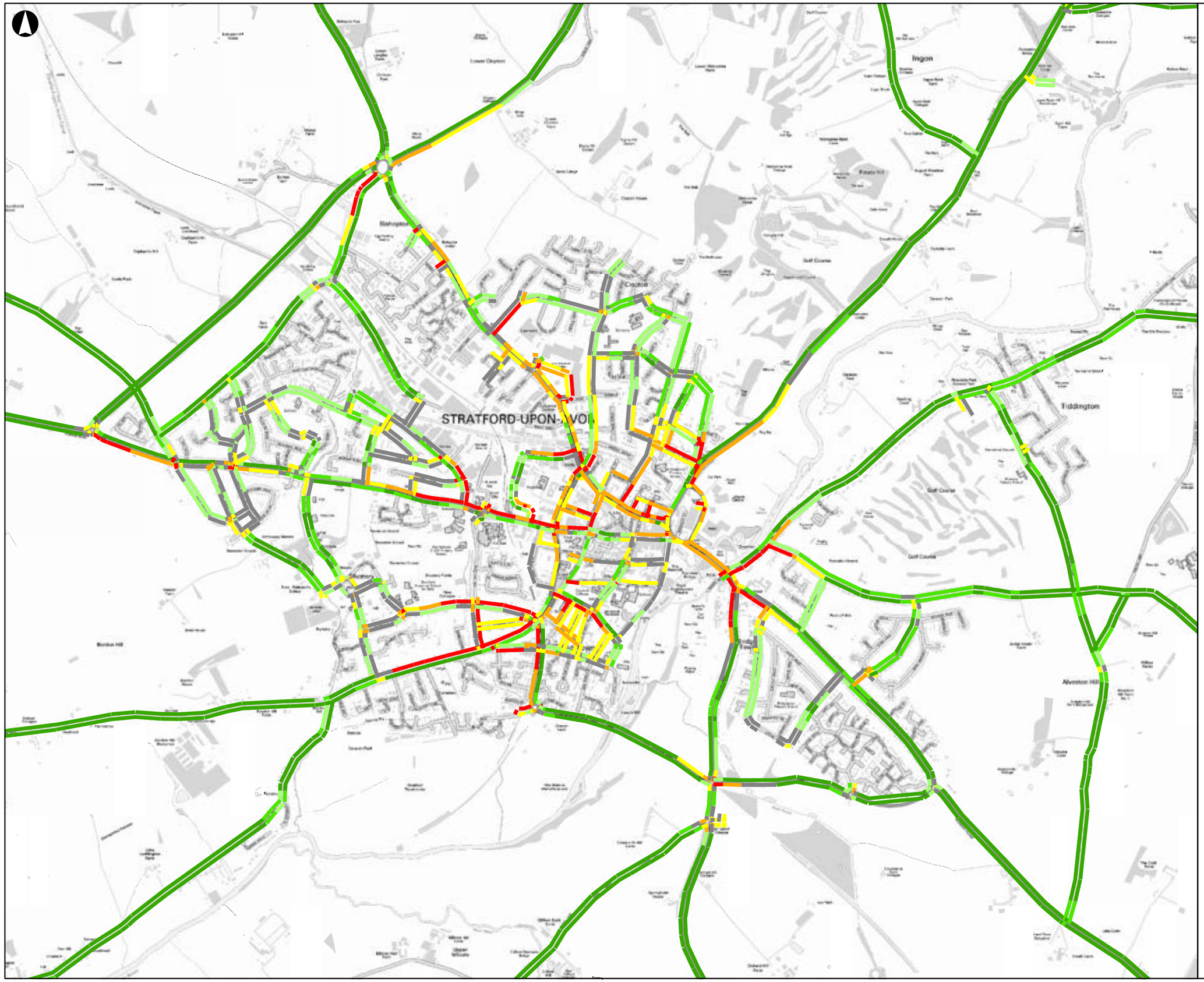
Scale at A3

NTS

Job No	Drawing Status
211439-19	**Information**

Drawing No	Issue
Figure 53	**P1**

MXD Location



Legend

Speeds Between

- 0 - 5 mph
- 5 - 10 mph
- 10 - 15 mph
- 15 - 20 mph
- 20 - 25 mph
- 25 - 30 mph
- above 30 mph

Issue	Date	By	Chkd	Appd
P1	13-06-12	MG	JE	JE

Metres

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Client

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Job Title

Strategic Transport Assessment

S4-TOWN CENTRE IMPROVEMENTS
A 2028 PM High Growth
Mean Speed Plot

Scale at A3

NTS

Job No	Drawing Status
211439-19	**Information**

Drawing No	Issue
Figure 54	**P1**

MXD Location

Appendix F

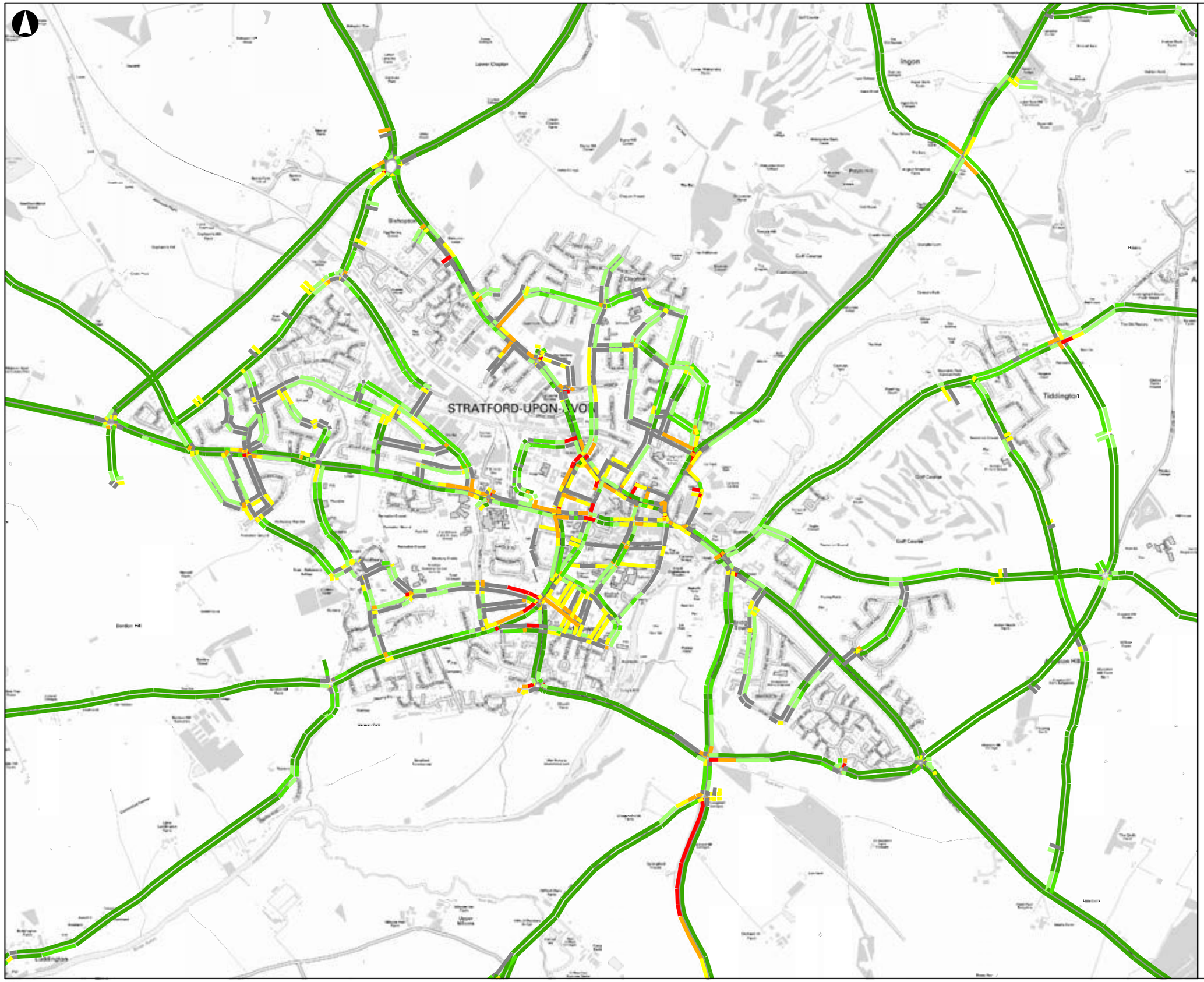
Town Centre Improvements - Scheme Overview

Indicative Town Centre Improvements

Scheme Location	Description	Rationale
Evesham Road/Evesham Place roundabout	Reconfiguration of the junction from a roundabout to a signal operated four arm priority junction	Potential capacity benefits of switching from a roundabout to traffic signal-controlled priority junction. Signalisation required due to the tidal nature of movements across the junction. During the AM heavy traffic flows are present northwards into Stratford whilst the opposite occurs in the PM. The use of signals allows the junction to be better tailored to the differing AM and PM conditions.
Signalisation of the Gyratory	Co-ordinated signalisation of Warwick Road, Bridge Foot and Bridge Street Junction entry arms (Guild Street antry and merge with Bridgefoot northbound already signalised).	Heavy flows out of Stratford via Guild Street northbound to Warwick Road coupled with a heavy flow into Stratford southbound from the Warwick Road results in limited opportunities for traffic to enter the junction via Bridge Foot or Bridge street which in turn results in severe queuing particularly along Clopton Bridge which extends back a significant distance along the Banbury Road. Signalisation provides a greater element of control which, in turn, enables these impacts to be better mitigated.
Tiddington Road/Swans Nest Lane /Banbury Road priority junction	Signalisation of the junction to co-ordinate with the Gyratory. Reconfiguration of the junction to enable traffic to turn right out of Tiddington road	Allowing traffic to turn right out of Tiddington Road removes the need for the u-turn at Banbury Road/Shipston Road which improves conditions at that junction. Reconfiguration of this junction, alongside the nearby Banbury Road/Shipston Road roundabout introduces a greater element of control over traffic movements and enables the tidal nature of the flow to be better accommodated.
Banbury Road/Shipston Road roundabout	Reconfiguration of existing roundabout to signalised priority junction with 3 lanes on the approaches from Banbury Road/Shipston Road	Scheme intended to work in tandem with Tiddington Road junction scheme that removes need for u-turn. Signalisation of the junction results in a greater element of control over the movement of traffic through the junction, particularly due to the tidal nature of the flow in that area during peak periods, the net result is increased throughput and notably lower queues on approaches when the scheme is implemented.
Grove Road/Rother Street	Redirection of flow by implementing a co-ordinated one way strategy. Grove Road becomes one way NB whilst Rother street becomes one way SB. Two lane SB approach extended from Rother Street to Evesham Place Roundabout	Queuing on Rother Street is frequently exacerbated by the limited opportunity for traffic travelling SB to exit onto Evesham Place, which, in turn results in lengthy queues that frequently block back through Greenhill Street and beyond. By making Grove Road one-way NB and Rother Street one-way SB the propensity for blocking back to occur is reduced significantly. Furthermore, the additional lanes provide additional storage capacity for any queues that do occur and they limit the propensity for queues to reach such an extent that they begin to impact upon the operation of adjacent major junctions.
Birmingham Road / Windsor Street	Reconfiguration of roundabout to priority junction with restricted movements.	Priority junction has no right turns which limits the propensity for vehicles to wait for gaps on what is becoming an increasingly busy section of road network. Removing the roundabout also discourages the use of Windsor Street NB in favour of Arden Street which, because of the signals, has a greater control over traffic movements due to signalisation.

Appendix G

Scenario 5 - Mean Speed Plots



Legend

Speeds Between

- 0 - 5 mph
- 5 - 10 mph
- 10 - 15 mph
- 15 - 20 mph
- 20 - 25 mph
- 25 - 30 mph
- above 30 mph

Issue	Date	By	Chkd	Appd
P1	23-07-12	MG	JE	JE

Metres

0 265 530 1,060

ARUP

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Client

Warwickshire County Council

Job Title

Strategic Transport Assessment

S3-004 9 2028 AM
High Growth
Mean Speed Plot

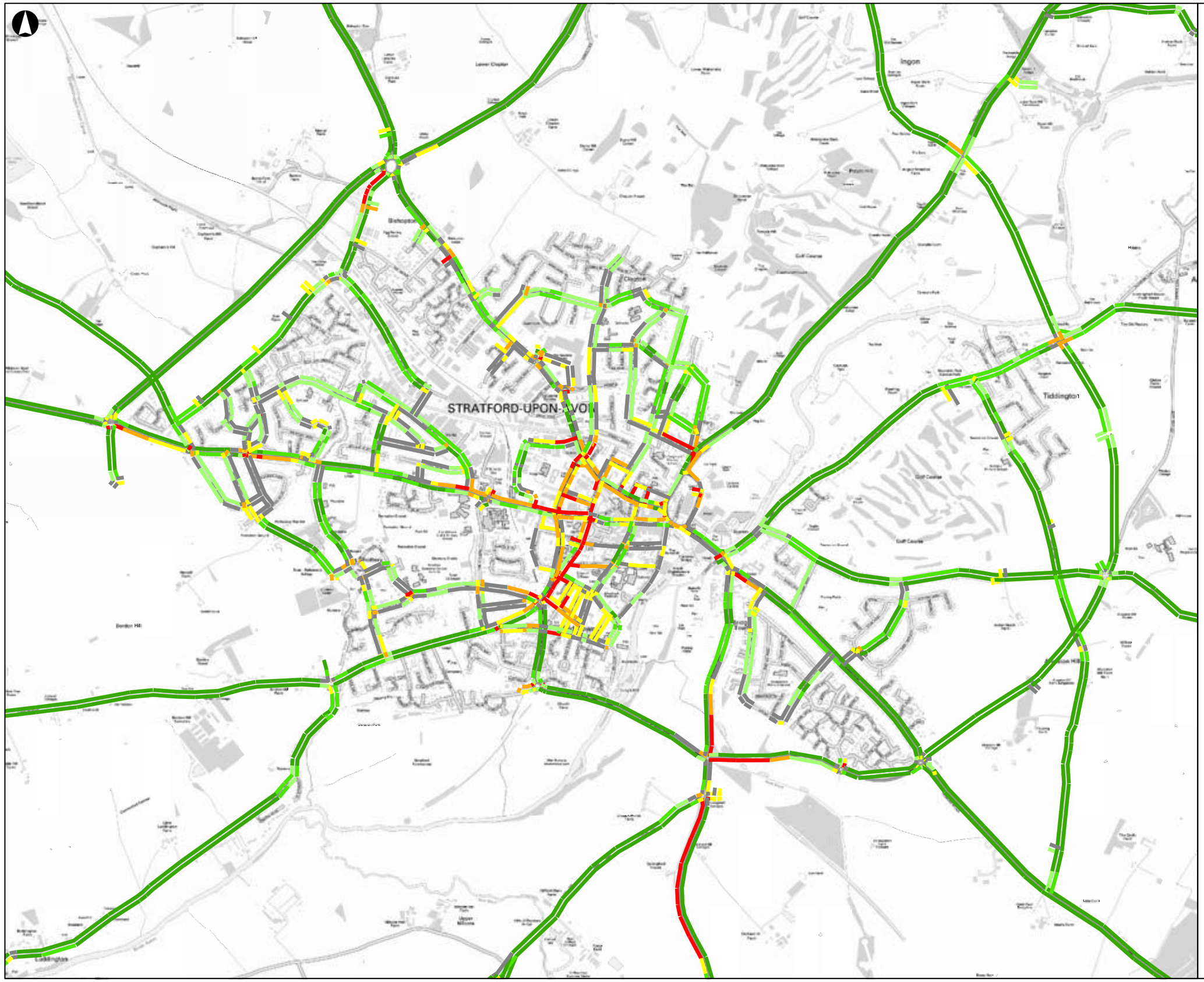
Scale at A3

NTS

Job No	Drawing Status
211439-19	**Information**

Drawing No	Issue
Figure 55	**P1**

MXD Location



Legend

Speeds Between

- 0 - 5 mph
- 5 - 10 mph
- 10 - 15 mph
- 15 - 20 mph
- 20 - 25 mph
- 25 - 30 mph
- above 30 mph

Issue	Date	By	Chkd	Appd
P1	23-07-12	MG	JE	JE

Metres

0 265 530 1,060

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Scale at A3

NTS

Job No	Drawing Status
211439-19	**Information**

Drawing No	Issue
Figure 56	**P1**

MXD Location