

Stratford upon Avon Third River Crossing Study –Town Centre

Scheme Testing

Introduction

1. This note builds on the work recently undertaken by Vectos Microsim (VM) to inform the appraisal of options pertaining to the provision of a Third River Crossing within Stratford upon Avon¹, which has, in turn, been supplemented with detailed analysis of the impacts of a Third River Crossing on trips across Stratford town centre².
2. A series of reports/technical notes have been produced which document the predicted impact of delivering various combinations of additional river crossing options using the 2031 Reference Case and 2031 Core Strategy model of Stratford upon Avon town and the surrounding area.
3. The initial study work revealed that, in a scenario whereby the Core Strategy housing allocation is delivered, the third river crossing option predicted to deliver the greatest benefits was the South-Western Relief Road (S-WRR).
4. It has been agreed with WCC that in terms of further testing from this point forwards that the Core Strategy scenario represents the most accurate future year scenario, and that the S-WRR would be the most likely scheme to be delivered.
5. This note explores the impact upon the town centre of implementing a number of measures designed to improve the accessibility for buses, along with improving the pedestrian and cyclist environment by removing traffic and reducing speed limits. It is anticipated that these measures would be delivered alongside a Third River Crossing (S-WRR).
6. This report explores the impact of delivering the proposed schemes, detailed in this note, in terms of the volume of traffic flows across the town centre, and network wide, along with comparing the impact on the levels of queueing at key junctions across the network.
7. The town centre schemes tested, along with the impact of each scheme have been outlined in the following section of this note.

Scheme Testing

8. Following discussions with WCC it was agreed that a number of schemes, designed to be delivered alongside the third river crossing, would be tested within the modelling. It was intended that the schemes would be designed to benefit non-motorised users or public transport within the town centre, largely via the reallocation of road space away from the traditional car use, and would be delivered in an incremental manner.
9. The schemes included within this assessment are as follows:

¹ VM155036 R001 High Level Option Appraisal Report

² VM155036 R002 Town Centre Trip Analysis

- **Scheme 1** - Making High Street/Chapel Street/Church Street one-way northbound between Chestnut Walk and Wood Street/Bridge Street
- **Scheme 2** - Restricting traffic on Wood Street/Bridge Street
- **Scheme 3** - Making Wood Street/Bridge Street bus only
- **Scheme 4** - Applying a 20mph speed restriction across the town centre

** Including a scheme which involved the modification of the Evesham Road/Shottery Road/Seven Meadows Road junction in order to ban the right turn from Evesham Road into Seven Meadows Road and reduce the overall junction footprint, had been discussed with WCC, however, it was established that this had already been included within the Core Strategy models as part of the Stratford Transport Package*

10. The above schemes have been tested within the 2031 Core Strategy + S-WRR model which, for the purposes of this assessment, provides the Reference Case. On this basis the following scenarios have been created:

- **Scenario 1** – Reference Model (Core Strategy + S-WRR)
- **Scenario 2** – Reference Model + Scheme 1
- **Scenario 3** – Reference Model + Scheme 1 + Scheme 2
- **Scenario 4** - Reference Model + Scheme 1 + Scheme 2 + Scheme 3
- **Scenario 5** - Reference Model + Scheme 1 + Scheme 2 + Scheme 3 + Scheme 4

Town Centre Flow Difference Analysis

11. The following tables present the differences in absolute numbers in flows travelling to/from or through the town centre, in each of the scenarios tested, within the AM and PM peak hours (0800-0900 and 1700-1800).
12. The tables highlight the where flows have reduced in green, and the locations at which flows have increased, in red, for each scenario compared to the Reference Case, at a series of links within the town centre.
13. The links assessed are outlined within Figure 1, whilst the flow differences presented in Tables 1 and 2.

Figure 1 Link Locations Analysed

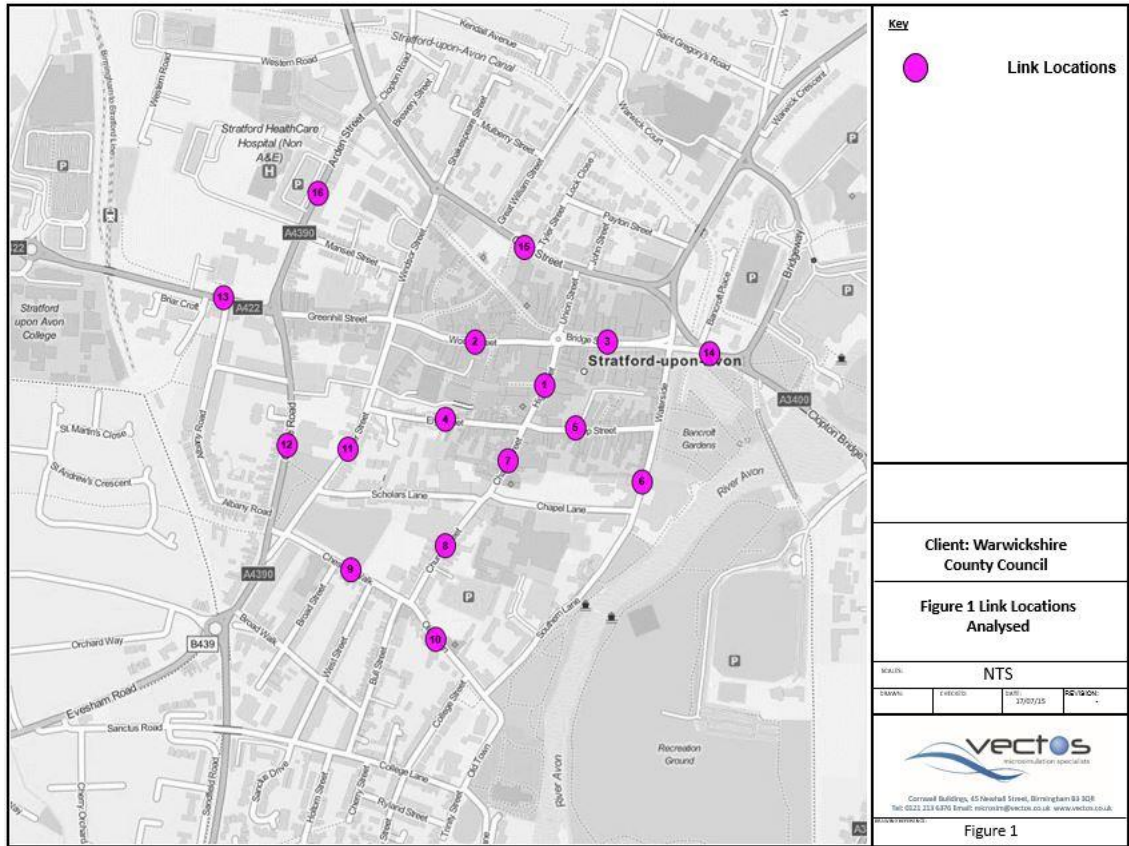


Table 1 Town Centre Links Flow Differences (compared to Reference Case) – AM Peak Hour

Ref	Link	Scenario 2	Scenario 3	Scenario 4	Scenario 5
1	High Street NB	24	-44	-138	-196
	High Street SB	-153	-153	-153	-153
2	Wood Street EB	8	-190	-243	-243
	Wood Street WB	85	-165	-189	-190
3	Bridge Street EB	26	-228	-396	-397
	Bridge Street WB	-51	-295	-337	-337
4	Ely Street WB	-33	-27	-28	-28
5	Sheep Street WB	-5	-12	-1	-3
	Sheep Street EB	-7	-15	-12	-20
6	Waterside SB	1	19	35	60
7	Chapel Street NB	-2	-4	-1	-3
8	Church Street NB	83	28	-77	-144
	Church Street SB	-56	-56	-56	-56
9	Chestnut Walk WB	-33	-6	36	76
	Chestnut Walk EB	88	50	5	-58
10	Old Town NB	-13	-17	13	21
	Old Town SB	-2	-1	-2	-1
11	Rother Street NB	1	-14	15	7
	Rother Street SB	79	60	53	-54
12	A4390 NB	6	-32	-40	-85
	A4390 SB	31	22	20	54
13	Alcester Road EB	2	-39	-57	-108
	Alcester Road WB	-13	-49	-29	-56
14	Bridge Foot NB	-9	-46	12	33
	Bridge Foot SB	6	-32	-62	-53
15	Guild Street WB	-11	42	48	75
	Guild Street EB	13	-23	-25	-12
16	Arden Street NB	0	40	56	13
	Arden Street SB	18	11	14	21

14. Table 1 highlights that, during the AM peak hour, the introduction of all of the schemes assessed largely reduces traffic across the town centre. Significant reductions are observed at Wood Street, Bridge Street and High Street, due to the restrictions applied, (particularly in Scenario 4 and 5).
15. The most significant increase in traffic flows during the AM peak hour occurs on Waterside, Chestnut Walk and Guild Street, as traffic re-routes to avoid link restrictions applied as part of the scheme.

Table 2 Town Centre Links Flow Differences (compared to Reference Case) – PM Peak Hour

Ref	Link	Scenario 2	Scenario 3	Scenario 4	Scenario 5
1	High Street NB	43	-6	-74	-117
	High Street SB	-174	-174	-174	-174
2	Wood Street EB	-62	-220	-248	-248
	Wood Street WB	104	-135	-264	-265
3	Bridge Street EB	15	-148	-243	-245
	Bridge Street WB	-35	-255	-354	-354
4	Ely Street WB	-30	-25	-18	-17
5	Sheep Street WB	-9	-17	-35	-38
	Sheep Street EB	-17	-21	-24	-23
6	Waterside SB	27	121	191	188
7	Chapel Lane EB	3	4	1	1
8	Church Street NB	103	77	45	6
	Church Street SB	-83	-83	-83	-83
9	Chestnut Walk WB	-77	12	94	95
	Chestnut Walk EB	81	70	54	49
10	Old Town NB	1	79	150	133
	Old Town SB	-3	-2	-2	-2
11	Rother Street NB	-2	35	95	79
	Rother Street SB	90	29	40	-48
12	A4390 NB	1	4	-17	-4
	A4390 SB	37	-16	-26	28
13	Alcester Road EB	-16	-36	-32	-54
	Alcester Road WB	11	-44	-48	-65
14	Bridge Foot NB	-8	-105	-102	-77
	Bridge Foot SB	5	-27	-22	-7
15	Guild Street NB	4	-16	0	10
	Guild Street SB	-16	49	84	98
16	Arden Street NB	-11	42	48	75
	Arden Street SB	13	-23	-25	-12

16. Table 2 highlights that during the PM peak hour, the introduction of the schemes reduces traffic across a number of sites within the town centre. Significant reductions are observed at Wood Street, Bridge Street and High Street, due to the restrictions applied, (particularly in Scenario 4 and 5).
17. There are some instances of increases in traffic flows during the PM peak hour, modelled on Waterside, Chestnut Walk, Old Town, Rother Street, Arden Street and Guild Street.
18. The largest increases in flows appears to be on Waterside (SB) and Old Town (NB) which occur in Scenario 4 and 5 (with the introduction of the bus only links on Wood Street and Bridge Street). It would appear that traffic uses these link to rat-run through the town centre, to avoid the enforced vehicle restrictions on Bridge Street/Wood Street and High Street.

Network Wide Flow Difference Analysis

19. Alongside presenting the differences in town centre traffic flows as a result of the introduction of each of the scheme assessed, it is possible to present the differences in flows across the entire model network in each of the scenarios.
20. The following plots present the AM and PM peak hour (0800-0900 and 1700-1800) flow differences across the entire network, when comparing each of the scenarios assessed to the Reference Case (Core Strategy + S-WRR). These plots are also presented in Appendix A.

Reference Case vs Scenario 2

Figure 2 Flow Difference Plot – Reference vs Scenario 2 (0800-0900)

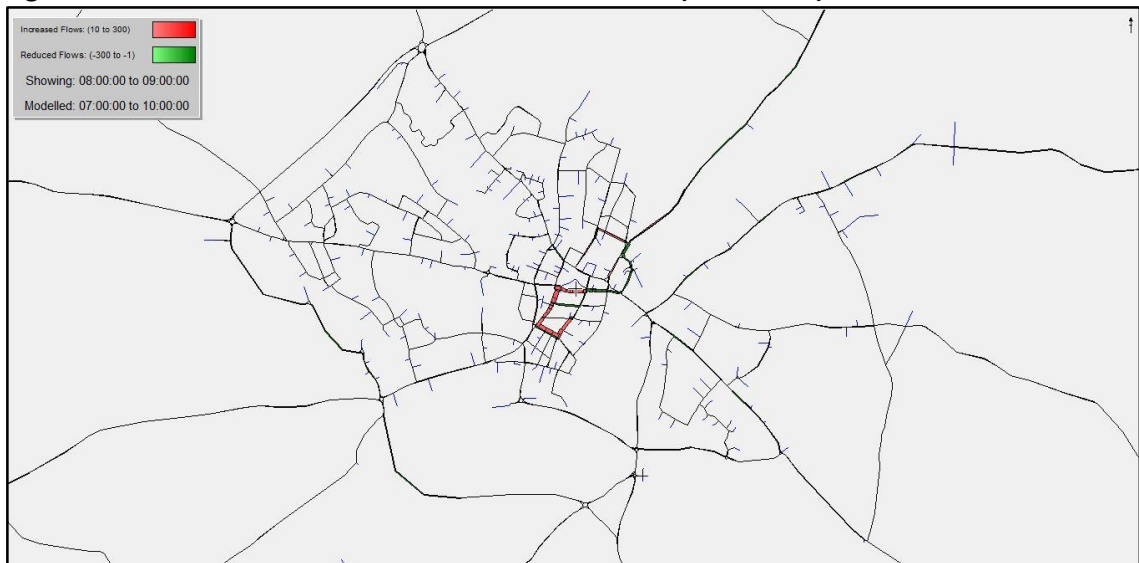
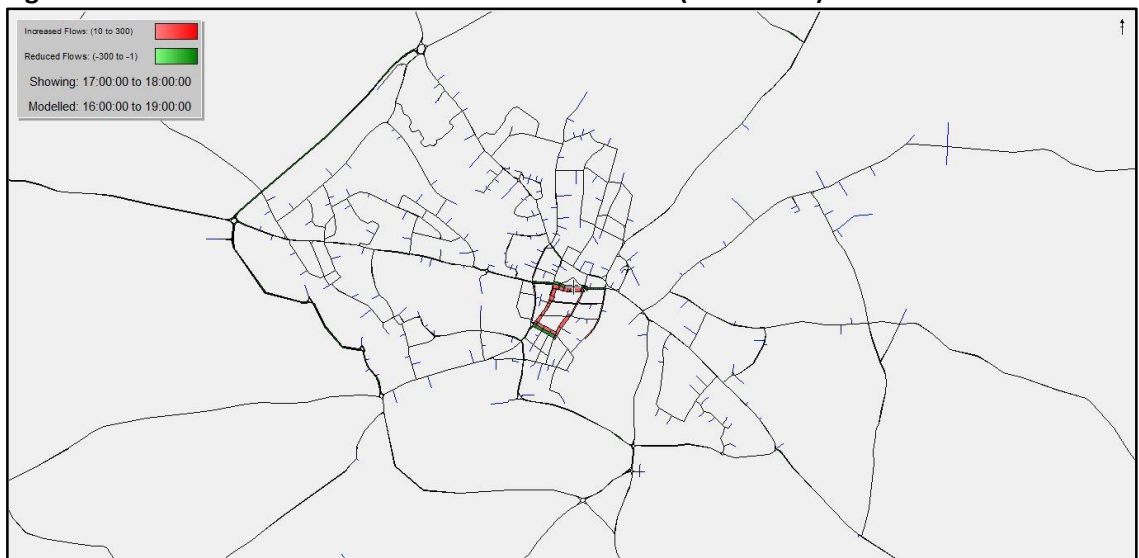


Figure 3 Flow Difference Plot – Reference vs Scenario 2 (1700-1800)



21. The flow difference plots presented in Figure 2 and 3 reveal minor differences in flows across the model network as a result of the introduction of the scheme delivered in Scenario 2 (High Street one way NB).

- 22. Some reductions in flows are modelled within the town centre in both the AM and PM, whilst there are no major instances of flows increasing across the network.
- 23. It would appear that there is no significant impact upon the wider network as a result of introducing the High Street one way NB scheme.

Reference Case vs Scenario 3

Figure 4 Flow Difference Plot – Reference vs Scenario 3 (0800-0900)

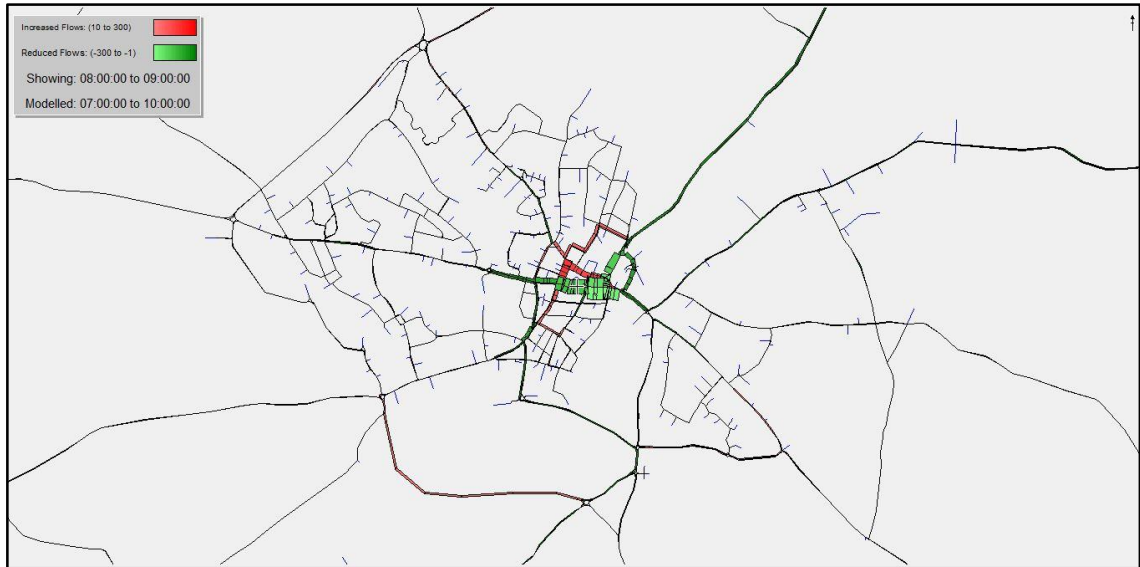
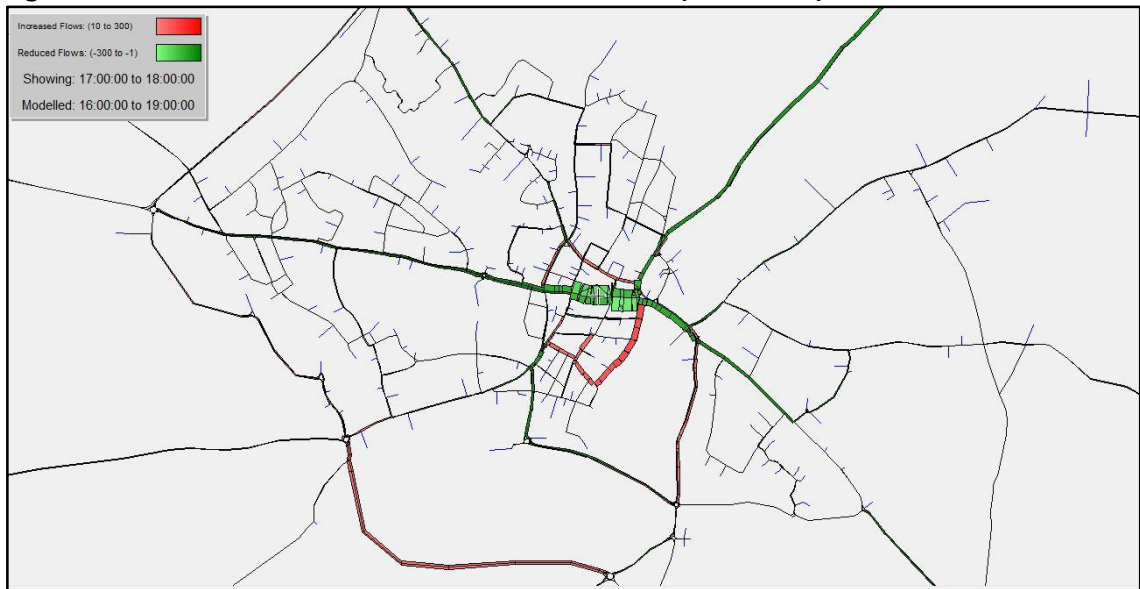


Figure 5 Flow Difference Plot – Reference vs Scenario 3 (1700-1800)



- 24. The flow difference plots presented in Figure 4 and 5 reveal noticeable differences in flows across the model network as a result of the introduction of the scheme delivered in Scenario 3 (High Street one way NB + Wood Street/Bridge Street restrictions).

- 25. Aside from the reduced flows on Wood Street/Bridge Street, there appears to be a reduction of flows on Warwick Road, and across Clopton Bridge in both the AM and PM peak. Reductions in flows are also observed on Alcester Road during the PM peak.
- 26. The model outputs also show an increase in flows, along the S-WRR, along with St Gregory's Road in the AM and Waterside during the PM.
- 27. It would appear that there is there are some significant reductions in flows across the wider network as a result of introducing the High Street one way NB scheme + Wood Street/Bridge street restrictions, however some increases in flows are also observed, with rat-running occurring on Waterside and Old Town/Chestnut Walk.

Reference Case vs Scenario 4

Figure 6 Flow Difference Plot – Reference vs Scenario 4 (0800-0900)

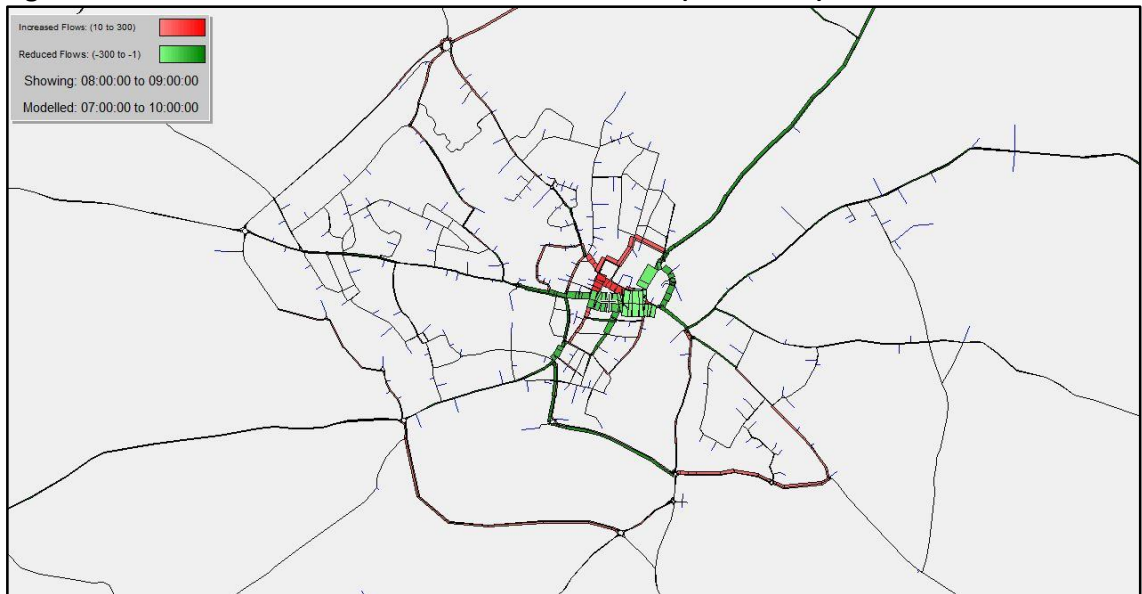
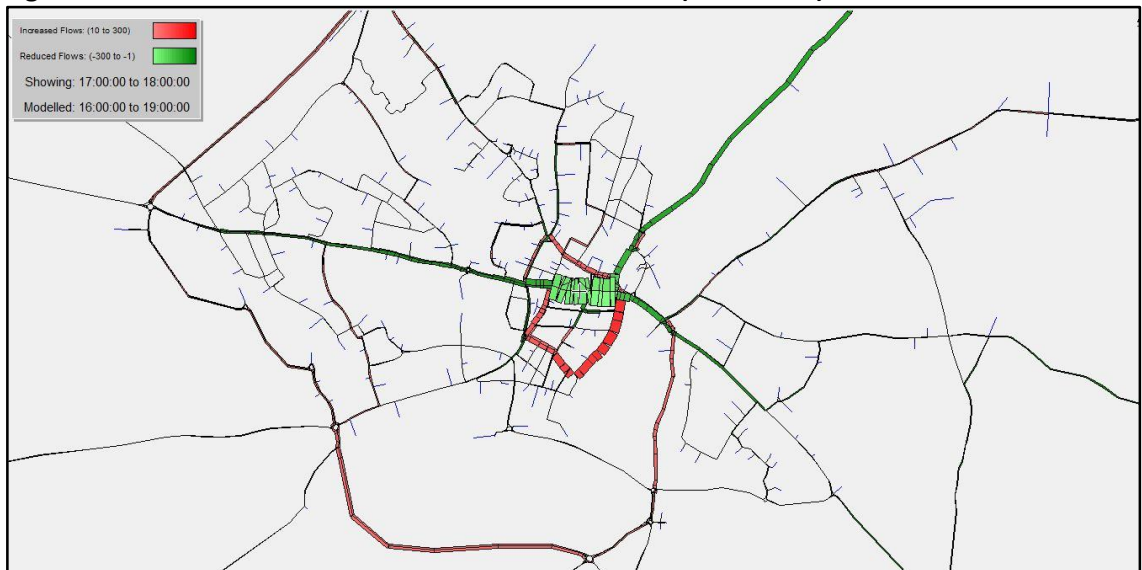


Figure 7 Flow Difference Plot – Reference vs Scenario 4 (1700-1800)



28. The flow difference plots presented in Figure 6 and 7 reveal noticeable differences in flows across the model network as a result of the introduction of the scheme delivered in Scenario 4 (High Street one way NB + Wood Street/Bridge Street bus only).
29. The AM flow differences results in reductions in northbound flows on Seven Meadows Road, Evesham Road, along the A4390 (northbound), around the Stratford Gyratory and northbound on Warwick Road. This is offset by an increase in flows on the S-WRR along with on Guild Street in the town centre.
30. The PM flow differences results in reductions in flows on Alcester Road, Warwick Road, Bridge Foot. This is offset with by an increase in flows on the S-WRR, Rother Street, and the A3400 Shipston Road to the south east of the town centre.
31. The flow difference plots presented in Figures 6 and 7 appear to show that the schemes introduced in Scenario 4 have the potential to divert a number of trips from the town centre onto the S-WRR. However, the results also show a noticeable amount of diverting of trips onto potentially sensitive links within the town centre, (Waterside, Old Town, Chestnut Walk).

Reference Case vs Scenario 5

Figure 8 Flow Difference Plot – Reference vs Scenario 5 (0800-0900)

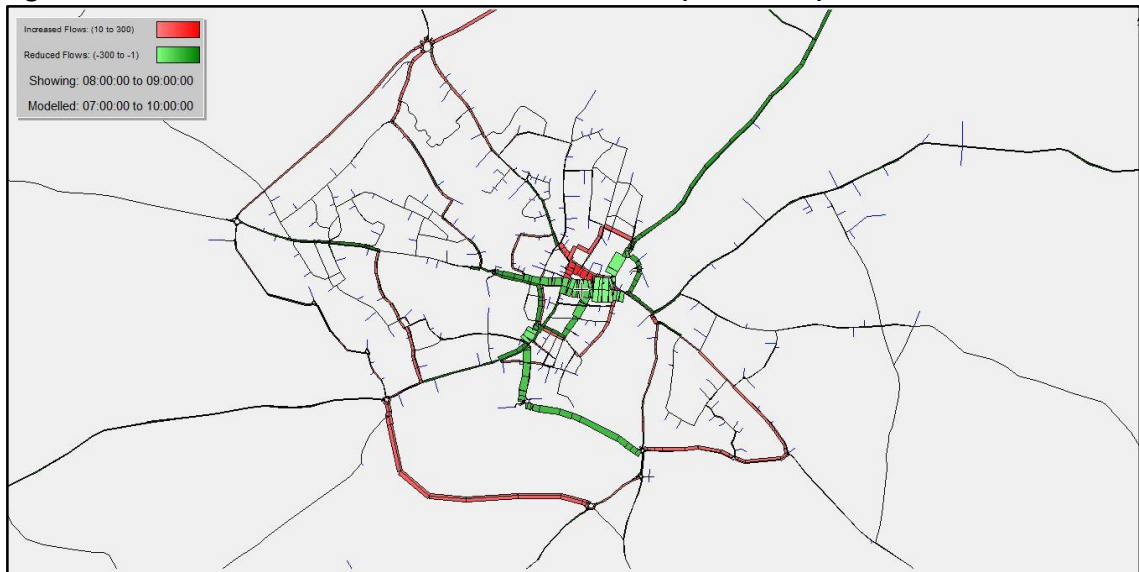
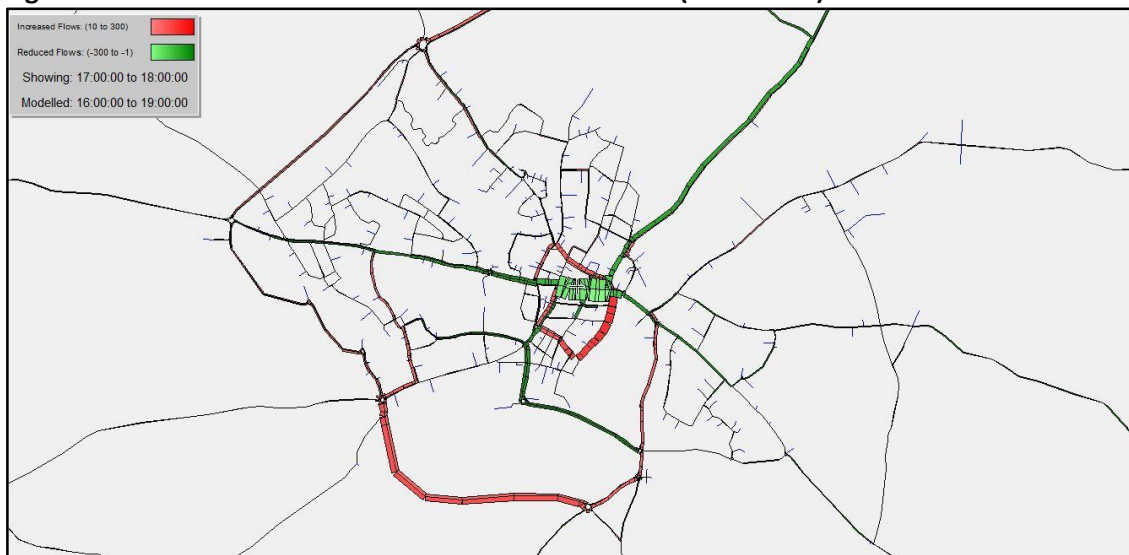


Figure 9 Flow Difference Plot – Reference vs Scenario 5 (1700-1800)

32. The flow difference plots presented in Figure 8 and 9 reveal noticeable differences in flows across the model network as a result of the introduction of the scheme delivered in Scenario 5 (High Street one way NB + Wood Street/Bridge Street bus only + Town Centre 20mph restrictions).
33. The AM flow differences results in reductions in northbound flows on Seven Meadows Road, Evesham Road, along the A4390 (northbound), around the Stratford Gyratory, northbound on Warwick Road and across Clopton Bridge. This is offset by an increase in flows on the S-WRR, the A46, along with on Guild Street in the town centre.
34. The PM flow differences results in reductions in flows on Alcester Road, Warwick Road, Bridge Foot. This is offset with by an increase in flows on the S-WRR, the A46, Rother Street, and the A3400 (Shipston Road).
35. The flow difference plots presented in Figures 8 and 9 appear to show that the schemes introduced in Scenario 5 have a very similar impact to Scenario 4, with the potential to divert a number of trips from the town centre onto the S-WRR.
36. The results however show a noticeable amount of diverting of trips onto potentially sensitive links within the town centre, (Waterside, Old Town, Chestnut Walk).

Queue Plot Analysis

37. The following section details the analysis that has been undertaken relating to the differences in queue lengths across the model network in each of the scenarios developed. Queue plots have been produced for the AM and PM peak hours (0800-0900 and 1700-1800) which highlight any parts of the network where queue lengths have changed significantly between each scenario and the Reference Case.
38. These queue plots created are presented in Appendix B and summarised below:

Scenario 1 vs. Scenario 2 – Queue Analysis (MQ001 and MQ002)

39. The queue comparison between the Reference scenario and Scenario 2 shows a reduction in queues across the model network during the AM peak in Scenario 2. Queues reduce around the Stratford Gyratory, at the junction of the A3400/Union Street, within the town centre, along with at the junction of Birmingham Road/Worthing Way
40. The PM analysis also shows a reduction of queues in Scenario 2, again at the Stratford Gyratory, along with at the Shipston Road/Banbury Road junction and along Birmingham Road.
41. In summary, it appears that the network changes applied in Scenario 2 results in reductions in queues at a small number of junctions across the model network.

Scenario 1 vs. Scenario 3 – Queue Analysis (MQ003 and MQ004)

42. The queue analysis for the AM peak between the Reference Case and Scenario 3 reveals four locations where queues have reduced across the model network, at the same locations as revealed in Scenario 2, plus at a junction along Alcester Road. However, the analysis also reveals an increase in queues at the Shipston Road/Banbury Road and Alcester Road/A4390 junction.
43. The PM analysis reveals one instance of reductions in queues, at the junction of Birmingham Road/Arden Street, and one instance of increased queueing, where Bridge Foot meets Stratford Gyratory.
44. In summary, it appears that the network changes applied in Scenario 3 results in some reductions in queues and some increases in queues at limited number of junctions across the model network.

Scenario 1 vs. Scenario 4 – Queue Analysis (MQ005 and MQ006)

45. The AM queue analysis of Scenario 4 reveals 6 instances of reductions in queue lengths when compared to the Reference Case. These are concentrated within the town centre, along with at the junction of the A46/Birmingham Road, and at Seven Meadows Road/Wetherby Way.
46. There are also instance of increases in queue during the AM peak, at Shipston Road/Banbury Road, along with at the junction of Alcester Road/A4390.
47. The PM analysis reveals four instances of queue reductions across the network, focused within the town centre. There is only one instance of increased queueing which occurs at the A3400/Union Street junction.

Scenario 1 vs. Scenario 5 – Queue Analysis (MQ007 and MQ008)

48. Similar to Scenario 4, the inclusion of the measures within Scenario 5 results in a number of instances of queue reductions across the network within the AM peak. There are 8 instances of queue reductions, focused mainly within the town centre.
49. The AM peak however also reveals four instances of queue increases, one of which is of greater than a 30 vehicle increase, which occurs at the junction of Alcester Road/A4390.

50. Increases in queueing are also modelled at the junction of Birmingham Road/Arden Street and at Shipston Road/Banbury Road.
51. The PM analysis of this scenario reveals two instances of queue reductions and two instances of queue increases. Queues reduce on Alcester Road, whilst increasing at the junction of the A3400/Union Street.

Queue Analysis Summary

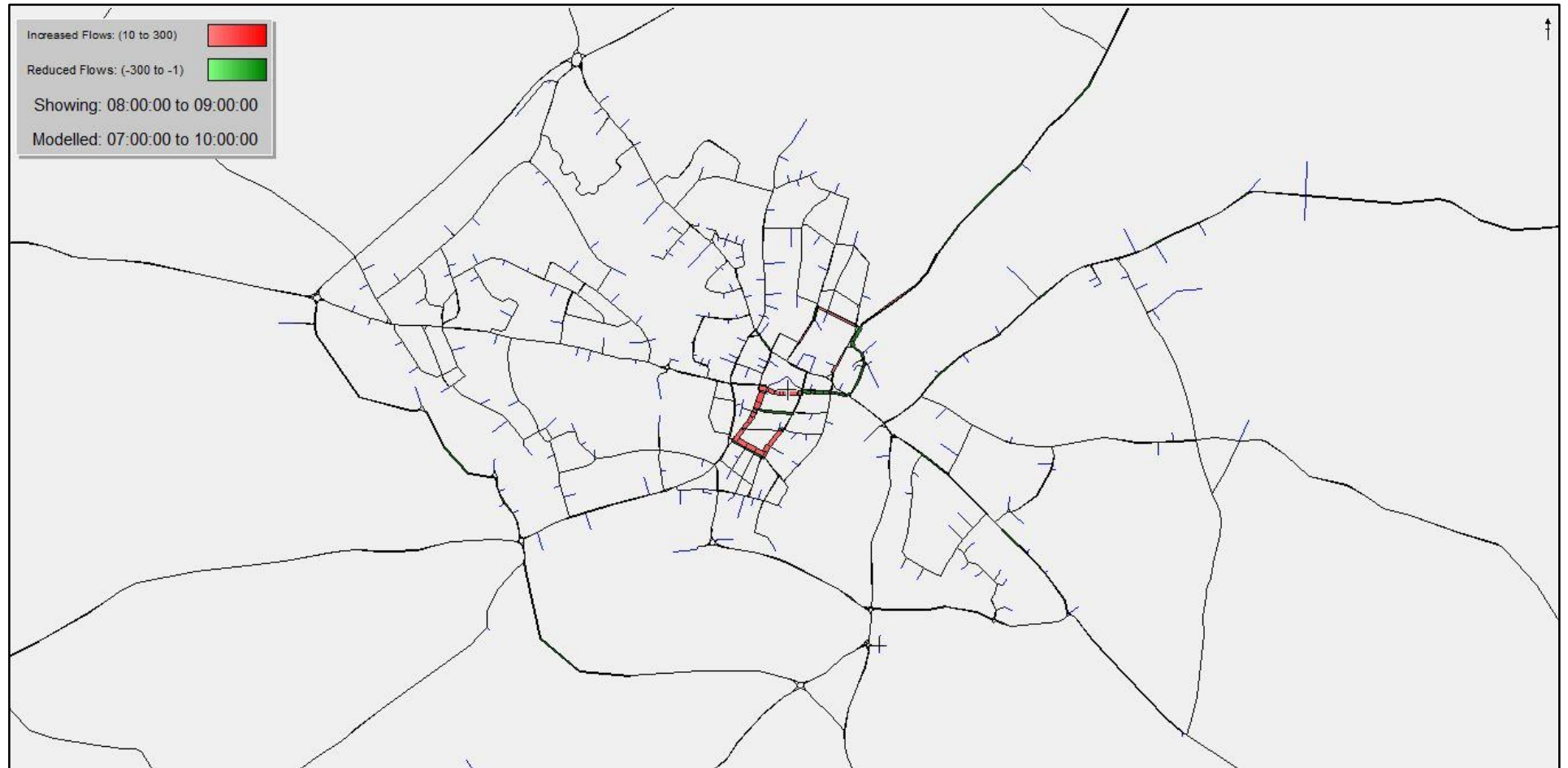
52. The analysis of queue lengths in each scenario, compared to Scenario 1 (Reference Case) has revealed that with the inclusion of the schemes within the model network, in the majority of cases, there are relatively minor changes in queue lengths.
53. Each scenario results in queues reducing at some part of the network, whilst each scenario also results in queues increasing.
54. There is one instance of queue increases greater than 30 vehicles, which occurs at the junction of Alcester Road/A4390 in Scenario 5. Aside from this instance, the model results suggest that increases are slight rather than severe.

Summary and Conclusions

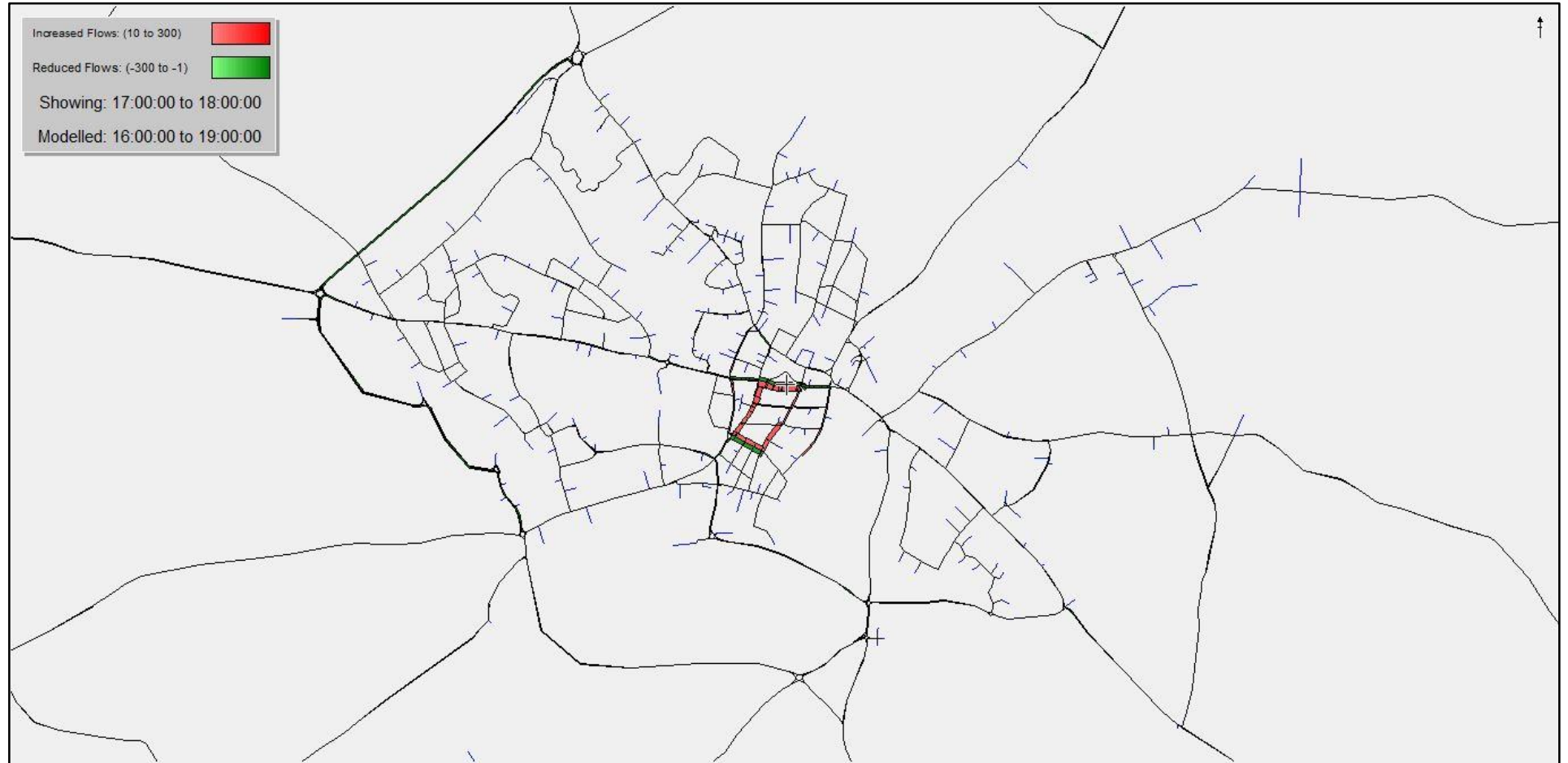
55. This report has assessed the impact of delivering a number of schemes within Stratford town centre, which are design to benefit non-motorised and public transport users within the town. The schemes are intended to be delivered alongside a Third River Crossing, and therefore, for the purposes of this analysis the 2031 Core Strategy + S-WRR has been used as the Reference Case.
56. Using this as the Reference Case a number of scenarios have been developed which include the schemes identified for the town centre. Based upon these scenarios a comparison of town centre and network wide flows along with network wide queue levels has been undertaken.
57. The analysis has revealed that each of the schemes included have the potential to deliver reduced flows around the town centre, with a large proportion of trips diverting onto the S-WRR rather than travelling through the town centre as a result of the network changes in Scenarios 3, 4 and 5. This is demonstrated in the network wide flow analysis.
58. The queue analysis that has been undertaken has revealed that the inclusion of the schemes has a relatively minor impact in queueing levels across the model network, with instances of queue reductions across the network, along with some queue increases. The increases in queueing are most noticeable in Scenario 5, with the inclusion of the 20mph speed limits within the town centre.
59. The analysis has revealed that where queues have reduced in the town centre, in many instances they appear to re-route onto the S-WRR. However there are some instances, most noticeable in Scenarios 4 and 5 whereby some re-routing occurs onto town centre links, namely Waterside, Chestnut Walk, Old Town, Rother Street, Arden Street, Guild Street and St Gregory's Road.

Appendix A

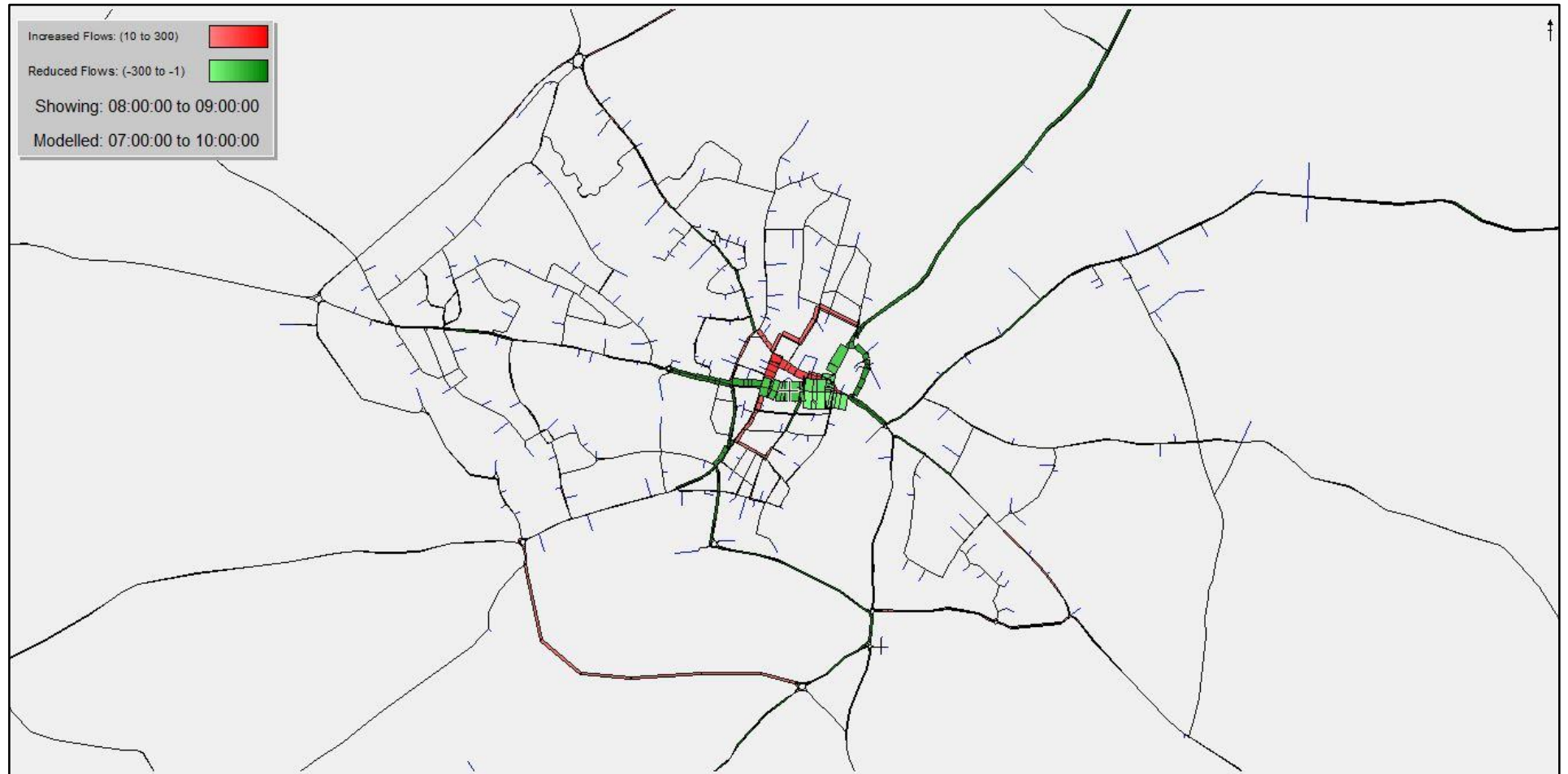
Network Wide Flow Difference Plots



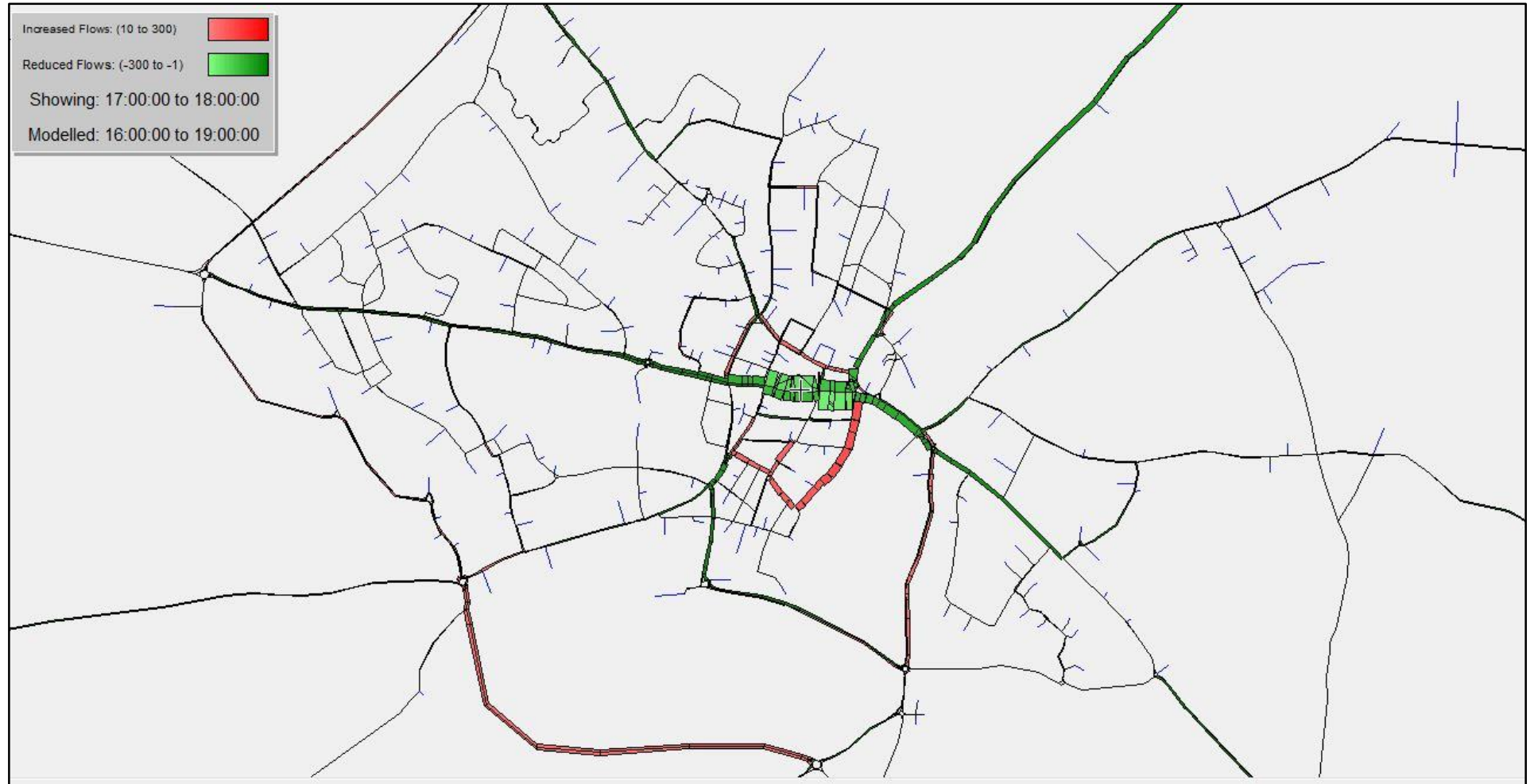
Scenario 1 vs Scenario 2 AM Peak Hour (0800-0900)



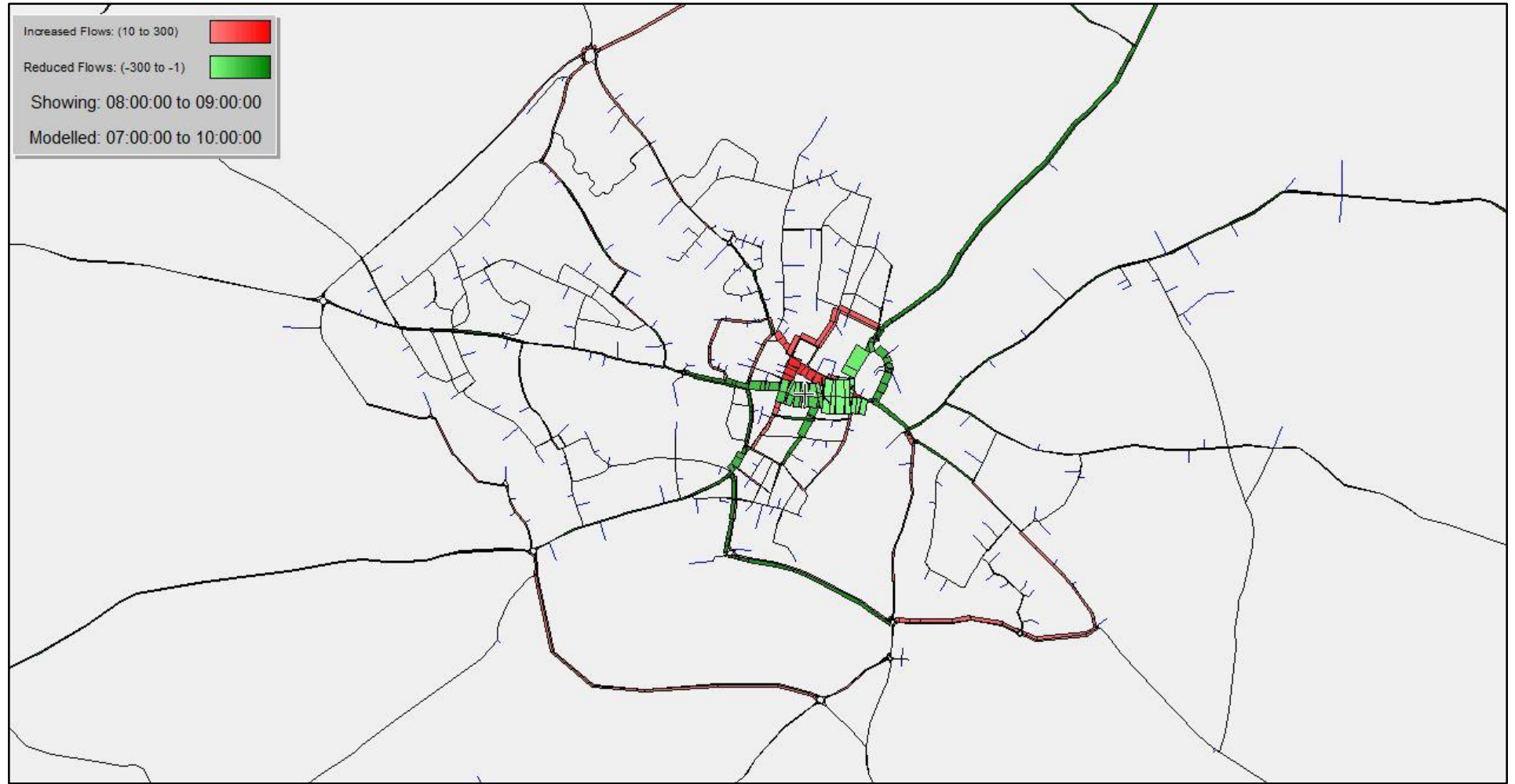
Scenario 1 vs Scenario 2 PM Peak Hour (1700-1800)



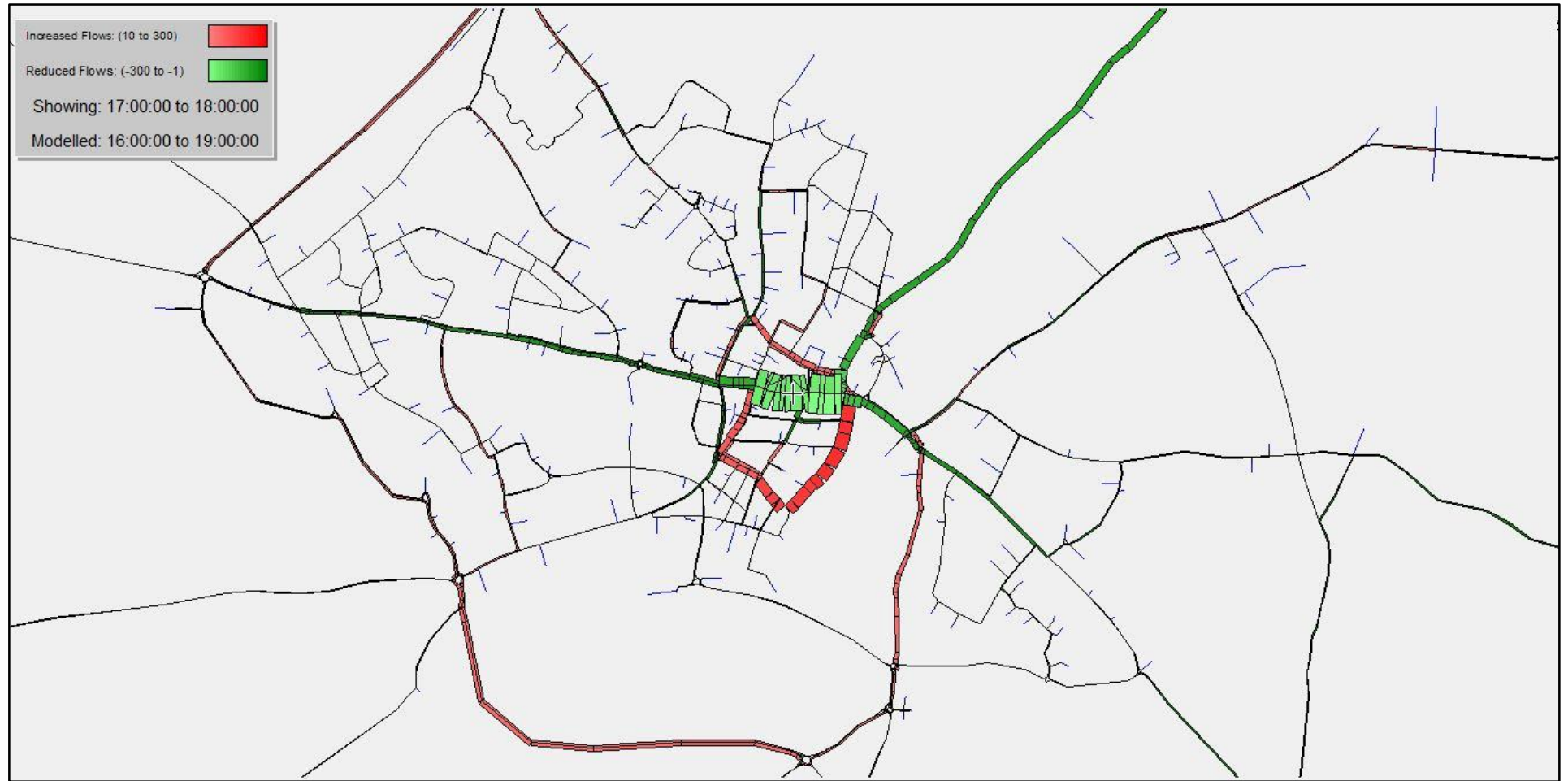
Scenario 1 vs Scenario 3 AM Peak Hour (0800-0900)



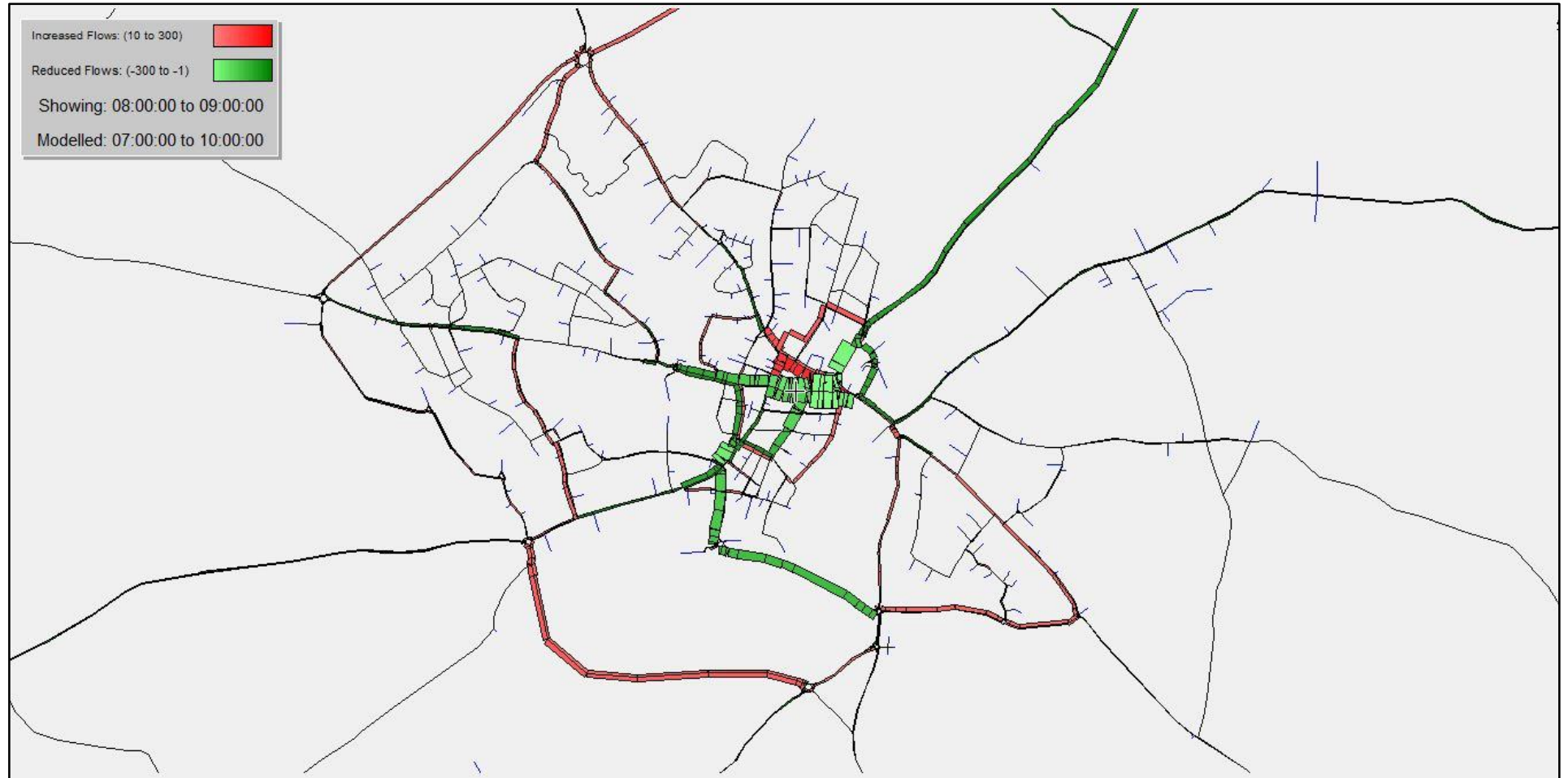
Scenario 1 vs Scenario 3 PM Peak Hour (1700-1800)



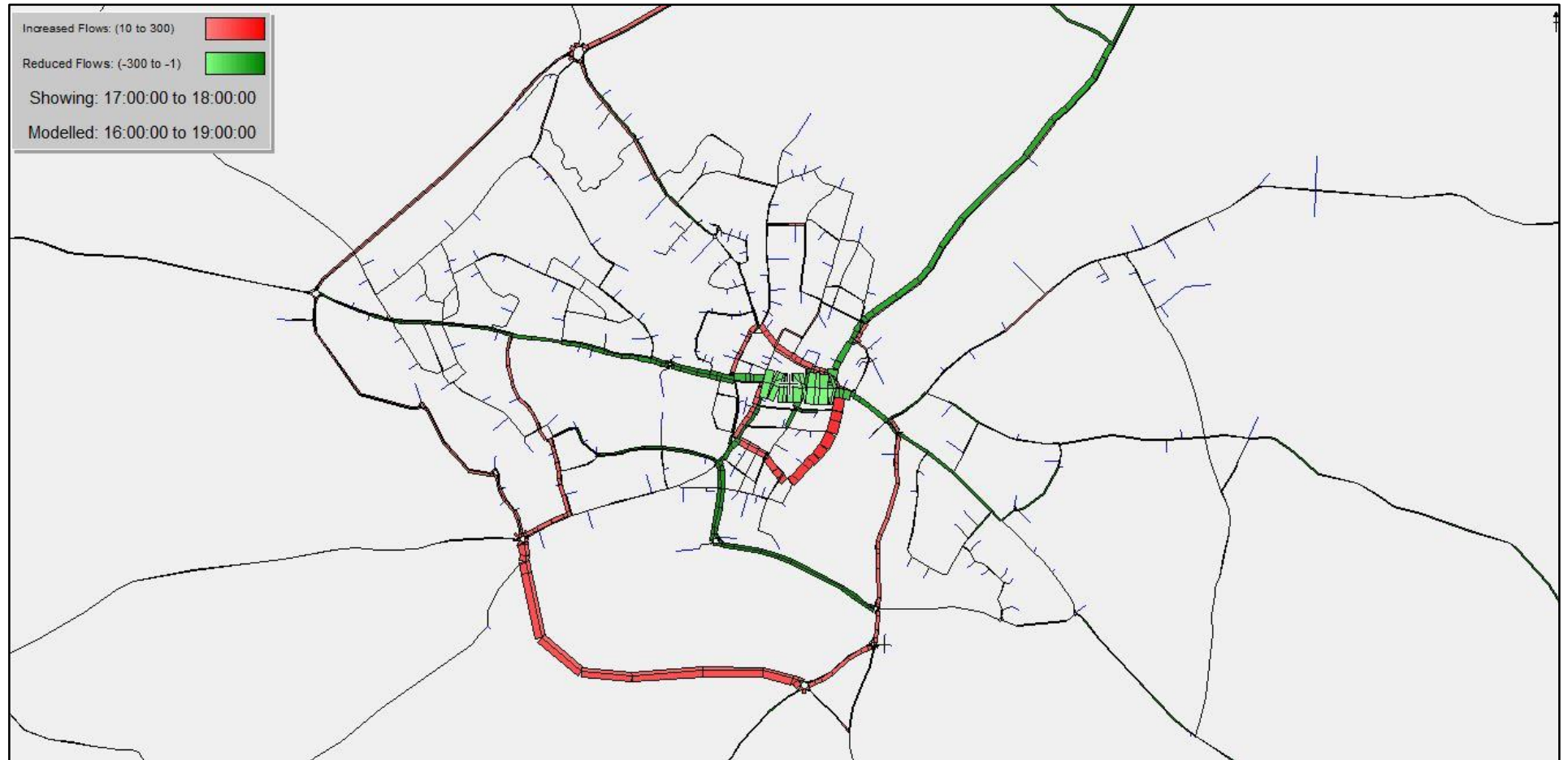
Scenario 1 vs Scenario 4 AM Peak Hour (0800-0900)



Scenario 1 vs Scenario 4 PM Peak Hour (1700-1800)



Scenario 1 vs Scenario 5 AM Peak Hour (0800-0900)



Scenario 1 vs Scenario 5 PM Peak Hour (1700-1800)