

Keynsham S-PARAMICS Model

2015 and 2022 Town Centre Option Tests

June 2015

B&NES

Mott MacDonald

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A	March 2015	G Gessa	S Finney	S Finney	First Issue to Client
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Contents

Executive Summary

Mott MacDonald produced a draft Keynsham Transport Strategy for B&NES in 2014 with a proposed vision and objectives for the future of transport provision in the town.

As part of this exercise, S-PARAMICS modelling work was undertaken to test network schemes that included High Street one-way southbound, and also a gyratory scheme with Ashton Way one-way northbound. The tests were carried out with a forecast year of 2022 when all planned and committed developments in the Keynsham area were assumed to be in place.

The outcomes of this modelling work showed areas of concern with the High Street one-way, especially in the PM peak period. Based on this it was concluded that a one-way scheme is unlikely to be able to provide sufficient capacity to meet the anticipated traffic demand in the future.

Additional traffic modelling was commissioned to develop and assess further scenarios with the Keynsham Transport Model with the aim of:

1. Finding the best solution for a possible experimental test of a one-way system on-street in the current situation, i.e. 2015, and
2. Finding a possible workable solution for making the High Street one-way in the forecast year of 2022.

The testing of the 2015 current situation has taken account of the developments that have gone ahead since 2012 (when the Keynsham S-PARAMICS base year model was validated), and also road schemes that have been implemented recently.

Several tests have been carried out in S-PARAMICS in order to identify the best possible network layout able not only to satisfy the implementation of a one-way system on High Street in 2015, but also to accommodate the planned developments in the forecast year of 2022. These tests included:

- High Street closed (both directions)
- High Street one-way southbound and Ashton Way two-way
- High Street one-way southbound and Ashton Way one-way northbound, i.e. clockwise gyratory system
- High Street one-way northbound and Ashton Way two-way
- High Street one-way northbound and Ashton Way one-way southbound, i.e. anticlockwise gyratory system.

The different options have been firstly tested for the 2015 current situation and then, based on the outcome of the modelling results (in terms of journey times on selected routes), the best performing ones have been also tested in 2022.

These best options were:

- High Street one-way southbound and Ashton Way two-way
- Clockwise gyratory scheme with High Street one-way southbound (with two lanes) and Ashton Way one-way northbound

The results of the modelling of these options is summarised below:

2015 With High Street One-way Southbound

This scheme would result in journey times through the town centre that are comparable with the 2015 Base Case, with some relatively small increases for some routes but reductions on others.

2015 Clockwise Gyratory

The performance of the Gyratory scheme would be similar to that of the 2015 Base Case, with reduced journey times for some movements, but only if two southbound lanes are provided on the High Street. This scheme would actually cause an increase in traffic flow on the High Street and in the town centre overall. As such, as one of the objectives is to improve the pedestrian environment on the High Street, the Gyratory scheme is not recommended.

2022 Base Case

To minimise increases in congestion in the future, both the Bath Road/Chandag Road and Wellsway/Bath Hill junctions should be signalised. At Chandag Road, pedestrian crossings should be incorporated into the signal layout to avoid the need for a separate zebra crossing as this causes delays to traffic.

These improvements are in addition to those already committed or proposed:

- signalisation of the Keynsham Road Somerdale access and signalisation of the Keynsham Road/Avon Mill Lane junction
- introduction of a flare at the bottom of Avon Mill Lane
- an additional lane on Keynsham Road westbound at the signals with Avon Mill Lane allowing a dedicated left turn lane.

Furthermore, if a one-way scheme is not introduced on the High Street, approaches to the High Street/Bath Hill roundabout should be widened to provide short two-lane flares.

2022 With High Street One-way Southbound

As for 2015, this scheme would be successful in greatly reducing traffic on the High Street, with an overall reduction in traffic passing through the town centre of around 15%. However, this would be at the expense of a significant increase in journey time for westbound trips through the centre from around 12 minutes to 19 minutes in the PM peak hour. Some trips would re-route to avoid long delays on Bath Hill, causing some increases in delay on Avon Mill Lane.

Therefore, due to this increase in congestion, the High Street One-way Southbound scheme is not recommended in the long term. However, the one-way layout is shown to work successfully between 2015 and 2019, assuming that the other proposed improvements for the 2022 Base Case are implemented soon after 2015.

2022 Clockwise Gyratory

The Gyratory scheme would perform better than the High Street One-way scheme in traffic capacity terms, resulting in less of an increase in congestion from the 2022 Base Case. As for 2015, this scheme would actually cause an increase in traffic flow on the High Street and in the town centre overall. As such, the Gyratory scheme is not recommended.

Overall Conclusion

To avoid large increases in congestion in the long term, the best option is to retain the current road layout in the town centre but with improvements elsewhere as outlined for the 2022 Base Case above.

In the short to medium term (up to 2019), the High Street One-way Southbound scheme would work satisfactorily if the other identified improvement schemes are implemented soon after 2015.

A gyratory scheme is not recommended is it would require two southbound lanes on the High Street and would result in increased traffic flow on the High Street.

1 Introduction

Mott MacDonald produced a draft Keynsham Transport Strategy for B&NES in 2014 with a proposed vision and objectives for the future of transport provision in the town. As part of this exercise, S-PARAMICS modelling work was undertaken to test network schemes that included High Street one-way southbound, and also a gyratory scheme with Ashton Way one-way northbound. The tests were carried out with a forecast year of 2022 when all planned and committed developments in the Keynsham area were assumed to be in place. The outcomes of this modelling work showed areas of concern regarding the High Street one-way scheme (the better performing option when compared with the gyratory scheme), especially in the PM peak period. Based on this it was concluded that a one-way scheme is unlikely to be able to provide sufficient capacity to meet the anticipated traffic demand in the future.

Following an e-mail from B&NES (Rab Smith) on 5th January 2015, Mott MacDonald was commissioned to develop and assess further scenarios with the S-PARAMICS Keynsham Transport Model with the aim of:

1. Finding the best solution for a possible experimental test of a one-way system on-street in the current situation, i.e. 2015, and
2. Finding a possible workable solution for making the High Street one-way in the forecast year.

The testing of the 2015 current situation required the revision of the demand matrices to take account of the developments that have gone ahead since 2012 (when the Keynsham S-PARAMICS base year model was validated), and also the updating of the network for the new road schemes that have occurred since 2012.

Therefore our activities for this new commission have comprised the following:

- Amend the 2012 S-PARAMICS demand to 2015 to account for new developments that have happened since 2012 (AM and PM Models)
- Code in network changes from 2012 to 2015 (AM and PM Models)
- Identify the best possible network solution for a one-way system in S-PARAMICS (2015 and 2002 years)
- Sketch up the details of the best network layouts (2015 and 2022 years)
- Draw-up the best network layout in CAD and ensure that it is feasible (2015 and 2022 years).

This report details how the activities above have been carried out and the outcomes of the modelling work, noting that the 2022 work is based on the assumption that the 2022 demand matrices as developed by Halcrow (which take into account traffic reductions due to travel planning and soft measures) were left untouched.

The report has been structured as follows:

- Chapter 2 details the amendments of the 2012 demand matrices and network changes to 2015
- Chapter 3 presents the S-PARAMICS tests carried for the current year of 2015
- Chapter 4 presents the S-PARAMICS tests carried out for the 2022 forecast year
- Chapter 5 contains the overall conclusions from the modelling.

2 Development of the 2015 S-PARAMICS Model

One target of the January 2015 commission was to find the best solution for a possible experimental test of a one-way system on-street in the current situation. This required the S-PARAMICS model to be amended to account for:

- New developments that had gone ahead since 2012 (i.e. the year the S-PARAMICS model was calibrated/validated for) and inclusion of these into the 2012 demand matrices
- New road schemes/alterations that had been introduced since 2012.

The amendments were introduced into the 2012 model to create a 2015 S-PARAMICS model, noting that this was not re-calibrated/re-validated for 2015.

2.1 2015 S-PARAMICS Demand Matrices

The document "*Housing_trajectory_dec14.pdf*" supplied by B&NES (also available on the B&NES website) identified two main housing developments that have taken place in the five year period 2011/2012 to 2014/2015 as shown in Table 2.1.

Table 2.1: Housing Developments in Keynsham – 2011/2012 to 2015/2016

Housing Development (Units)	2013-2014	2014-2015	Total Units
South West Keynsham - K2B (East)	36	51	87
Somerdale	0	26	26

Source: B&NES

These residential developments were included in the 2015 model (AM and PM peak periods, i.e. 07:00-10:00 and 15:00-19:00) with trip-ends calculated by using the following hourly trip rates as reported in Halcrow's report "*Keynsham Core Strategy Options_Paramics Assessment Report-FINAL 130214 Rev1.pdf*" – see Tables 2.2 and 2.3.

Table 2.2: K2B Hourly Trip Rates and Trip-ends

Hour	Arrival Rate	Arrivals - IN	Departure Rate	Departures - OUT
07:00-08:00	0.063	5	0.270	19
08:00-09:00	0.120	9	0.390	28
09:00-10:00	0.130	9	0.201	15
Total trip-ends AM		**23**		**62**
15:00-16:00	0.256	18	0.181	13
16:00-17:00	0.325	23	0.184	13
17:00-18:00	0.360	26	0.200	14
18:00-19:00	0.342	25	0.221	16
Total trip-ends PM		**93**		**57**

Source: Halcrow's Report "*Keynsham Core Strategy Options_Paramics Assessment Report-FINAL 130214 Rev1.pdf*"

It should be noted that the totals IN and OUT for K2B take into account the reduction of 17% due to the assumption that some traffic will be associated with movements to/from the A37, traffic that therefore would not travel through the Keynsham S-PARAMICS modelled area.

Table 2.3: Somerdale Hourly Trip Rates and Trip-ends

Hour	Arrival Rate	Arrivals - IN	Departure Rate	Departures - OUT
07:00-08:00	0.072	2	0.230	6
08:00-09:00	0.156	4	0.402	10
09:00-10:00	0.162	4	0.176	5
Total trip-ends AM		**10**		**21**
15:00-16:00	0.280	7	0.209	5
16:00-17:00	0.288	7	0.192	5
17:00-18:00	0.363	9	0.213	6
18:00-19:00	0.281	7	0.222	6
Total trip-ends PM		**32**		**22**

Source: Halcrow's Report "*Keynsham Core Strategy Options_Paramics Assessment Report-FINAL 130214 Rev1.pdf*"

Both K2B and Somerdale trip-ends have been distributed as assumed previously by Halcrow in 2022. In particular, K2B have been distributed to/from Temple Street, Rock Road and Charlton Road (each of which is associated with a zone in the S-PARAMICS model), and Somerdale trip-ends have been distributed according to the 2022 Somerdale distribution with trips to/from the existing model zone already representing the Somerdale area.

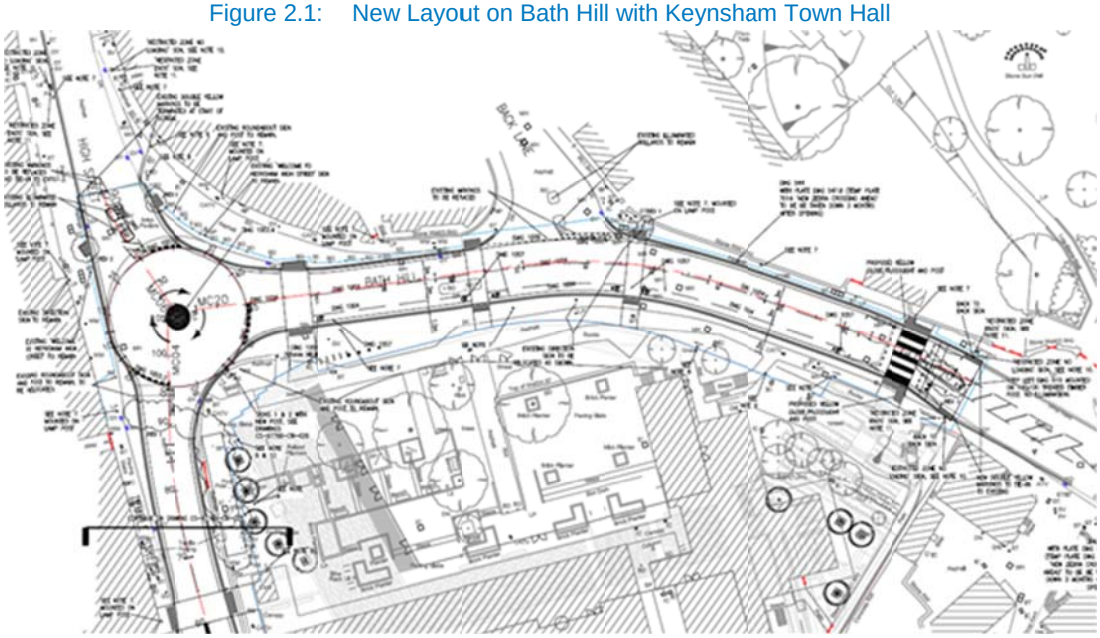
The demand has been input in the model at five minutes resolution for each hour of the modelled AM and PM peak periods (07:00-10:00 and 15:00-19:00). As no further information was available, a "flat" profile has been assumed within each hour.

2.2 Keynsham Town Centre Road Changes in 2015

At the beginning of 2015 a series of road layout changes were introduced in the Keynsham town centre as part of the Town Hall redevelopment. The following changes were implemented, as shown in Figure 2.1 and Figure 2.2:

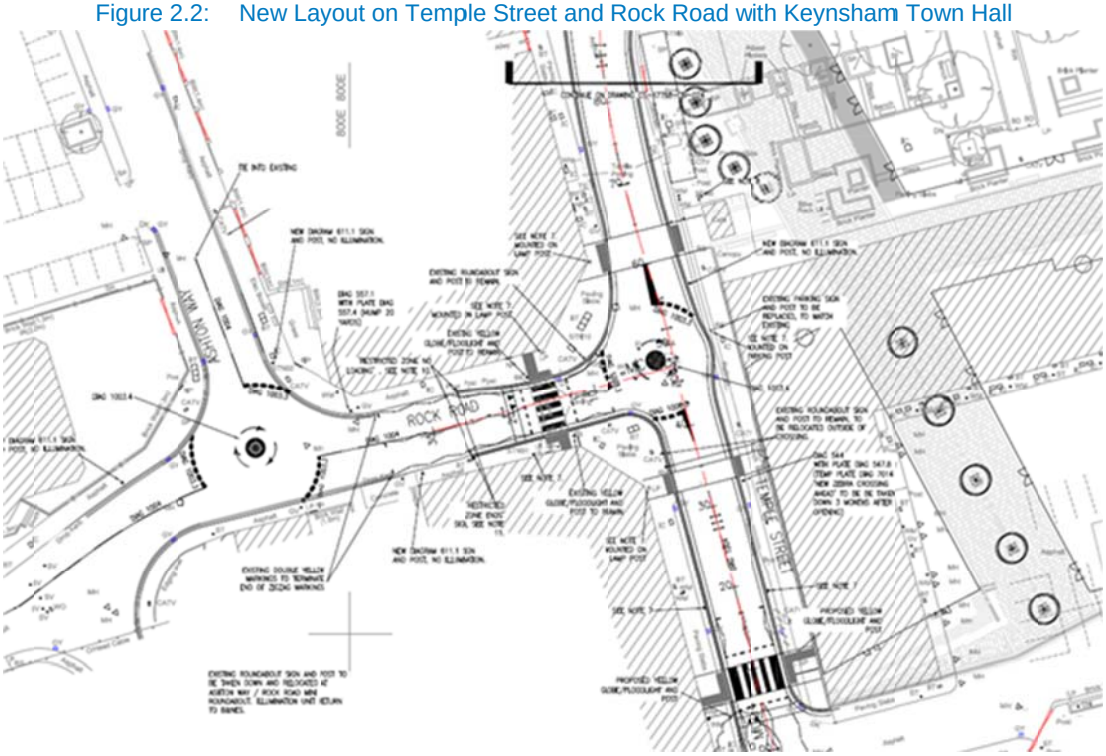
- High Street/Bath Hill junction: the approaches to the roundabout were reduced from two lanes to one lane on each arm
- Removal of the signalised crossing on Temple Street located between Rock Road and Bath Hill
- Introduction of two new zebra pedestrian crossings, one on Bath Hill and the other one on Temple Street, just south of Rock Road
- Introduction of a new mini roundabout between Rock Road and Ashton Way to replace the give-way junction.

Figure 2.1: New Layout on Bath Hill with Keynsham Town Hall



Source: extract from drawing ref. CS-67768-CIV-24 rev I

Figure 2.2: New Layout on Temple Street and Rock Road with Keynsham Town Hall

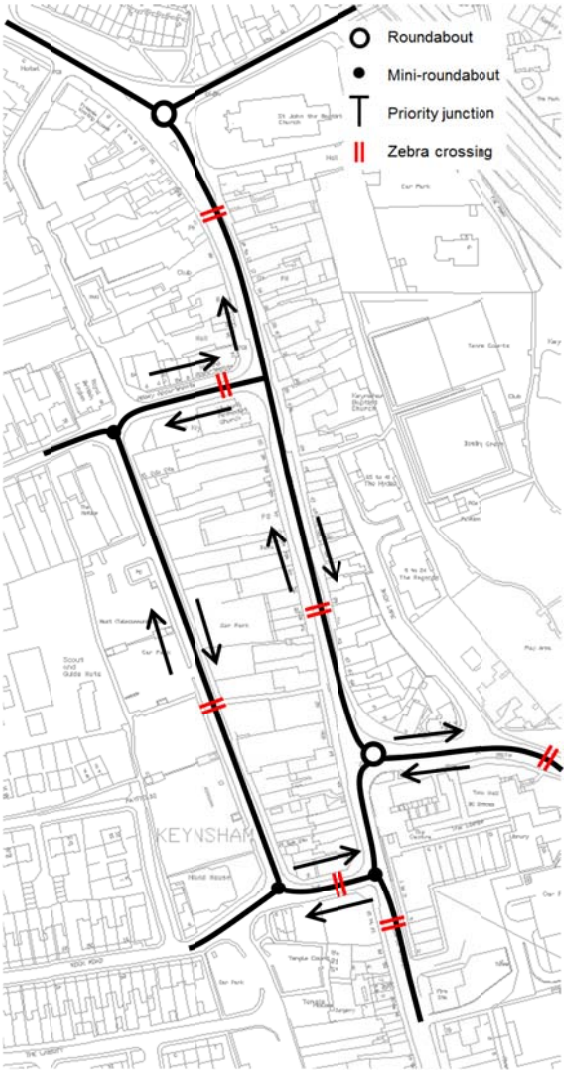


Source: extract from drawing ref. CS-67768-CIV-25 rev I

In addition to these town centre amendments, a new mini roundabout was introduced at the Bath Road/Chandag Road junction (with a zebra pedestrian crossing just east of Chandag Road) replacing the give-way junction layout.

B&NES provided drawings showing these changes, and Figure 2.1 below illustrates the layout of the 2015 town centre junctions.

Figure 2.3: Keynsham 2015 town centre junction layout



Source: Mott MacDonald

These road network changes were coded onto the 2012 S-PARAMICS model to represent the 2015 operation. The new pedestrian zebra crossings were coded as signalised junctions with the pedestrian stage being called in every cycle (as a way of reflecting the pedestrian demand holding up traffic).

3 2015 S-PARAMICS Model Runs

3.1 Introduction

The amended 2015 S-PARAMICS models (AM and PM peak periods) formed the basis for a series of tests aimed at finding the best performing solution for a possible one-way system in the Keynsham town centre area. The following options have been tested:

1. 2015 Base Case – with the recent changes as described and illustrated in section 2
2. 2015 with High Street closed (both directions)
3. 2015 with High Street one-way southbound and Ashton Way two-way
4. 2015 with High Street one-way southbound and Ashton Way one-way northbound i.e. clockwise gyratory on High Street and Ashton Way
5. 2015 with High Street one-way northbound and Ashton Way two-way
6. 2015 with High Street one-way northbound and Ashton Way one-way southbound i.e. anti-clockwise gyratory on High Street and Ashton Way.

The following sections describe the results of the tests which have been compared in terms of modelled journey times extracted along selected routes covering the main westbound, eastbound, northbound and eastbound movements through Keynsham town centre, and also on Avon Mill Lane and Temple Street. These are represented in Figure 3.1 overleaf. It should be noted that the eastbound and westbound journey times have been extracted both via High Street and Ashton Way as, depending on the option tested, one of these routes may not be available.

Table 3.1 shows the modelled journey times (in units of seconds) extracted from the 2012 model and the revised 2015 base for the AM and PM peak hours 08:00-09:00 and 17:00-18:00.

Table 3.1: 2012 vs 2015 Modelled Journey Times [sec]

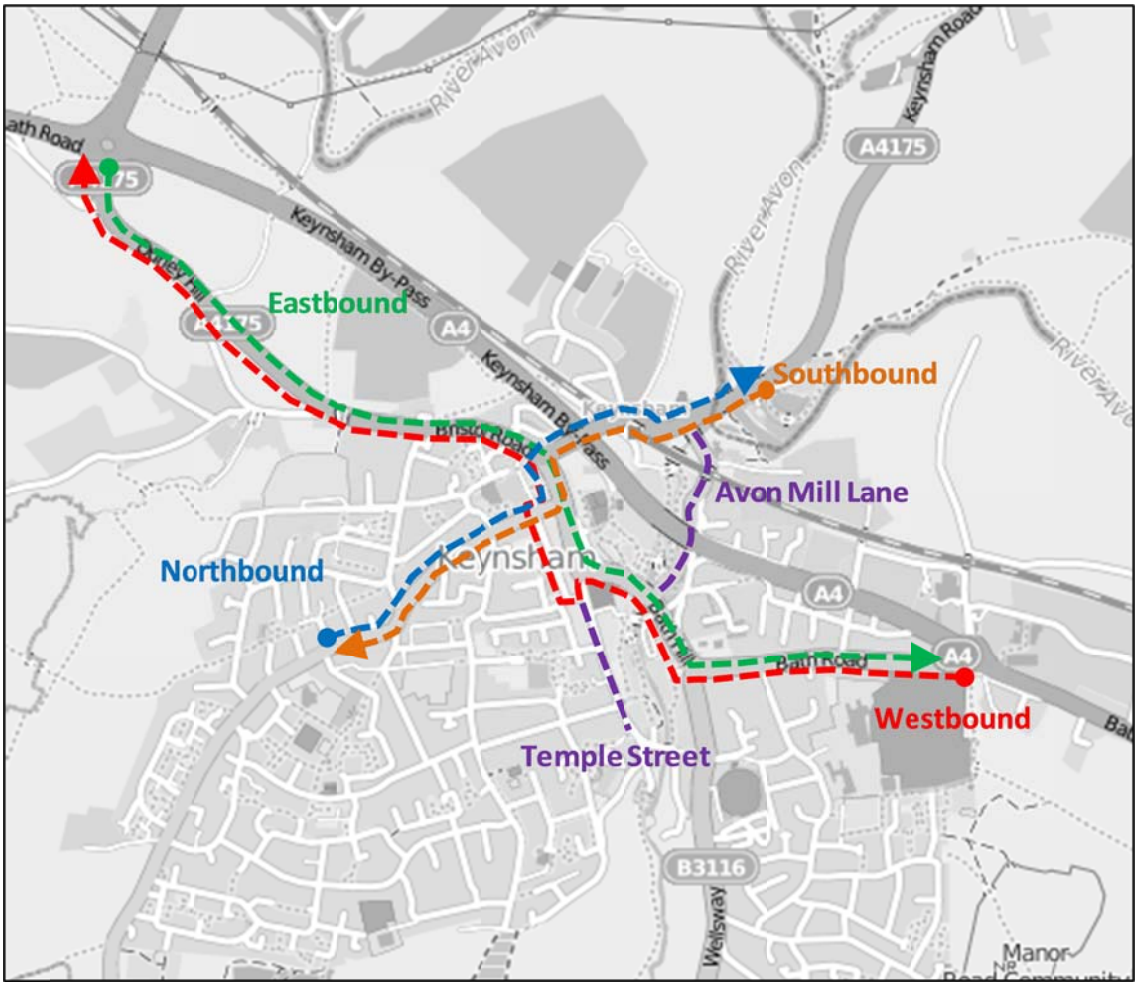
Journey Time Route	2012 Base		2015 Base	
	AM 08:00-09:00	PM 17:00-18:00	AM 08:00-09:00	PM 17:00-18:00
Temple St northbound (up to Rock Road)	42	43	160	186
Route 1 wb via Ashton Way northbound	487	449	691	647
Route 1 wb via High Street northbound	473	422	643	608
Route 2 eb via High Street southbound	372	372	525	541
Route 2 eb via Ashton Way southbound	432	445	637	704
Route 3 northbound	225	217	260	263
Route 4 southbound	181	186	223	277
Avon Mill Lane northbound	139	127	171	199
Avon Mill Lane southbound	110	81	312	351

Source: Mott MacDonald

The 2015 models show journeys times that are higher than the corresponding 2012 ones in all cases. This was expected as a result of the additional demand that has been added in for the K2B and Somerdale residential developments. However, it is also clear that the network changes that took place from 2012 to 2015, in particular the reduced junction capacity at the High Street/Bath Hill junction, and the introduction of the mini roundabout (with associated pedestrian crossing activities) at the Bath Road/Chandag Road junction have had the effect of slowing down eastbound/westbound movements.

Temple Street northbound also experiences higher delays as a result of the changes to the layout around Town Hall.

Figure 3.1: Modelled Journey Times – Routes

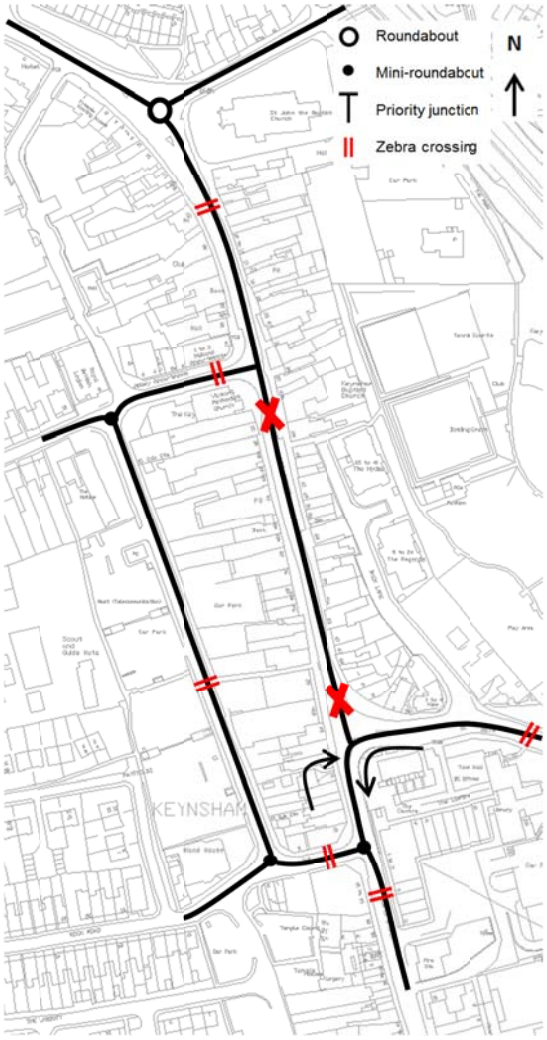


Source: Mott MacDonald

3.2 2015 with High Street closed

This test assumes that the High Street is closed in both directions to all vehicles. The layout of the town centre network is shown in Figure 3.2.

Figure 3.2: 2015 Base with High Street closed



Source: Mott MacDonald

Table 3.2 shows the comparison of journey times between the 2015 Base Case and test with High Street closed.

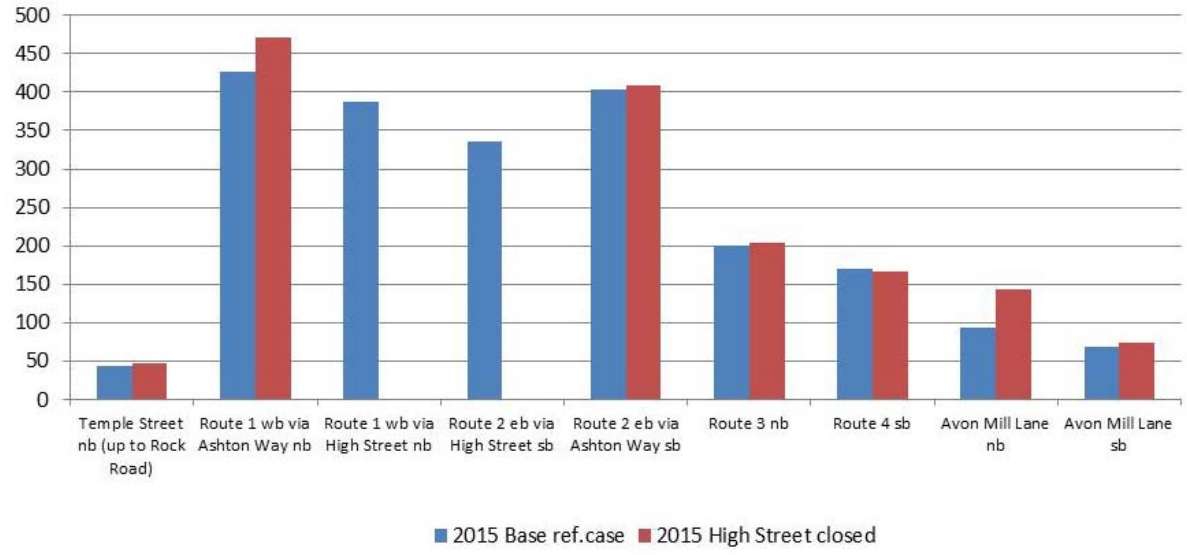
Table 3.2: 2015 Base Case vs 2015 High Street closed [sec]

Journey Time Route	2015 Base Case		2015 – High St closed	
	AM 08:00-09:00	PM 17:00-18:00	AM 08:00-09:00	PM 17:00-18:00
Temple St northbound (up to Rock Road)	160	186	94	198
Route 1 wb via Ashton Way northbound	691	647	671	994
Route 1 wb via High Street northbound	643	608	N/A	N/A
Route 2 eb via High Street southbound	525	541	N/A	N/A
Route 2 eb via Ashton Way southbound	637	704	564	1091
Route 3 northbound	260	263	231	375
Route 4 southbound	223	277	185	379
Avon Mill Lane northbound	171	199	221	395
Avon Mill Lane southbound	312	351	256	386

Source: Mott MacDonald

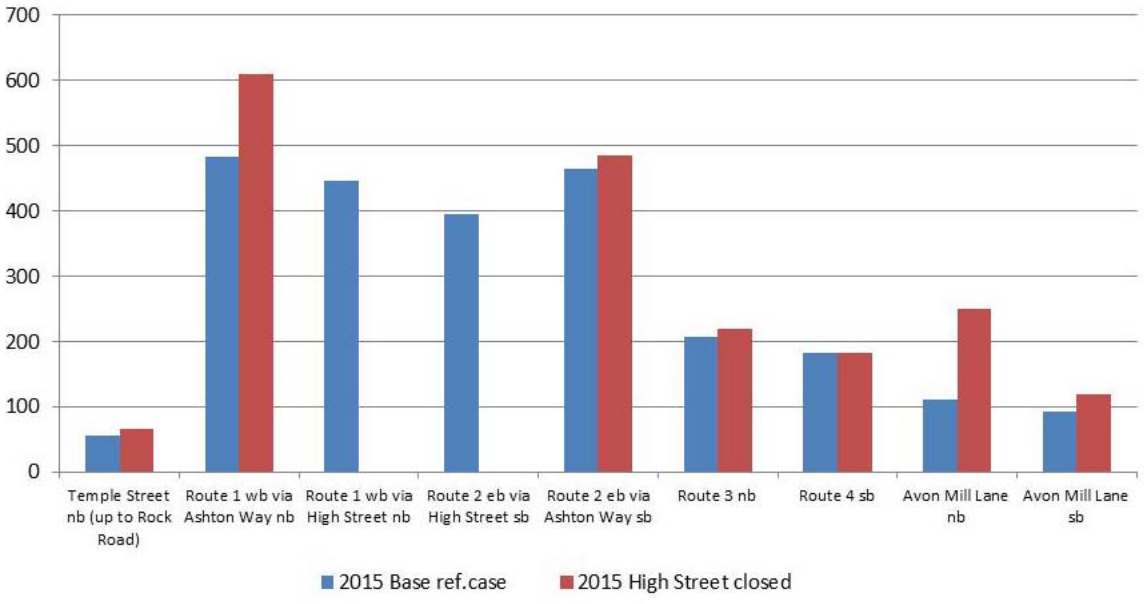
The comparison shows that in the PM peak hour journey times via Ashton Way increased significantly. However, the model shows that it would be still possible to implement a full closure of High Street up until 17:00, and then revert to its opening. Figures 3.3 and 3.4 show the comparison of the journey times for the 15:00-16:00 and 16:00-17:00 hours, and as it can be seen the journey times with High Street closed are comparable with the 2015 Base Case indicating similar network performance.

Figure 3.3: 2015 Base Case vs 2015 High Street closed [sec] – 15:00-16:00



Source: Mott MacDonald

Figure 3.4: 2015 Base Case vs 2015 High Street closed [sec] – 16:00-17:00



Source: Mott MacDonald

We understand that the actual implementation of a full closure of High Street and its re-opening after 17:00 has serious safety implications for two reasons:

- Traffic from Bath Hill wishing to head northbound along the High Street has to turn right at the roundabout and it would be very difficult to give advance warning that this was no longer possible (and that all traffic has to turn left)
- Pedestrians would get used to there being no traffic (or very little if certain types of vehicle e.g. buses and deliveries were still allowed to use the High Street) and so may not expect vehicle movements around 17:00.

These issues for vehicular movements and pedestrian activities would need to be carefully considered should a part-time High Street closure be considered by the Council.

3.3 2015 with High Street One-way Southbound

The layout with High Street one-way southbound and Ashton Way two-way is shown in Figure 3.5.

The scheme is characterised by the give-way junction at the bottom of High Street where High Street traffic has to turn left but has to give priority to Temple Street to Bath Hill traffic. Movements from Temple Street to Bath Hill (and vice-versa) do not interfere with each other and are unopposed.

This test has been carried out with two variations:

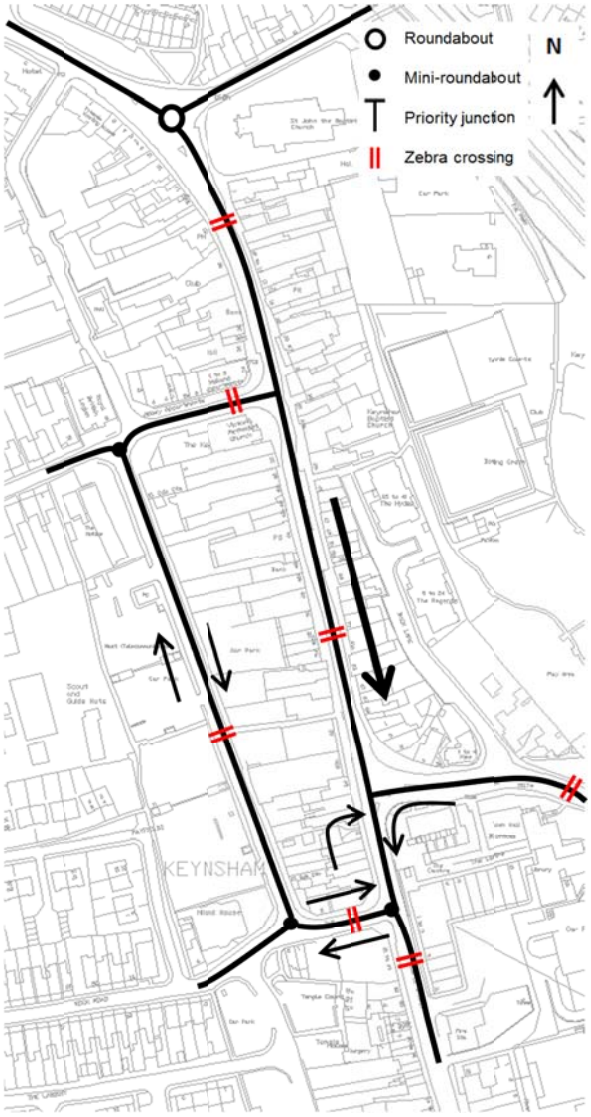
1. Junction between Temple Street and Rock Road as priority junction (for Temple Street northbound traffic), and
2. Junction between Temple Street and Rock Road as mini roundabout, as per 2015 Base Case arrangement.

The first test has highlighted that the assumed priority junction at the Temple Street/Rock Road junction would not work for Temple Street northbound traffic. The journey time on Temple Street northbound would be significant (more than 11 minutes in the PM peak hour 17:00-18:00) with queues that would build up and extend back as far as the outer limit of the model resulting in traffic not being able to enter the network.

For this reason this layout has been abandoned and only the current mini roundabout arrangement for the junction has been brought forward as the model showed a better network operation.

The modelled journey times for this test are shown in Tables 3.3 (AM 08:00-09:00) and 3.4 (PM 17:00-18:00) which are later in this section for comparison with results of another test.

Figure 3.5: 2015 with High Street One-way Southbound and Ashton Way Two-way



Source: Mott MacDonald

3.4 2015 Gyratory clockwise (High Street one-way southbound and Ashton Way one-way northbound)

Different 2015 gyratory clockwise network layouts have been tested depending on the different assumptions regarding the Charlton Road/High Street junction and the number of lanes on High Street southbound:

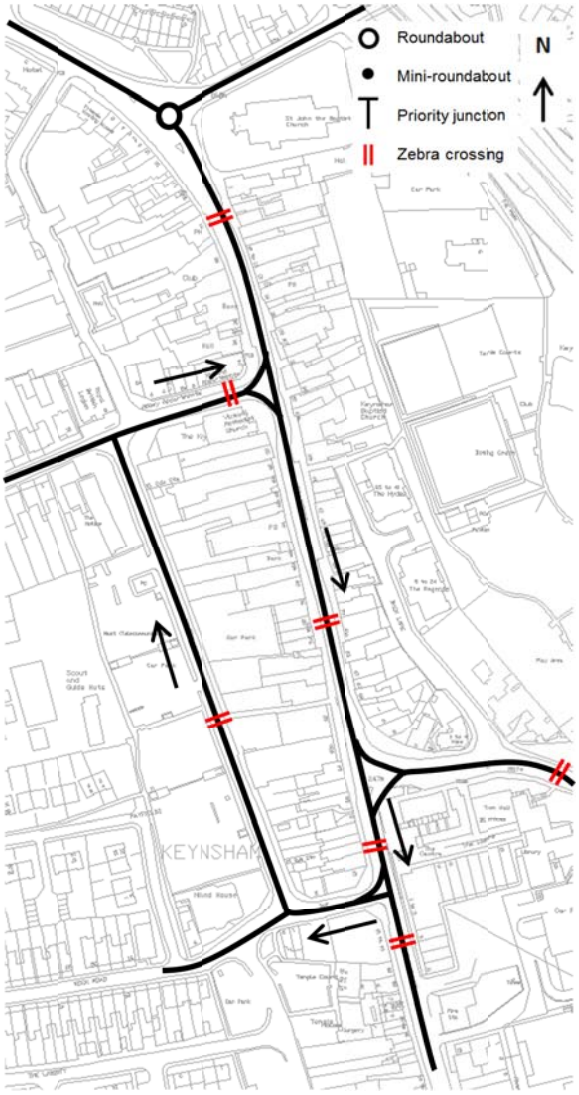
1. Charlton Road/High Street as priority junction with right turn Charlton Road traffic giving way to High Street southbound traffic, and High Street one lane southbound
2. Charlton Road/High Street with banned right turn from Charlton Road onto High Street, with one lane on High Street southbound flaring to two lanes approaching the High Street/Bath Hill junction
3. Charlton Road/High Street with two lanes on High Street southbound allowing the merging manoeuvre from Charlton Road onto High Street.

Test 1 failed to provide satisfactory network performance as the give-way junction between Charlton Road and High Street does not provide enough capacity for right turners from Charlton Road. Traffic is held on Charlton Road and the queues that would develop here would block the upstream Charlton Road/Ashton Way junction and in turn the Ashton Way northbound traffic, therefore undermining the operation of the gyratory clockwise arrangement.

To overcome this problem, Test 2 banned the right turn from Charlton Road onto High Street (as per 2015 Base Case), and therefore this manoeuvre was forced to u-turn at the Station Road roundabout. This re-routing, coupled with the overall one-way clockwise gyratory system implemented, resulted in the Station Road roundabout operating over-capacity. Consequently, long queuing occurred on its approaches, reflected in higher Route 3 northbound and Route 4 southbound journey times, especially in the PM peak hour 17:00-18:00.

As the Charlton Road/High Street junction proved to be the critical one for the satisfactory operation of the clockwise gyratory scheme, Test 3 provided a merging manoeuvre from Charlton Road onto High Street southbound. This required the introduction of two lanes southbound for the full length of High Street (see Figure 3.6). This junction layout would provide a good network operation both in the AM and PM peak hours as the modelled journey times in Tables 3.3 and 3.4 show.

Figure 3.6: 2015 Gyratory clockwise



Source: Mott MacDonald

We understand that keeping two lanes on High Street (although on a one-way system arrangement) is unlikely to be popular as it does not achieve the overall aim of improving the pedestrian environment on High Street. Nevertheless, this network arrangement provides the Council with an additional possible solution of implementing a one-way system on High Street that should not significantly increase congestion in the short term.

3.5 2015 with High Street One-way Northbound and Ashton Way Two-way

This option has one lane on High Street northbound which can only be accessed from Temple Street northbound i.e. traffic from Bath Hill cannot turn right into the High Street. This allows the free flow of traffic from Temple Street northbound heading east on Bath Hill.

This option has been tested with two variants:

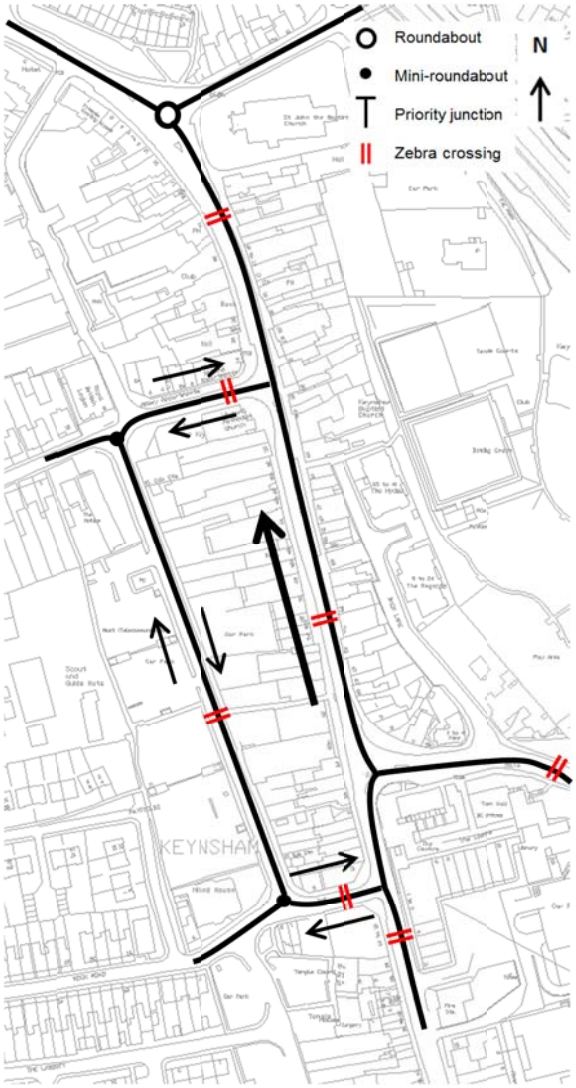
1. Rock Road/Temple Street as a mini roundabout as per 2015 Base Case
2. Rock Road/Temple Street as give-way junction (with Temple Street traffic giving way).

Test 1 showed poor network performance for the main eastbound and westbound movements due to the high volumes of traffic that have to pass through the Rock Road/Temple Street mini roundabout. This caused queues to develop both on Ashton Way southbound and Bath Hill westbound, which were particularly bad in the PM peak hour. The queues on Bath Hill periodically extended back as far as the Wellsway/Bath Road junction affecting the junction throughput there. The overall westbound traffic movement also suffered by the presence of the new mini roundabout at Bath Road/Chandag Road (along with the new Zebra crossing).

With the proposed network layout, the Avon Mill Lane southbound movement was also affected as traffic from Keynsham Road to Temple Street (or from Bristol Road to Bath Road) diverted to Avon Mill Lane southbound when queues started to develop on Ashton Way southbound. The increased traffic on Avon Mill Lane, coupled with the queues on Bath Road westbound, reduced the throughput capacity at the bottom of Avon Mill Lane as Avon Mill Lane traffic struggled to join the main westbound traffic towards the High Street/Bath Hill junction.

For these reasons Test 1 was abandoned and the Rock Road/Temple Street junction was coded as a give-way junction allowing movements between Ashton Way and Bath Hill to be unopposed. The southbound movement into Temple Street from the High Street/Bath Hill junction would also be unopposed but right turn traffic from Rock Road to Temple Street and northbound movement from Temple Street would have to give way. The network layout for this test is shown in Figure 3.7.

Figure 3.7: 2015 with High Street one-way northbound and Ashton Way two ways



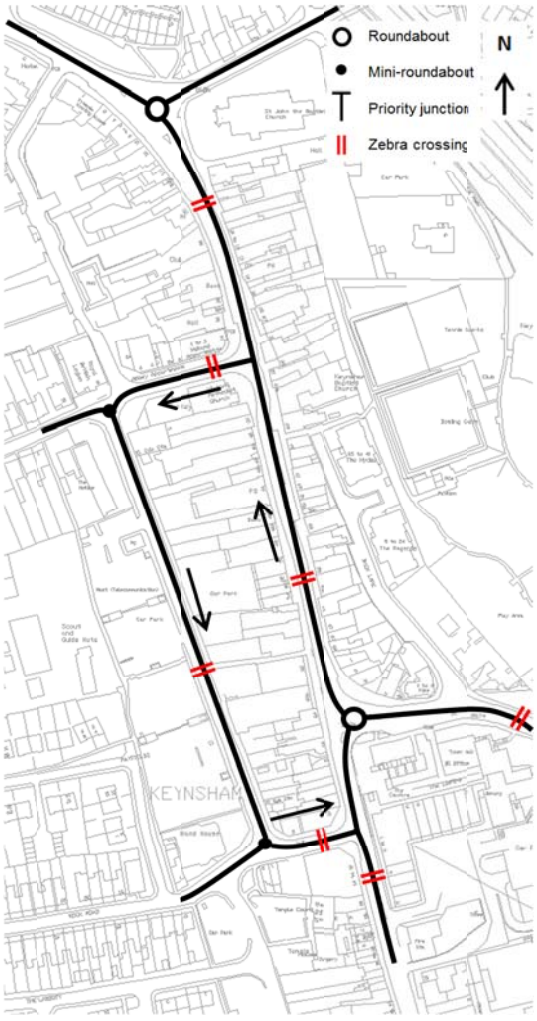
Source: Mott MacDonald

Although Test 2 resolved the problems for the main eastbound and westbound movements, the give-way layout caused capacity issues for the Temple Street northbound traffic which was unable to find suitable gaps in the traffic stream. As a consequence, queues developed on Temple Street northbound and traffic was unable to enter the network. In the PM peak hour this resulted in a journey time of more than 14 minutes. For this reason, it would appear that the High Street northbound option should not be considered further.

3.6 2015 Gyratory Anti-clockwise (High Street One-way Northbound and Ashton Way One-way Southbound)

The gyratory anti-clockwise option (with one lane on High Street northbound) network layout is shown in Figure 3.8.

Figure 3.8: 2015 Gyratory anti-clockwise - High Street one-way northbound and Ashton Way one-way southbound



Source: Mott MacDonald

This option required the High Street/Bath Hill junction to be retained as a roundabout allowing the right turn from Bath Hill onto High Street northbound. The junction between Rock Road and Temple Street has been coded as a priority junction given the outcomes of the previous test reported in section 3.5, whereby a mini-roundabout would not provide sufficient capacity for the high volume of traffic on Rock Road.

The modelling results showed that the introduction of the roundabout at High Street/Bath Hill has similar effects of those shown for the High Street northbound scheme, with queues extending back onto Ashton Way southbound. This, in turn, resulted in re-routing of traffic which affected the operation of Avon Mill Lane southbound and also Keynsham Road westbound especially in the PM peak hour. The give-way junction at Rock Road/Temple Street also caused long delays on Temple Street northbound both in the AM and PM peak hours.

As for the option with High Street northbound (and Ashton Way two way) it would appear that the gyratory option with High Street northbound should not to be taken forward due to increased congestion.

3.7 Summary of the 2015 S-PARAMICS tests

A summary of the modelled journey times (AM and PM peak hours) for the routes identified in Figure 3.1 is shown in Tables 3.3 and 3.4. Only the tests that would appear to offer a possible workable solution for the implementation of a High Street one-way system in 2015 have been presented. The tables include a comparison with the 2012 journey times.

Table 3.3: 2015 Options – Summary of the modelled S-PARAMICS journey times [sec] – AM 08:00-09:00

Journey Time Route AM 08:00-09:00	2012 Base Case	2015 Base Case	2015 High Street one-way southbound (with mini at Rock Rd/Temple St)	2015 High Street one-way southbound Gyratory (2 lanes High Street southbound)
Temple St northbound (up to Rock Road)	42	160	79	91
Route 1 wb via Ashton Way northbound	487	691	655	605
Route 1 wb via High Street northbound	473	643	N/A	N/A
Route 2 eb via High Street southbound	372	525	519	492
Route 2 eb via Ashton Way southbound	432	637	537	N/A
Route 3 northbound	225	260	217	265
Route 4 southbound	181	223	184	326
Avon Mill Lane northbound	139	171	170	145
Avon Mill Lane southbound	110	312	203	159

Source: Mott MacDonald

Table 3.4: 2015 Options – Summary of the modelled S-PARAMICS journey times [sec] – PM 17:00-18:00

Journey Time Route PM 17:00-18:00	2012 Base Case	2015 Base Case	2015 High Street one-way southbound (with mini at Rock Rd/Temple St)	2015 High Street one-way southbound Gyratory (2 lanes High Street southbound)
Temple St northbound (up to Rock Road)	43	186	142	189
Route 1 wb via Ashton Way northbound	449	647	781	532
Route 1 wb via High Street northbound	422	608	N/A	N/A
Route 2 eb via High Street southbound	372	541	672	442
Route 2 eb via Ashton Way southbound	445	704	672	N/A
Route 3 northbound	217	263	258	227
Route 4 southbound	186	277	251	300
Avon Mill Lane northbound	127	199	245	115
Avon Mill Lane southbound	81	351	409	153

Source: Mott MacDonald

The comparison of the 2015 modelled journey times shows that the one-way High Street southbound layout (with Ashton Way two-way) would result in journey times that are lower than the 2015 Base Case in the AM peak hour. In the PM peak hour, the times are generally comparable with the 2015 Base Case, with the highest increase (just over two minutes) shown on the westbound route via Ashton Way northbound.

The clockwise gyratory scheme with two lanes on High Street resulted in journey times that are generally lower than those from the current 2015 network layout, in both AM and PM peak hours, indicating a better performance. The increases on route 4 southbound reflect the longer distance required to reach Charlton Road as with the gyratory scheme this is via High Street southbound and Ashton Way northbound. However, in order to provide sufficient capacity, the gyratory scheme requires two lanes southbound on High Street, and this may not be desirable given the overall target of making the High Street a more pedestrian-friendly environment.

More detailed plans of these possible layouts are contained in **Appendix A**.

4 2022 S-PARAMICS Model Runs

4.1 Introduction

The network changes that were introduced in 2015 have been also added to the 2022 S-PARAMICS models that were developed by Halcrow and that were further amended by Mott MacDonald in June 2014 as part of the Transport Strategy work.

Given the outcomes of the 2015 modelling work, the 2022 tests concentrated on those options that would have the best chance of providing a satisfactory network performance in 2022 as well. Therefore, the 2022 options analysed were:

1. 2022 Reference Case – this assumed the same overall network layout for the town centre junctions as in 2015
2. 2022 with High Street one-way southbound and Ashton Way two-way
3. 2022 with High Street one-way southbound and Ashton Way one-way northbound, i.e. clockwise gyratory on High Street and Ashton Way

Variations of the above were tested, and modelled journey times extracted on the same routes shown in Figure 3.1. The following sections of the report describe the tests carried out.

4.2 2022 Reference Case

The 2022 Reference Case network is the same as that developed by Halcrow for 2022 and further amended by Mott MacDonald in June 2014. The changes comprise:

- signalisation of the Keynsham Road Somerdale access and signalisation of the Keynsham Road/Avon Mill Lane junction
- introduction of a flare at the bottom of Avon Mill Lane,
- an additional lane on Keynsham Road westbound at the signal with Avon Mill Lane allowing a dedicated left turn lane, and
- The signalisation of the Wellsway/Bath Hill junction.

Starting from this reference network, different junction layouts were tested for the 2022 base:

- with all of the changes that were introduced in 2015, in particular the introduction of only one approaching lane at the High Street/Bath Hill junction
- as above but with two approaching lanes at the High Street/Bath Hill junction (as per junction layout before the Town Hall changes)
- with two approaching lanes at the High Street/Bath Hill junction, signals at the Bath Road/Chandag Road junction and mini roundabout at the Wellsway/Bath Hill junction
- with two approaching lanes at the High Street/Bath Hill junction, signals at the Bath Road/Chandag Road junction and signals at the Wellsway/Bath Hill junction.

4.2.1 2022 Reference Case with one lane at the High Street/Bath Hill junction

The S-PARAMICS assignment with just one lane on each arm of the High Street/Bath Hill junction showed queues developing on Temple Street, High Street southbound and also Bath Hill. Queues would extend back as far as the upstream junctions, blocking or limiting throughput capacities with network performance deteriorating, with the PM peak being the most affected period.

The operation of the new mini roundabout at the Bath Road/Chandag Road and the presence of the zebra pedestrian crossing just east of Chandag Road also had a detrimental effect on the model assignment. Queues developed on Bath Road eastbound that affected the operation of the Wellsway signal junction, effectively reducing the throughput capacity of the Wellsway signals.

4.2.2 2022 Reference Case with two lanes at the High Street/Bath Hill junction

In order to overcome some of the problems with the reduced capacity at the High Street/Bath Hill junction, this test reverted back to the 2014 junction layout with two lanes on each approach. The other 2015 changes were, however, still included, in particular the mini roundabout at the Bath Road/Chandag Road junction with the associated zebra pedestrian crossing.

This test confirmed that the presence of the new mini roundabout at Bath Road/Chandag Road was having a negative impact on the operation. Queues extended back as far as the High Street/Bath Hill junction and therefore undermined the re-introduction of the two lanes at the roundabout. In turn, queues developed on High Street southbound that had a knock down effect on the operation of Station Road roundabout.

4.2.3 2022 Reference Case with Signals at Bath Road/Chandag Road junction and mini roundabout at the Wellsway/Bath Hill junction

This option was carried out with the introduction of new signals at the Bath Road/Chandag Road, and the reversion to a mini roundabout at the Wellsway/Bath Hill junction.

The new signals at Bath Road/Chandag Road incorporated an all-red pedestrian stage to allow crossings to take place (assumed to occur every 4 minutes) but with central islands which allowed crossings to be split into two legs to minimise delay to traffic. A LINSIG model was developed to gather the best cycle times, staging and phasing for achieving this in the AM and PM peak periods.

The assignments for this network layout confirmed previous findings that the mini roundabout at Bath Hill/Wellsway would be over-capacity during the AM and PM peak hours.

4.2.4 2022 Reference Case with signals at both Bath Road/Chandag Road and Wellsway/Bath Hill junctions

The logical evolution of the tests carried out with the 2022 reference case network has been to signalise (and coordinate) both the Bath Road/Chandag Road and the Bath Hill/Wellsway junctions. LINSIG was used to derive the best optimum cycle times, staging and phasing for the AM and PM peak hours. It should be noted that although the pedestrian stage was explicitly modelled at the Bath Road/Chandag Road junction, an all-red pedestrian stage was not allowed for at the Bath Hill/Wellsway junction, where it was assumed that pedestrian activities would occur by using central islands and crossing during the progression of the vehicular stages.

It is this run that has been taken as the '2022 Base Case' for comparison with the High Street one-way tests. Modelled journey times for this Base Case are presented in Tables 4.1 and 4.2.

4.3 2022 with High Street One-way Southbound and Ashton Way Two-way

As for the Reference Case, the 2022 tests with the implementation of High Street southbound were carried out with different junction layouts for the Bath Hill/Wellsway and Bath Road/Chandag Road junctions:

- Bath Hill/Wellsway as a mini roundabout and Bath Road/Chandag Road reverted back as a priority junction
- Bath Hill/Wellsway signalised and Bath Road/Chandag Road reverted back as a priority junction
- Both Bath Hill/Wellsway and Bath Road/Chandag Road junctions signalised

This confirmed that the High Street option (Figure 3.5) worked best with both the Wellsway and Chandag Road junctions signalised, with the modelled journey times shown in Tables 4.1 and 4.2.

4.4 2022 Clockwise Gyratory (High Street one-way southbound and Ashton Way one-way northbound)

Two variations were tested for this gyratory option with two lanes on High Street southbound:

- Signals at Bath Road/Chandag Road and mini roundabout at Bath Hill/Wellsway
- Signals at both Bath Road/Chandag Road and Bath Hill/Wellsway

The problems of the mini roundabout arrangement at Bath Hill/Wellsway not providing enough capacity were exacerbated with the gyratory scheme, with queues building up to High Street and further up to Charlton Road affecting the right turning movement from Charlton Road. The blocking of High Street also affected movements from the Station Road roundabout with the consequence of the gridlocking the network.

The results with signals at both junctions and the clockwise gyratory scheme (Figure 3.6) are shown in Tables 4.1 and 4.2.

4.5 Summary of the 2022 S-PARAMICS tests

A summary of the modelled journey times (AM and PM peak hours) for the routes identified in Figure 3.1 is shown in Tables 4.1 and 4.2. Only the tests that would appear to offer a possible solution for the implementation of the Keynsham town centre one-way system in 2022 have been presented. The tables include a comparison with the 2015 and 2022 Base Case modelled journey times.

Table 4.1: 2022 Options – Summary of the modelled S-PARAMICS journey times [sec] – AM 08:00-09:00

Journey Time Route AM 08:00-09:00	2015 Base Case	2022 Base Case	2022 High Street one-way southbound (with mini at Rock Rd/Temple St)	2022 High Street one-way southbound Gyratory (2 lanes High Street southbound)
Temple St northbound (up to Rock Road)	160	46	82	65
Route 1 wb via Ashton Way northbound	691	754	856	670
Route 1 wb via High Street northbound	643	744	N/A	N/A
Route 2 eb via High Street southbound	525	594	540	473
Route 2 eb via Ashton Way southbound	637	541	565	N/A
Route 3 northbound	260	274	289	373
Route 4 southbound	223	255	251	362
Avon Mill Lane northbound	171	150	248	210
Avon Mill Lane southbound	312	102	111	98

Source: Mott MacDonald

Table 4.2: 2022 Options – Summary of the modelled S-PARAMICS journey times [sec] – PM 17:00-18:00

Journey Time Route PM 17:00-18:00	2015 Base Case	2022 Base Case	2022 High Street one-way southbound (with mini at Rock Rd/Temple St)	2022 High Street one-way southbound Gyratory (2 lanes High Street southbound)
Temple St northbound (up to Rock Road)	186	66	280	490
Route 1 wb via Ashton Way northbound	647	704	1149	922
Route 1 wb via High Street northbound	608	664	N/A	N/A
Route 2 eb via High Street southbound	541	630	660	626
Route 2 eb via Ashton Way southbound	704	578	682	N/A
Route 3 northbound	263	277	298	492
Route 4 southbound	277	303	316	634
Avon Mill Lane northbound	199	206	380	219
Avon Mill Lane southbound	351	141	272	201

Source: Mott MacDonald

In the AM peak hour both of the 2022 schemes (High Street one-way southbound and gyratory) would provide a satisfactory network performance with journey times that are comparable (and sometimes lower) than the corresponding 2022 Base Base ones.

In the PM peak hour, route 1 westbound (via Ashton Way northbound) with the High Street one-way southbound scheme increased by more than 7 minutes when compared with both the 2015 and 2022 Base Cases. This is due to the operation of the Rock Road/Temple Street mini roundabout which causes queuing to block back to the Bath Hill roundabout, in turn exacerbating queuing and delays on Bath Hill itself.

With the gyratory scheme, this increase was lower at 3.6 minutes while, as noted earlier, the journey time on route 4 southbound increased by around 5 minutes, mainly due to the longer distance travelled around the gyratory.

In addition to the journey times, link flows (in units of vehicles/hour) were extracted on both the High Street and Ashton Way for the 2022 options shown above. These are shown Tables 4.3 and 4.4.

Table 4.3: 2022 Link Flows AM 08:00-09:00 [vehs/hour]

Link	2022 Base Case	2022 High St one-way southbound	2022 clockwise gyratory
High St southbound	282	227	916
High St northbound	468	0	0
High St Total	**750**	**227**	**916**
Ashton Way southbound	240	301	0
Ashton Way northbound	227	525	1011
Ashton Way Total	**467**	**826**	**1011**
High Street + Ashton Way	***1217***	***1053***	***1927***

Source: Mott MacDonald

Table 4.4: 2022 Link Flows PM 17:00-18:00 [vehs/hour]

Link	2022 Base Case	2022 High St one-way southbound	2022 clockwise gyratory
High St southbound	287	235	888
High St northbound	476	0	0
High St Total	**763**	**235**	**888**
Ashton Way southbound	178	306	0
Ashton Way northbound	266	477	1023
Ashton Way Total	**444**	**783**	**1023**
High Street + Ashton Way	***1207***	***1018***	***1911***

Source: Mott MacDonald

The tables show the reduction in total flow on the High Street when the one-way scheme is implemented to less than one third of the 2022 Base Case. However, with the gyratory scheme and two lanes on High Street there would be an increase in total flow (22% in AM and 16% in PM) which would not be desirable given the target of making the High Street a more pedestrian-friendly environment. In the AM peak hour, this would be equivalent to an increase from 12 to 15 vehicles every minute.

When considering the total flow on both the High Street and Ashton Way, the gyratory scheme gives a huge increase of more than 50% over the Base Case, as many trips would have to use both routes, rather than just one route if they were both kept two-way. With the High Street one-way scheme, flows on Ashton Way are higher than the Base Case but there is an overall reduction in traffic passing through the town centre of around 15%.

4.6 Life of the High Street One-way Scheme

It has been shown that the High Street One-way scheme would be acceptable in 2015, in terms of traffic congestion, but that increased traffic demand to 2022 would give a large increase in PM westbound journey times through the town centre. A further test was carried out with the one-way scheme, assuming that only 50% of the proposed development to 2022 would be in place i.e. representing a year around

2019, but with the 2015 network. This test showed large increases in journey time in both the AM and PM peak periods, compared to the 2015 Base Case.

This test was also run assuming that the other proposed improvements would be in place i.e. the 2022 network. This showed that the overall network would be able to accommodate the growth to 2019, with most journey times being less than for the 2015 Base Case. There would be some increase in PM westbound journey times through the town centre but this is limited to around two minutes (increasing from 11 minutes in 2015 to 13 minutes in 2019).

5 Conclusions

2015 With High Street One-way Southbound

This scheme would result in journey times through the town centre that are comparable with the 2015 Base Case, with some relatively small increases for some routes but reductions on others.

2015 Clockwise Gyratory

The performance of the Gyratory scheme would be similar to that of the 2015 Base Case, with reduced journey times for some movements, but only if two southbound lanes are provided on the High Street. This scheme would actually cause an increase in traffic flow on the High Street and in the town centre overall. As such, as one of the objectives is to improve the pedestrian environment on the High Street, the Gyratory scheme is not recommended.

2022 Base Case

To minimise increases in congestion in the future, both the Bath Road/Chandag Road and Wellsway/Bath Hill junctions should be signalised. At Chandag Road, pedestrian crossings should be incorporated into the signal layout to avoid the need for a separate zebra crossing as this causes delays to traffic.

These improvements are in addition to those already committed or proposed:

- signalisation of the Keynsham Road Somerdale access and signalisation of the Keynsham Road/Avon Mill Lane junction
- introduction of a flare at the bottom of Avon Mill Lane
- an additional lane on Keynsham Road westbound at the signals with Avon Mill Lane allowing a dedicated left turn lane.

Furthermore, if a one-way scheme is not introduced on the High Street, approaches to the High Street/Bath Hill roundabout should be widened to provide short two-lane flares.

2022 With High Street One-way Southbound

As for 2015, this scheme would be successful in greatly reducing traffic on the High Street, with an overall reduction in traffic passing through the town centre of around 15%. However, this would be at the expense of a significant increase in journey time for westbound trips through the centre from around 12 minutes to 19 minutes in the PM peak hour. Some trips would re-route to avoid long delays on Bath Hill, causing some increases in delay on Avon Mill Lane.

Therefore, due to this increase in congestion, the High Street One-way Southbound scheme is not recommended in the long term. However, the one-way layout is shown to work successfully between 2015 and 2019, assuming that the other proposed improvements for the 2022 Base Case are implemented soon after 2015.

2022 Clockwise Gyratory

The Gyratory scheme would perform better than the High Street One-way scheme in traffic capacity terms, resulting in less of an increase in congestion from the 2022 Base Case. As for 2015, this scheme would actually cause an increase in traffic flow on the High Street and in the town centre overall. As such, the Gyratory scheme is not recommended.

Overall Conclusion

To avoid large increases in congestion in the long term, the best option is to retain the current road layout in the town centre but with improvements elsewhere as outlined for the 2022 Base Case above.

In the short to medium term (up to 2019), the High Street One-way Southbound scheme would work satisfactorily if the other identified improvement schemes are implemented soon after 2015.

A gyratory scheme is not recommended is it would require two southbound lanes on the High Street and would result in increased traffic flow on the High Street.

Appendix A Plans of Possible Road Layout Changes

Keynsham

One Way High Street Southbound

Mott MacDonald

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Scale : 1:1000 @ A3

Keynsham

One Way Clockwise Gyratory System
with 2-lanes on Southbound High Street

Mott MacDonald

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Scale : 1:1000 @ A