3 Future situation

3.1 Introduction

3.1.1 This section summarises the A27 Arundel Bypass modelling methodology and results, described in more detail in the PCF Stage 2 Further Consultation SAR and ComMA. This section also describes the methodology and results of supplementary sensitivity testing, including forecasting and operational modelling.

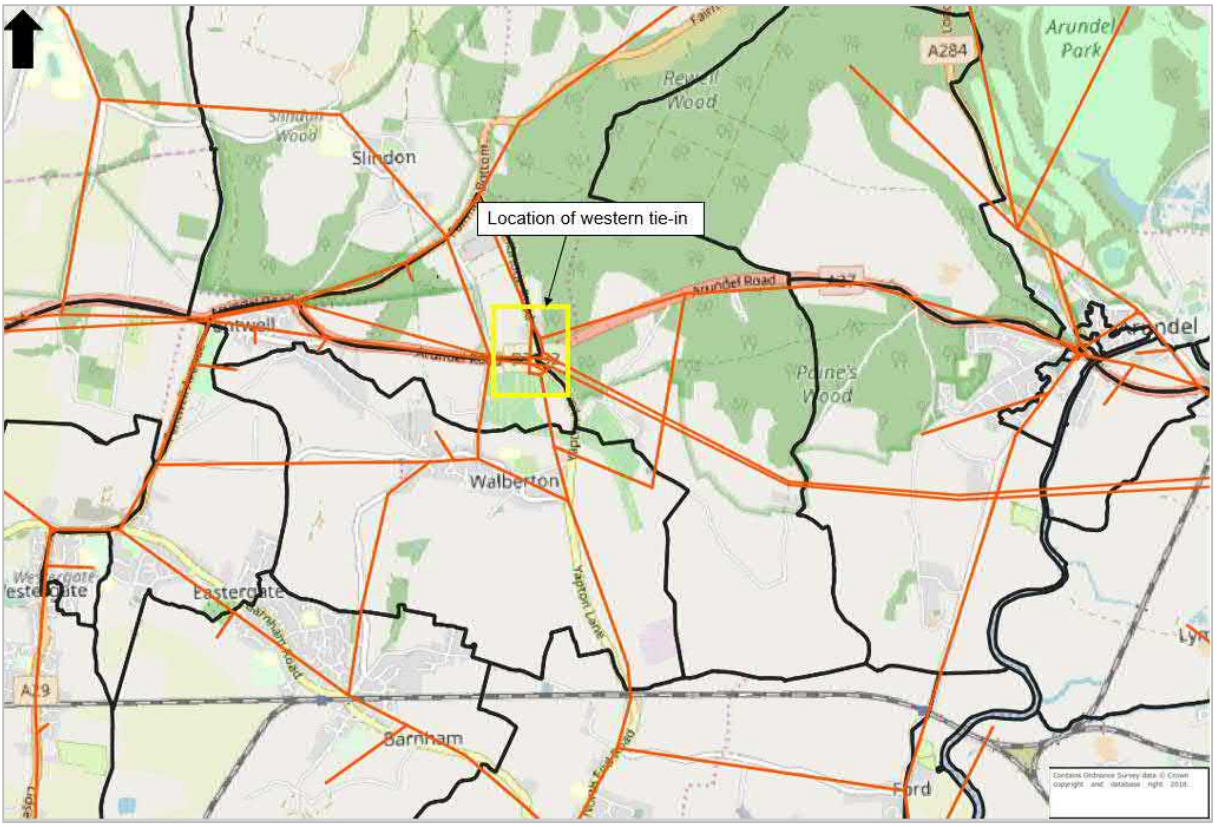
3.2 Modelling methodology

3.2.1 The A27 transport model was developed with inputs from the South East Regional Transport Model (SERTM), including demand data and the transport network. A cordon of the SERTM was used, and the transport model network refined to produce the model extent illustrated in Figure 3-1. The A27 transport model was developed using SATURN[14] software. The network within the western tie-in local roads study area (indicated by orange lines) is presented in Figure 3-2.

Figure 3-1: A27 transport model extent

[14] For further details, refer HE551523-WSP-GEN-SWI-RP-TR-00017-P03 – A27 Arundel Bypass, PCF Stage 2 Further Consultation Combined Modelling and Appraisal Report, Section 7.3 (July 2019)

Figure 3-2: Western tie-in location in the context of the modelled network



3.2.2 Three forecast years were modelled, 2026 scheme opening year, 2041 design year and 2051 final forecast year. For each of these forecast years, three time periods were modelled:

- Morning peak period, average hour: AM (07:00-10:00)
- Inter peak period, average hour: IP (10:00-16:00)
- Evening peak period, average hour: PM (16:00-19:00)

3.2.3 There are five user classes modelled:

- Car: Business
- Car: Commute
- Car: Other
- Light Goods Vehicles (LGV)
- Heavy Goods Vehicles (HGV)

3.2.4 The forecast level of growth within the three forecast years are consistent with the Department for Transport (DfT) National Trip End Model (NTEM) forecasts. In addition, traffic growth associated with LGV's and HGV's is consistent with National Road Traffic Forecasts (NRTF)[15].

3.2.5 To demonstrate the transport model is robust and representative of current conditions, appropriate independent data (external to the model development / matrix estimation process) was used for validation along key sections in the network. Journey time data was also used to assess the performance and validation of the base model. Appendix C-1 shows the location of count sites used for validation.

3.2.6 The link flow calibration and validation results for all time periods are at a sufficient standard to provide confidence that the model is replicating existing traffic conditions. Screenlines and journey time data provide further confirmation that the PCF Stage 2 A27 base year transport model reasonably represents 2015 observed traffic conditions[16].

3.2.7 As with all strategic models, there are some links within the network that were not subject to calibration or validation, and some individual links that do not pass model calibration or validation criteria. The ComMA notes these limitations, which affects links which include Yapton Lane (see ComMA section 3.3.2). Nevertheless, the PCF Stage 2 A27 transport model calibration is above the 85% threshold, as specified within TAG Unit M3.1 (see section 9.1.10 and 9.1.11 of the ComMA), for all peak hours for all vehicles. Similarly, in terms of model validation, all link flow and GEH[17] criteria are above the 85% threshold for AM, Inter and PM peak periods. This indicates the modelled data provides a good fit with the observed data and provides a suitable basis for transport forecasting and scheme appraisal. For further information on the model calibration and validation GEH see chapter 10 of the ComMA. A supplementary operational modelling assessment has been undertaken on Option 4/5AV1, in order to address the A27 transport model limitations associated with the calibration and validation of the model flows on Yapton Lane.

[15] HE551523-WSP-GEN-SWI-RP-TR-00017-P03 – A27 Arundel Bypass, PCF Stage 2 Further Consultation Combined Modelling and Appraisal Report, paragraph 3.3.4, (August 2019),

[16] Chapter 3: HE551523-WSP-GEN-SWI-RP-TR-00017-P03 – A27 Arundel Bypass, PCF Stage 2 Further Consultation Combined Modelling and Appraisal Report (August 2019)

[17] The GEH statistic is similar to a chi-squared test and is used in traffic modelling to compare two sets of traffic volumes. The GEH formula gets its name from Geoffrey E. Havers, who invented it

3.2.8 The model forecasts are informed by an uncertainty log, which sets out the assumptions made in the model about the housing and employment land use and transport infrastructure changes for each forecast year and time period within the model area. Details of the uncertainty log are set out in section 11.2 of the ComMA. A summary of the predicted land use transport infrastructure changes defined as 'near certain' and 'more than likely' within the western tie-in area were modelled in the A27 transport model forecasts includes:

- **Yapton Level Crossing:** The existing crossing has a fixed life and will certainly require replacement prior to 2025 and not be replaced like for like. Therefore, the crossing control scheme is considered certain over the longer term (as an alternative bridge scheme is not funded or demonstrated to be viable) as Network Rail view it as a priority for the safety of the line.

3.3 Forecasting results

3.3.1 Figure 3-3 to Figure 3-14 present the pattern of traffic flow changes forecast within the western tie-in local roads study area as a result of the scheme options. The forecasts presented are for the design year 2041 AM and PM peak periods, as these scenarios are considered to be representative of the general effects of the A27 Arundel Bypass scheme options.

3.3.2 The traffic flow changes for all six options are presented in terms of coloured bandwidths. A blue line indicates a reduction in traffic flow and a green line indicates an increase in traffic flow. The thickness of the lines indicates the relative magnitude of change in traffic flow, i.e., a wider line would suggest a greater increase or decrease and vice versa for a thinner line. Coloured bandwidths are only shown for links which are consistent between the Do Minimum and Do Something scenarios.

Figure 3-3: Do Something (1V5) – Do Minimum 2041 AM

Figure 3-4: Do Something (1V5) – Do Minimum 2041 PM

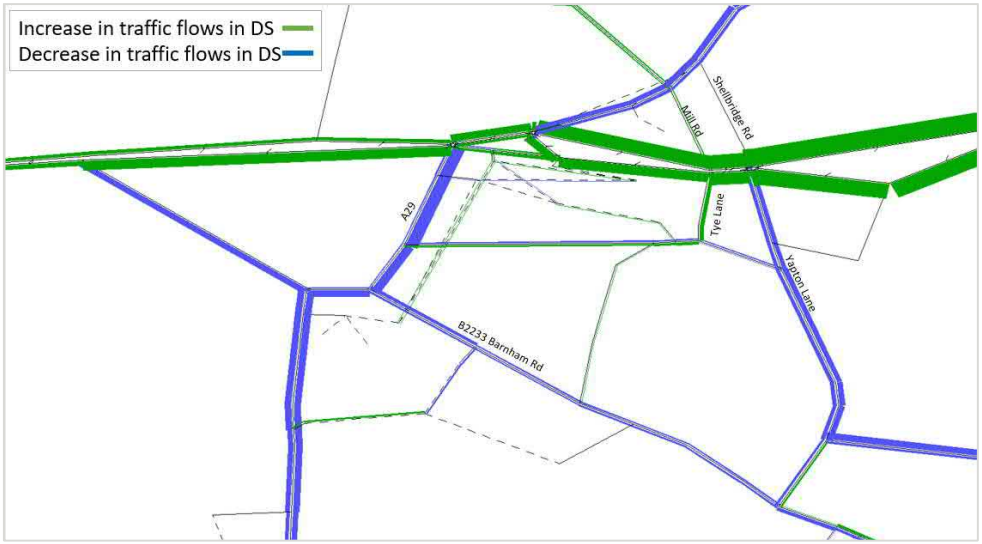


Figure 3-5: Do Something (1V9) – Do Minimum 2041 AM

Figure 3-6: Do Something (1V9) – Do Minimum 2041 PM

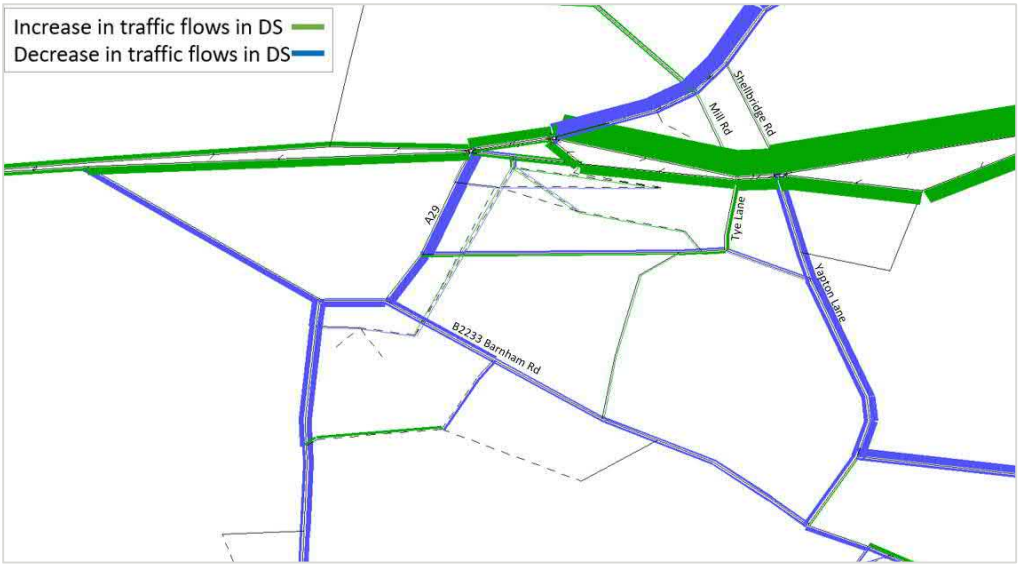


Figure 3-7: Do Something (3V1) – Do Minimum – 2041 AM

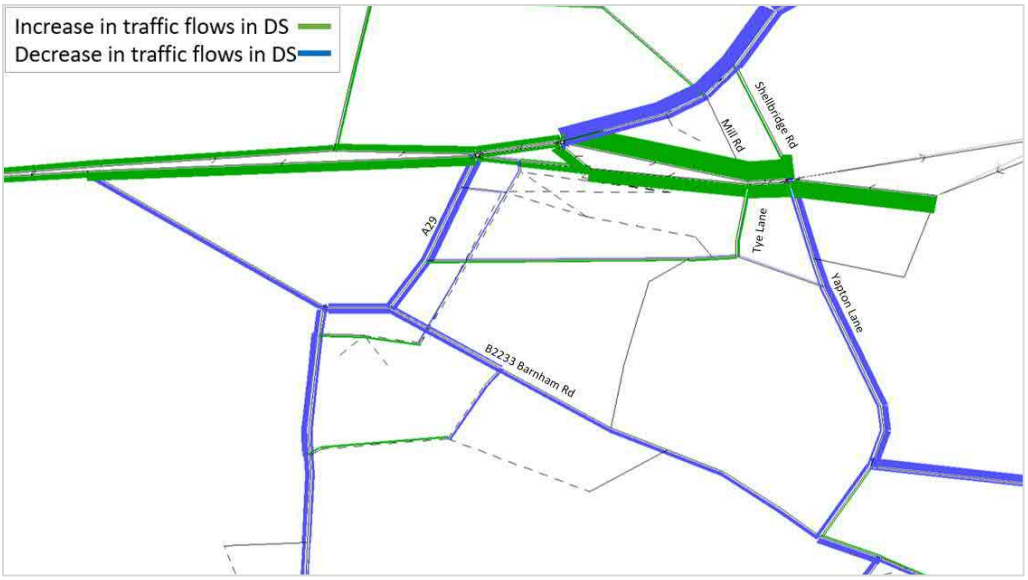


Figure 3-8: Do Something(3V1) – Do Minimum – 2041 PM

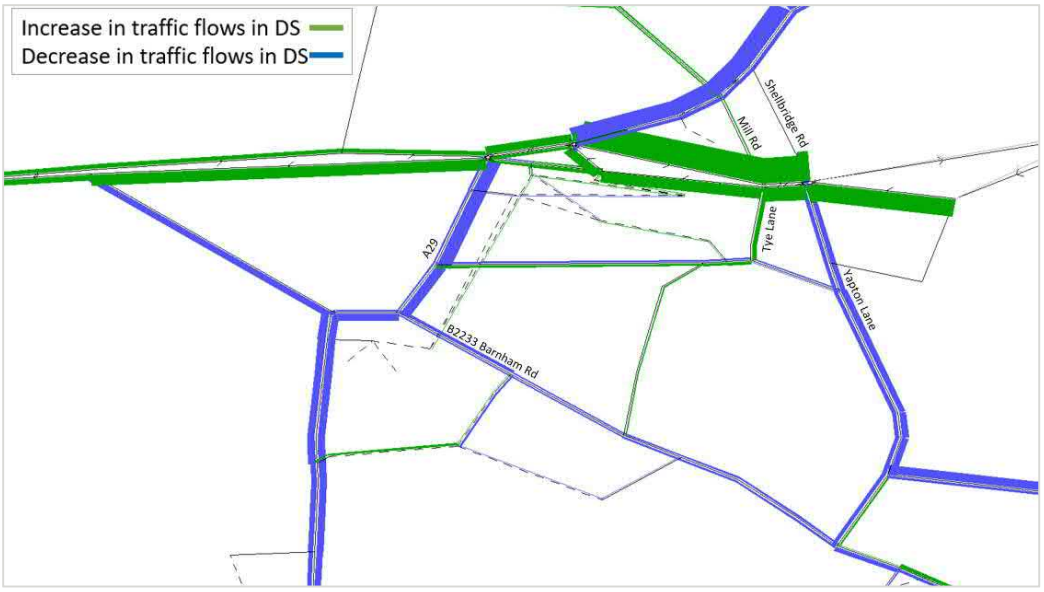


Figure 3-9: Do Something (4/5AV1) – Do Minimum – 2041 AM

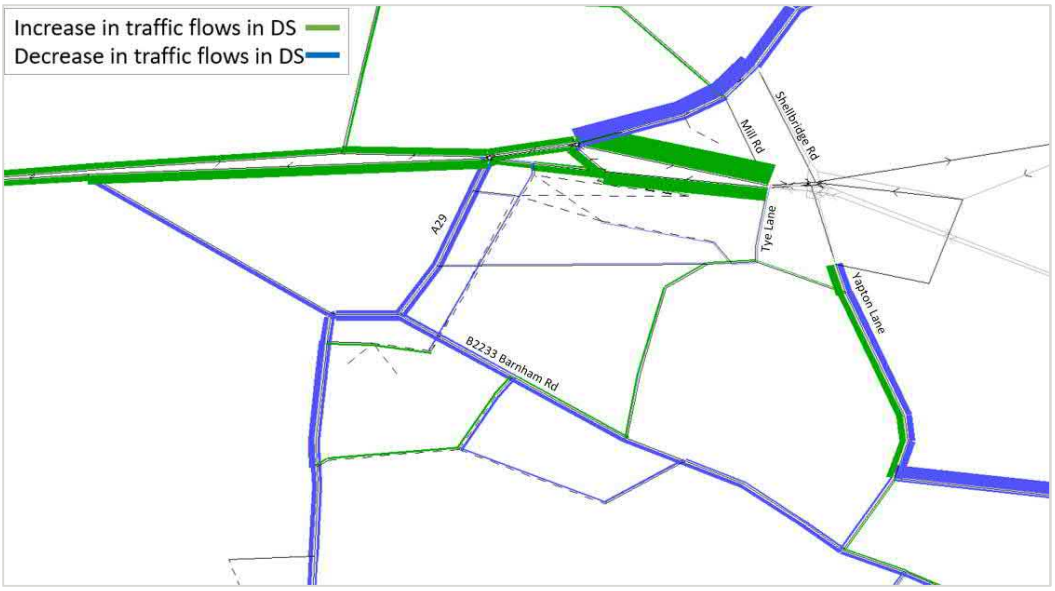


Figure 3-10: Do Something (4/5AV1) – Do Minimum – 2041 PM

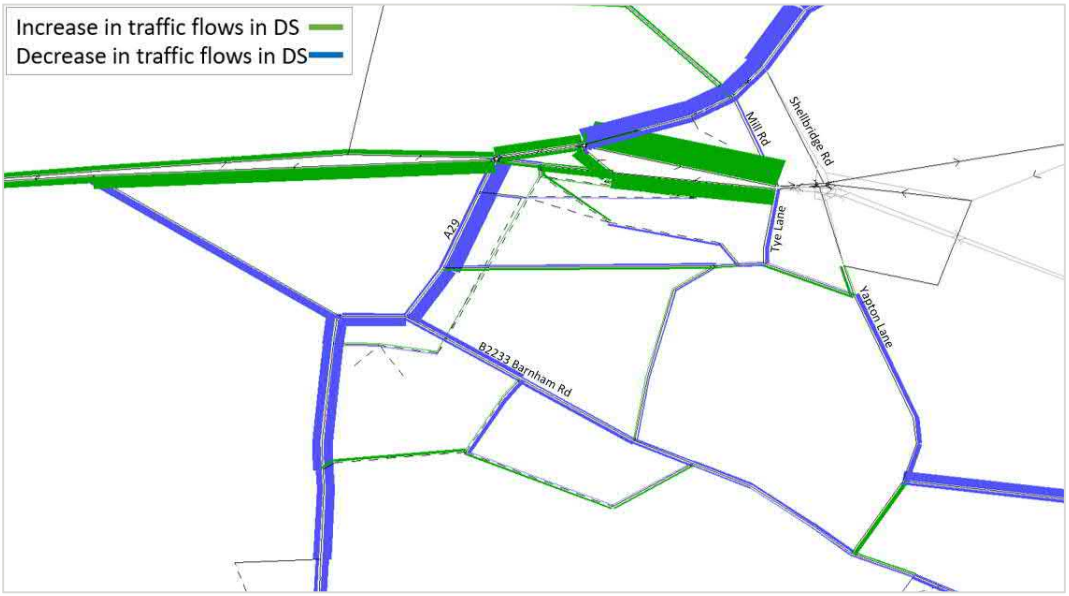


Figure 3-11: Do Something (4/5AV2) – Do Minimum 2041 AM

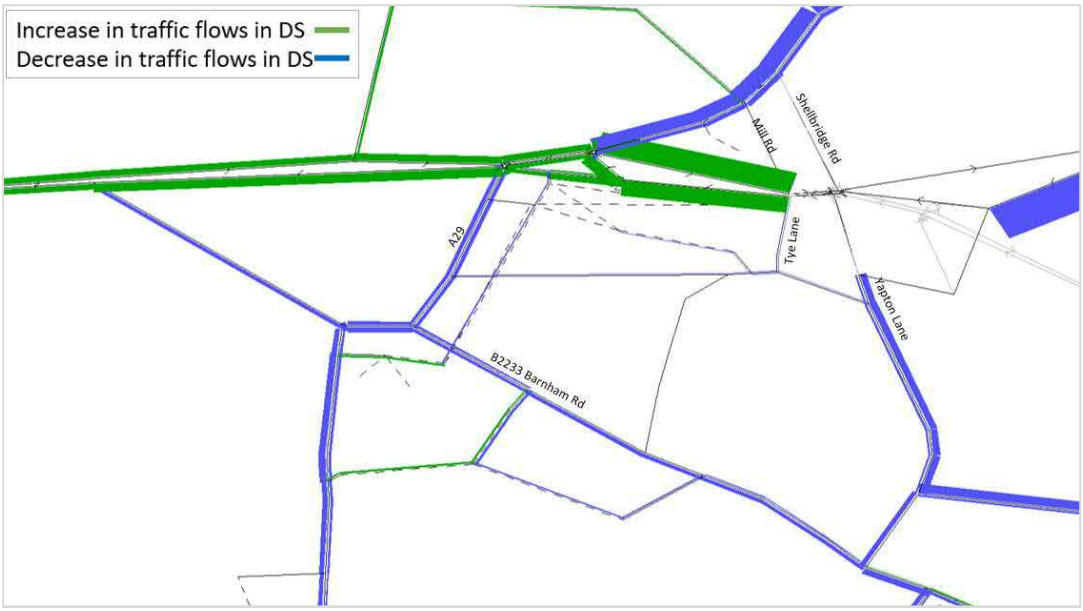


Figure 3-12: Do Something (4/5AV2) – Do Minimum – 2041 PM

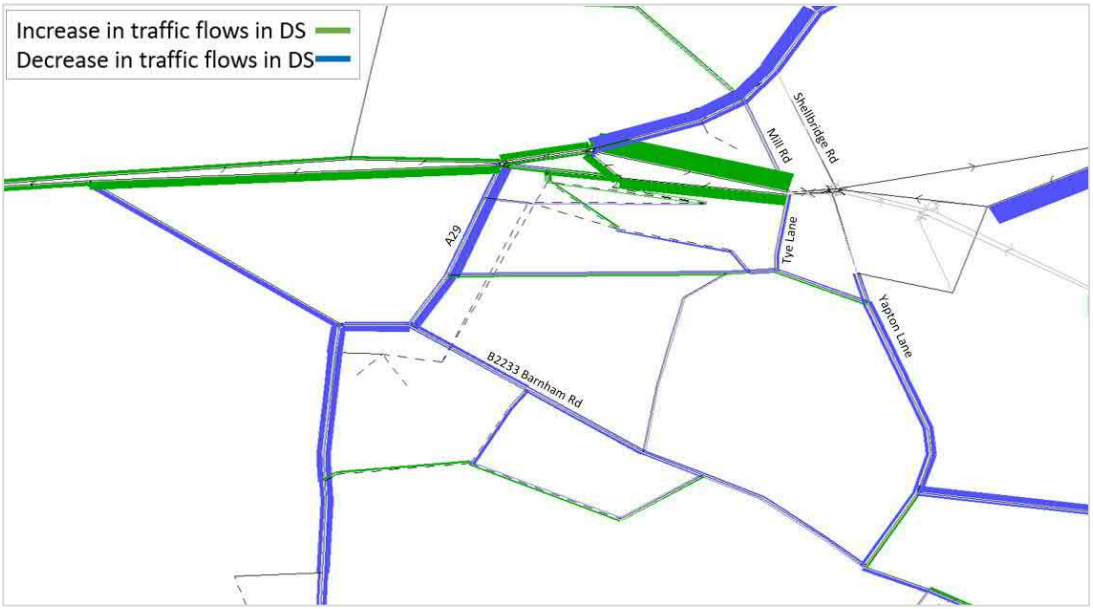


Figure 3-13: Do Something (5BV1) – Do Minimum – 2041 AM

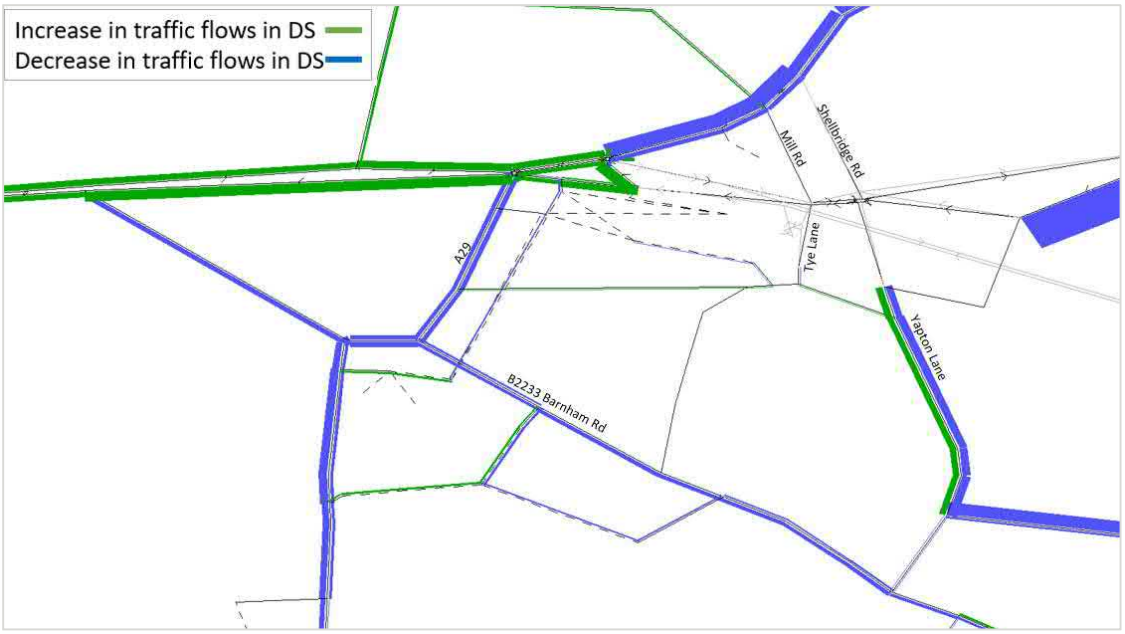
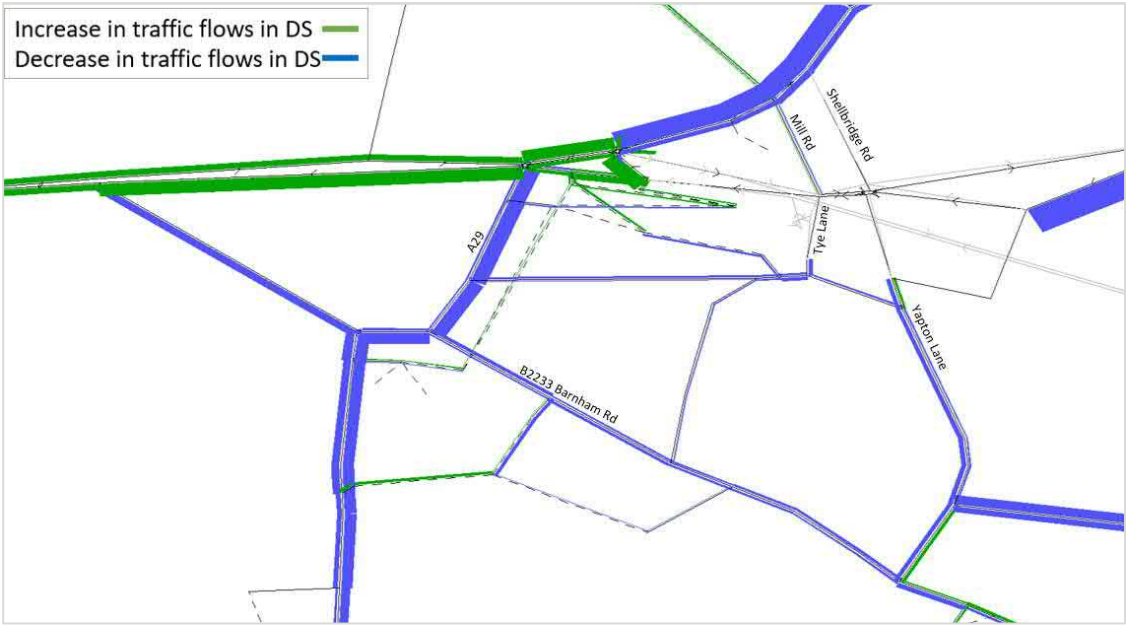


Figure 3-14: Do Something (5BV1) – Do Minimum – 2041 PM



3.3.3 The figures indicate that the scheme options result in similar changes in traffic volumes around the Walberton and Yapton area. This effect can be summarised as:

- A general decrease in traffic along the local roads within the Yapton and Walberton area for all options, resulting from the re-routing of 'rat running' traffic onto the A27. The exception to this is Option 4/5AV1 and Option 5Bv1, where the model predicts a slight increase in flow on Yapton Lane in the northbound direction in the AM peak. This is likely due to the introduction of a

new connecting link between Yapton Lane and Shellbridge Road, which would attract additional long-distance trips. A similar trend in traffic flow increase on Yapton Lane has also been demonstrated by Option 5BV1 with an increase in flows travelling north in the AM peak. This may be due to the proximity of Yapton Lane to the westbound on-slip, at the western tie-in, which offers the access opportunity for local traffic wishing to travel westbound on the A27 in the AM peak

- A significant reduction in traffic flows on the existing A27 east of the western tie-in, with the exception of the road section between Mill Road and Shellbridge Road in all options except Option 5BV1
- A27 Binsted Lane to Ford Road roundabout show a significant increase in traffic flows for options 1V5 and 1V9

3.3.4 Reductions in flow are attributed to the location of the section relative to the western tie-in. For example, in the case of Option 5BV1, the western tie-in is further west of this section of the A27, and the Mill Road to Shellbridge Road section would, therefore, be part of the bypassed section and subject to significantly lower flows, and consequently lower V/C values.

3.4 Operational modelling

3.4.1 An operational assessment on the proposed western tie-in arrangements for Option 4/5AV1 was performed as this option includes new priority junctions at the western tie-in area with the A27 and have the greatest impact upon Yapton Lane. The operational model assessments were informed by the forecasts from the A27 transport model. The operational assessment has been undertaken based on the highest peak hour rather than peak period average hour traffic flows.

3.4.2 Operational assessment of the western tie-in was not undertaken for the Option 1 scheme variants or for Option 3V1 as there is no western tie-in for these options within this area, or for Option 5BV1 which is a merge and diverge junction only. Option 4/5AV2 is located to the east and has a more limited impact upon flows on Yapton Lane, so no further operational assessment has been undertaken.

3.4.3 The results for the Option 4/5AV1 and Option 4/5AV2 assessments presented in Table 3-1 show that all movements would operate within an RFC[18] of 0.85. The arm labelling convention is provided at Appendix D-1. Further design development in the subsequent stages would improve the RFCs where they are shown to be approaching capacity.

Table 3-1: Western tie-in junction performance Option 4/5AV1

Junction Arm		AM Peak (2041)		PM Peak (2041)	
		RFC	Queue (Veh)	RFC	Queue (Veh)
1A-1C	Existing A27 (from Arundel) at Shellbridge Road	0.23	0.3	0.42	0.7
1B	Shellbridge Road Southbound at existing A27	0.20	0.2	0.65	1.8
2A-2C	Shellbridge Road Southbound at new overbridge	0.00	0.0	0.10	0.1
2B	A27 Arundel Bypass Overbridge at Shellbridge Road	0.46	0.8	0.33	0.5
3A-3C	A27 Arundel Bypass Overbridge at Yapton Lane	0.06	0.1	0.42	0.9
3B	Yapton Lane Northbound	0.44	0.8	0.25	0.3

3.4.4 For the purposes of the western tie-in local road study, a supplementary operational modelling assessment has been undertaken on Option 4/5AV1. This assessment was undertaken in order to consider the sensitivity of the A27 transport model limitations associated with the calibration and validation of the model flows on Yapton Lane.

3.4.5 This assessment is based on revised forecasts which take the observed traffic volumes described in chapter 2 and apply the changes in traffic volume between the A27 transport model base year and the A27 transport model 2041 AM and PM forecasts. The results of the assessment are presented in Table 3-2.

[18] The Ratio of Flow to Capacity (RFC) is a measure of how well roundabout and priority junction approaches perform under varying flow conditions. In the case of roundabouts, the capacity is determined by the entry flows, circulatory flows and the junction geometric parameters. Similarly, for priority junctions, the scale of magnitude of opposed and opposing movements influence capacity, besides geometry. Typically, an RFC of less than 0.85 is considered to indicate satisfactory performance

Table 3-2: Option 4/5AV1: western tie-in operational assessment (Yapton Lane sensitivity)

		AM Peak (2041)		PM Peak (2041)	
		RFC	Queue (Veh)	RFC	Queue (Veh)
1A-1C	Existing A27 (from Arundel) at Shellbridge Road	0.23	0.3	0.45	0.8
1B	Shellbridge Road Southbound at existing A27	0.35	0.5	1.02	14.1
2A-2C	Shellbridge Road Southbound at new overbridge	0.00	0.0	0.20	0.3
2B	A27 Arundel Bypass Overbridge at Shellbridge Road	0.64	1.7	0.64	1.7
3A-3C	A27 Arundel Bypass Overbridge at Yapton Lane	0.11	0.1	0.80	4.5
3B	Yapton Lane Northbound	0.85	5.2	0.49	1.0

3.4.6 The results of the operational assessment indicate that two of the arms operate over capacity, with RFCs at or in excess of 0.85. However, depending on the option selected for the preferred route announcement, the western tie-in layout would be subject to further design development, in order to mitigate any capacity issues. It is also considered that the scheme improvements to the western tie-in would improve the standards of junctions and access to and from the A27.

3.5 Impact on bus services

3.5.1 Of the bus services travelling through Yapton and Walberton, the service 85 may need to be re-routed with the change in alignment at the western tie-in in Option 4/5AV1 and 5BV1 due to the closure or modification of Tye Lane and Yapton Lane. The impact is likely to be greatest for Option 5BV1, where the overbridge at Yapton Lane would limit access to the A27 Arundel Bypass. All scheme options that close Tye Lane would impact upon some bus service routing.

3.6 Traffic movement restrictions on Tye Lane, Shellbridge and Mill Road

3.6.1 As demonstrated in Figure 2-4 and Figure 2-5, Shellbridge Road, Mill Road and Tye Lane have total junction turning movements of less than 100 vehicles in the peak hours. It is therefore considered that the closure of Tye Lane or the restriction of certain movements to/from Mill Road and Shellbridge Road is likely to result in a minimal impact with the implementation of the A27 Arundel Bypass scheme.

4 Summary

4.1 Summary

4.1.1 The information presented in this report shows that, overall, the implementation of the A27 Arundel Bypass would reduce rat-running along lower order roads, as the scheme would draw traffic away from the local roads on to the A27 SRN. Consequently, some local roads would benefit from reduced vehicle flows.

4.1.2 With the western tie-in: local roads study area, the transport forecasting predicts a slight increase in flow on Yapton Lane in the northbound direction in the AM peak, in Option 4/5Av1. This is likely due to the introduction of a new connecting link between Yapton Lane and Shellbridge Road, which would attract additional long-distance trips.

4.1.3 An increase in flow is also forecasted on the Yapton Lane route with Option 5BV1; an increase in flows travelling north in the AM peak. This would also affect Shellbridge Road. This may be due to the proximity of Yapton Lane to the westbound on-slip, at the western tie-in, which offers the access opportunity for local traffic wishing to travel westbound on the A27 in the AM peak.

4.1.4 Given the relatively low number of vehicles using the Tye Lane, Mill Road and Shellbridge Road junction with the A27, it is considered that the closure of Tye Lane or the restriction of certain movements to/from Mill Road and Shellbridge Road is likely to be minimal with the implementation of the A27 Arundel Bypass scheme.

4.1.5 The operational modelling sensitivity tests undertaken for Option 4/5AV1 indicate that two of the arms operate over capacity, with RFCs in excess of 0.85. However, depending on the option selected for the preferred route announcement, the western tie-in layout would be subject to further design development, in order to mitigate any capacity issues. It is also considered that minor improvements to the junction arrangements would result in a layout that would operate well within capacity, and the scheme improvements to the western tie-in would improve the standards of junctions and access to and from the A27.