ITS Group
Environment, Transport and Economy Department
Hampshire County Council

Fareham Local Plan
Local Junction Modelling Report

CONTROL SHEET

Issued by: Hampshire Services
Economy, Transport and Environment
Hampshire County Council
Second Floor, EII Court West,
The Castle,
Winchester,
SO23 8UD

Tel: 01962 832122

Client: Fareham Borough Council
Project: **Fareham Local Plan – Local Junction Modelling Report**
Title: Technical Report
Status: Final
Date: 25th September 2020

Document Production Record

Issue	Purpose/Status	Prepared by	Checked	Approved	Date
01	Draft for Client Review	JM	NW	DM	13/05/2020
02	Final Draft for Client Review	JM/NW	NW	DM	06/08/2020
03	Final	JM/NW	NW	DM	11/08/2020
04	Final – title amended	NW	NW	DM	25/09/2020

Introduction

This report has been produced by the ITS Group at Hampshire County Council (HCC) working as part of the HCC's Traded Services arm "Hampshire Services". The report has been commissioned by the client Fareham Borough Council in support of their Local Plan Strategic Transport Assessment.

The South Hampshire Strategic Regional Transport Model (SRTM) has been used by Systra to test the cumulative impact of the Local Plan traffic at a macro-level. From this high level model, a number of junctions have been identified where the Local Plan traffic would produce a significant (17 junctions) or severe (1 junction) impact on capacity over the baseline situation. Following more detailed assessment at each location, and application of thresholds (shown in Figure 1) developed by Hampshire Services and agreed by both Highways England and the Highway Authority, a reduced list of five junctions has been investigated.

Mitigation Thresholds

Junction approaches with delays of 10 seconds or fewer per vehicle are not considered to require mitigation at a strategic level, unless flows are very high, or queues are expected to block the preceding junction.

Vehicle flows are categorised as follows:

Flow through an arm (vehicles)		Level of flow
300	or under	Low
301	550	Medium
551	850	High
851	or over	Very High

Figure 1: Mitigation thresholds

Demonstrating potential mitigation of the impact of traffic arising from development at these five junctions is considered to be critical to the success of the Local Plan development strategy and most likely to require works at the strategic level to accommodate the Local Plan development proposals. The mitigation proposed seeks to address the impact of the Local Plan development only, as opposed to impacts resulting from background growth in traffic over the Local Plan period. It should be noted that the list of junctions that may require mitigation is not exhaustive and other junctions and links within the modelled area may also require improvements in further studies as the Local Plan is taken forward. It is also important to note that the mitigation presented in this report is to demonstrate that the level of development proposed is capable of mitigation – it is not intended to present a preferred package of works or to advocate specific junction designs. The final design solutions would be developed as and when the individual site proposals come forward to take account of any changes in traffic patterns and other infrastructure schemes coming forward in intervening years; and to ensure that inclusion of infrastructure for sustainable modes is considered.

This report examines these five junctions and investigates mitigation measures to offset the Local Plan traffic. The report also includes details of walking and cycling at these locations with reference to Fareham's emerging Local Cycling and Walking Infrastructure Plan (LCWIP). This will help ensure that the design of any potential junction schemes takes account of the needs of all users.

Traffic data

The traffic data (projected flows) was obtained from the Strategic Regional Transport Model (SRTM). Two sets of data were provided. Baseline flow data (without Local Plan traffic) and Do Minimum (DM) flow data (with Local Plan traffic). These sets of flows have been used in local junction modelling in this report.

The model year for both data sets is 2036 which was the end date for the Plan at the point that the modelling was commissioned. The end date for the Plan has subsequently been amended to 2037. The modelling is still considered robust for the purpose of assessing the proposed development, particularly as projected housing numbers are now lower than those modelled.

Junctions

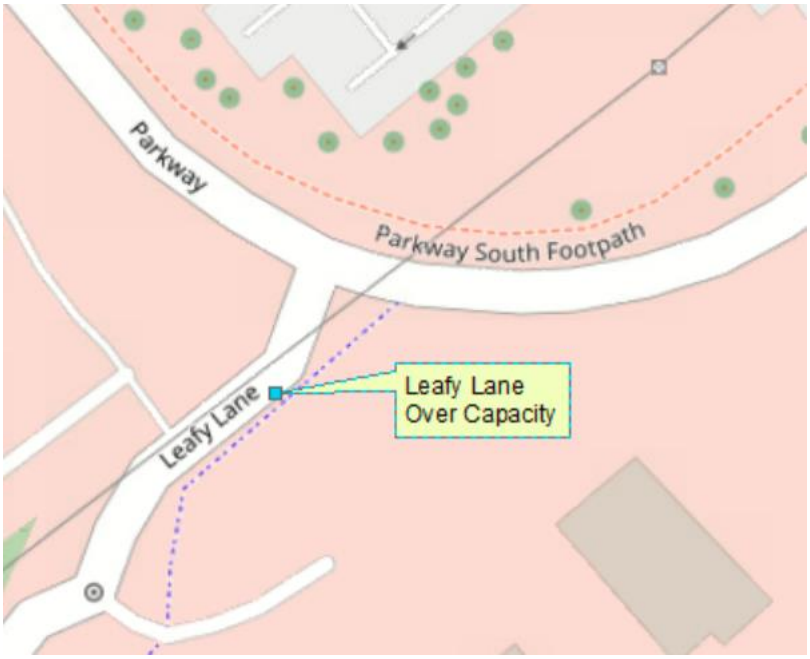
The filtered list of junctions identified four significant and one severe impact with the Local Plan (DM) 2036 flows applied. These have been assessed in greater detail with local junction modelling. The findings from the local modelling have been used to determine the mitigation measures required at the junctions with the aim to produce nil detriment to the junction's capacity performance.

The five junctions are as follows:

Junction number in SRTM	Junction name	Junction arm where capacity is exceeded	Severity
80	Parkway/Leafy Lane	Leafy Lane	Severe
6	A27 The Avenue/Redlands Lane/Gudge Heath Lane	A27 The Avenue (W)	Significant
17	Warsash Road/Abshot Road	Warsash Road (W)	Significant
26	Delme Roundabout	A27 Cams Hill	Significant
46	A27 The Avenue/Bishopsfield Road	Bishopsfield Road	Significant

The junctions have been modelled using industry standard software. Junctions9 software has been used for modelling roundabouts and priority junctions; specifically, the Arcady module for roundabouts and Picady module for priority junctions. The traffic signal junctions have been modelled using Linsig3 software.

Junction 80: Parkway/Leafy Lane: Severe



Background

This is a three arm priority junction which is located in Whiteley to the north of M27 Junction 9. The main road is Parkway which runs broadly east-west and Leafy Lane forms the side road to the south. There is extensive on street parking which occurs throughout the working day on both Parkway approaches to the junction. There are parking restrictions on both sides of Parkway for around 40 metres either side of the junction. Parking restrictions apply on both sides of Leafy Lane in this area.

The Strategic Regional Transport Model (SRTM) indicates that the Leafy Lane arm would be severely over capacity with the Local Plan traffic. This report has investigated mitigating the capacity impact on the Leafy Lane arm.

Option 1 - Priority junction with two lane flared approach on Leafy Lane

With the Strategic Model indicating Leafy Lane severely over capacity an option was tested to widen the side road to provide two lanes on the approach. Currently Leafy Lane is a single lane approach with a small amount of widening directly at the give way. This option tested widening Leafy Lane on the east side verge to accommodate a 42 metre two lane flared approach. The existing road layout on Parkway would remain unchanged.

This option was tested with Junctions9 Picady software. The summarised results are shown in tables 7 and 8 below.

Baseline 2036	AM peak		PM peak	
	RFC	Queue	RFC	Queue
Leafy Lane	**2.43**	**142.5**	**OOR***	**265.2**
Parkway (west right turn)	0.69	6.6	**1.2**	**76.6**

Table 7

DM 2036	AM peak		PM peak	
	RFC	Queue	RFC	Queue
Leafy Lane	**2.71**	**177.9**	**OOR***	**273.8**
Parkway (west right turn)	0.73	8.6	**1.25**	**87.1**

Table 8

OOR* - Out of range: the result was higher than the Picady maximum value

RFC – Ratio of Flow to Capacity where a value of 0.85 or greater (highlighted in red) indicates the arm is over capacity

Queue – the maximum queue in vehicles predicted in the peak hour

The results for the 2036 baseline (table 1) indicate severe queuing would occur on Leafy Lane in both peak hours. Significant queuing would also occur on the Parkway west right turn movement in the PM peak. Even with a two lane flared approach on Leafy Lane the junction performance would be very over capacity.

Applying the 2036 DM traffic flows (table 2) would increase the queuing still further. The greatest uplift in queuing would occur on Leafy Lane in the AM peak with a further 35 vehicles added to the overall queue on this arm. Again, the priority junction would be far over capacity.

It is concluded that the dominance of the very high Parkway traffic flow from the east would cause extensive congestion for the opposing movements. A virtually continuous flow would provide very few opportunities for traffic to cross over this dominant movement.

Option 2 - Traffic signal junction

This option considered the introduction of signal control to regulate and provide time for the turning movements at the junction.

An initial option considered the introduction of traffic signals to the existing junction layout. Outline results indicated that the junction would be over capacity and would not mitigate the impact of the Local Plan traffic. Therefore, this option was not progressed further, and no further details are provided in this report on this iteration.

A further signal option was considered which was based on the priority junction layout tested in option 1. This included widening Leafy Lane to a two lane approach with individual lanes for the left and right turning movements. An incremental approach was taken to the junction design with the existing single lane provided on Parkway (east). The outline results showed an improvement over the initial option above but that it would still be over capacity and not mitigate the Local Plan traffic. Again, this option was not progressed, and no further details are provided.

Further enhancements were made to the signal junction design. These included providing a two lane approach on the Parkway (east) arm and incorporating a separate right turn lane on the Parkway (west) arm alongside an ahead lane. This option also included a two lane approach on Leafy Lane which is based on the priority junction layout in option 1.

The junction layout for this option is shown in Appendix A diagrams 4 and 5. The provision of two lanes on both Parkway approaches would require carriageway widening on the north side of Parkway through the junction. This area is currently verge with a footway behind and is believed to be highway land. It would require a minor realignment to the footway. Additionally, it would be essential to remove the extensive on street parking that occurs on both sides of the junction along Parkway. To accommodate the two lane approaches it would be necessary to remove around 220 metres of parking from the west side of the junction. This would need to be applied to both sides of the road and extend beyond the access road to the “Fusion” and would be within 60 metres of the Whiteley Way roundabout.

A separate scheme is to be implemented at the Whiteley Way/Parkway roundabout by Hampshire County Council. The scheme will fully signalise an enlarged roundabout at the junction. It forms part of the mitigation works to accommodate traffic associated with the North Whiteley Major Development Area and is currently expected to be implemented in 2022. This scheme would require a two lane exit into Parkway and in combination these schemes would remove all on street parking between the Whiteley Way roundabout and Leafy Lane junction. On the eastern side of the junction it would be necessary to remove a further 150 metres of on street parking on the southern side of Parkway. Central hatching is shown on the proposed layout and it may be possible to remove some of this to reduce the loss of on street parking from the north side of Parkway.

The signal staging tested for this option was

Stage 1 – Parkway (west ahead) and Parkway (east ahead and left turn)

Stage 2 – Parkway (west ahead and right turn) and Leafy Lane left turn

Stage 3 – Leafy Lane left and right turns

The signal staging separately controls the right turn movement into Leafy Lane for safety reasons. This is due crossing two lanes of opposing traffic within a 40 mph speed limit zone.

This option was modelled using Linsig software. The modelling results with the 2036 Local Plan traffic applied (DM) are summarised below in table 9.

	DM 2036 AM peak		DM 2036 PM peak	
	DoS	MMQ	DoS	MMQ
Parkway (west) ahead	89.2%	28	29.9%	3
Parkway (west) right turn	63.5%	8	85.9%	8
Leafy Lane	89.6%	9	73.8%	9
Parkway (east) nearside lane	47.9%	7	84.7%	24
Parkway (east) offside lane	47.8%	7	84.7%	24
Cycle time	90 seconds		100 seconds	
Practical reserve capacity	0.4%		4.8%	

Table 9

DoS – Degree of saturation (%)

MMQ – Mean maximum queue length in vehicles

The results indicate that the junction would operate just within capacity (0.4% reserve capacity) in the 2036 DM AM peak based on a 90 second cycle time. The option exists to increase the cycle time, if required to increase the spare capacity. This option would be within capacity in the 2036 DM PM peak based on a slightly longer 100 second cycle time. These results demonstrate that this signal option could successfully mitigate the impact of the 2036 Local Plan traffic at this location.

Junction summary

Enhancements to the existing priority junction would fail to mitigate the impact of the either the modelled 2036 baseline traffic or Local Plan traffic. A signal option (Option 2) would provide potential mitigation for both the modelled 2036 baseline and the Local Plan traffic scenarios.

Recommendation

It is recommended that Option 2 traffic signals (Appendix diagrams 4 and 5) could be progressed as the basis for mitigating Local Plan traffic impacts.

Future pedestrian/cyclist improvements

While the aim of the report is to identify local junction mitigation measures to the accommodate Local Plan traffic, consideration has been given to possible future enhancements for pedestrians and cyclists. The inclusion of a pedestrian and cyclist

crossing on the Parkway west arm has been considered. This would allow the crossings to appear with traffic to minimise the impact on traffic capacity and maintain the performance outlined for Option 2. The arrangement would require the two proposed centre islands to be widened and need additional carriageway widening on the north side of Parkway through the junction. No layout or modelling has been completed for this enhancement and this would be subject to further feasibility work.

Junction 6: A27 The Avenue/ Redlands Lane/ Gudge Heath Lane

Background

This is a four arm traffic signal junction located to the west of Fareham town centre. It is positioned around 400 metres to the east of the Bishopsfield Road junction. Traffic movements are controlled by signals. The main road is A27 The Avenue which runs west-east. To the north is Gudge Heath Lane which links through to a large residential catchment area. Redlands Lane forms the southern arm and sits on the Eclipse rapid bus service route. A pedestrian controlled crossing is situated on the western arm across The Avenue.

A number of traffic movements are restricted, which are

- Gudge Heath Lane left turn only (ahead and right turn movements are banned)
- The Avenue west right turn is banned

In 2016 Hampshire County Council completed a capacity improvement scheme. This increased the number of lanes for ahead traffic on The Avenue east from one to two lanes. The objective was to alleviate the extensive congestion which occurred on this approach during the PM peak. Previously bus priority was introduced to the operation of the traffic signals to reduce waiting times for the Eclipse bus services approaching on Redlands Lane.

The Local Plan modelling indicated that the Redlands Lane arm would be significantly affected in capacity terms by the Local Plan traffic in 2036. The report has aimed to address this situation.

Do-Nothing option

The existing traffic signal junction has been modelled using Linsig software. The current signal staging arrangement has been tested which is

Stage 1 – A27 The Avenue ahead and left turn in both directions

Stage 2 – A27 The Avenue east ahead, left and right turn; Gudge Heath Lane left turn

Stage 3 – A27 The Avenue right turn; Gudge Heath Lane left turn; pedestrians across The Avenue west

Stage 4 – Redlands Lane

The existing layout is shown in the Appendix diagram 1. The junction has been tested with the Local Plan (DM) 2036 traffic flows and the results are summarised in table 1 below.

	2036 AM peak		2036 PM peak	
	DoS	MMQ	DoS	MMQ
Gudge Heath Lane	86.2%	8	58.4	6
A27 eastbound Ahead and left	84.2%	19	69.0	10
A27 eastbound ahead	85.1%	20	71.2	11
Redlands Lane	88.4%	20	82.4	10
A27 westbound ahead and left	84.1%	20	82.4	19
A27 westbound ahead and right	88.3%	24	66.1	9
Westbound exit lane 1	6.5%	0	30.5	1
Westbound exit lane 2	41.4%	1	31.0	1
Cycle time	110 seconds		90 seconds	
Practical reserve capacity (%)	1.8%		9.2%	

Table 1

DoS – Degree of saturation (%) where this is 90% or greater the lane is at or over capacity (highlighted in bold red)

MMQ – Mean maximum queue length in vehicles

The results with 2036 Local Plan traffic (DM) traffic included indicate that the existing junction layout and operation could accommodate this flow with revised signal timings. The timings have been optimised to achieve this outcome. The AM peak has the least amount of spare capacity (1.8%) although an increase in the cycle time to a maximum 120 seconds may provide a small capacity increase.

Junction summary

The mitigation measure of adjusting the signal timings demonstrates that this would be sufficient to accommodate the modelled 2036 (DM) Local Plan traffic at this junction. No physical measures would be required.

Recommendation

It is recommended that the existing junction layout (Appendix diagram 1) and operation can be maintained to accommodate the Local Plan traffic and that incremental timing changes are made as necessary.

Future pedestrian/cyclist improvements

There is a reasonable level of crossing movements on the Gudge Heath Lane arm of the junction which is on main route between Fareham railway station/town centre and Fareham College to the west. No formal crossing facilities exist on this arm and users must cross during gaps in the traffic with the aid of a narrow central island. The pedestrian demand across Redlands Lane is much lower. No formal crossing exists across this arm either with the exception of dropped kerbs and a central island. The provision of push button controlled crossings on the Gudge Heath Lane and Redlands Lane arms would be beneficial to pedestrians and cyclists. Either crossing would require an all red to traffic stage to be included.

The 2036 (DM) results for the AM peak indicate that the junction would operate at approaching capacity. Although the inclusion of an all red to traffic stage has not been tested it is highly likely that this would push the junction performance some way over capacity in the AM peak and to a lesser extent in the PM peak.

Junction 17: Warsash Road/Abshot Road : Significant

Background

This is a four arm mini-roundabout that is located in the southern part of Locks Heath. The main road is Warsash Road which runs broadly east-west. Abshot Road joins from the north with a minor arm Little Abshot Road directly opposite. All approaches are single lanes with only marginal carriageway widening directly at the give ways. All arms have a 30 mph speed limit with the exception of Little Abshot Road which is derestricted.

The Strategic Regional Transport Model (SRTM) indicated that Warsash Road west would be significantly affected by the (DM) Local Plan traffic. The report has investigated capacity improvement measures on the Warsash Road west approach.

Do-Nothing option

The existing mini-roundabout has been modelled using Junctions9 Arcady software.

The baseline 2036 AM and PM peak flows have been tested. The Local Plan flows (DM) have also been tested on the existing layout. The results for both sets of flows are summarised below in table 2.

	Baseline 2036				DM 2036			
	AM peak		PM peak		AM peak		AM peak	
	RFC	Queue	RFC	Queue	RFC	Queue	RFC	Queue
Warsash Rd (east)	0.46	0.8	0.74	2.8	0.48	0.9	0.8	3.8
Little Abshot Road	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Warsash Rd west)	**1.13**	**61.7**	0.76	3.0	**1.2**	**92.8**	0.83	4.6
Abshot Road	0.32	0.5	0.27	0.4	0.34	0.5	0.29	0.4

Table 2

RFC – Ratio of Flow to Capacity where a value of 0.85 or greater (highlighted in bold red) indicates the arm is over capacity

Queue – the maximum queue in vehicles predicted in the peak hour

The above results confirm the findings of the Strategic Regional Transport Model with the Warsash Road west arm showing to be over capacity during the AM peaks for both the baseline and Local Plan (DM) 2036 flows.

Option - Retain mini-roundabout with localised widening on Warsash Road west approach.

This option investigated the retention of the existing four arm mini-roundabout. With the west arm showing a significant capacity increase a layout which widened this approach to two lanes was investigated. The widening would be accommodated within the existing highway boundary and would narrow the wide footway on the north side of Warsash Road. The layout is shown on diagram 1 in the Appendix.

The results for the localised widening on Warsash Road west have been modelled for the 2036 peaks with baseline and Local Plan (DM) flows. The results are summarised below in table 3.

	Baseline 2036				DM 2036			
	AM peak		PM peak		AM peak		PM peak	
	RFC	Queue	RFC	Queue	RFC	Queue	RFC	Queue
Warsash Rd (east)	0.46	0.8	0.74	2.8	0.48	0.9	0.8	3.8
Little Abshot Road	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Warsash Rd west)	0.42	0.7	0.28	0.4	0.45	0.8	0.31	0.5
Abshot Road	0.35	0.5	0.27	0.4	0.38	0.6	0.29	0.4

Table 3

RFC – Ratio of Flow to Capacity where a value of 0.85 or greater (highlighted in red) indicates the arm is over capacity

Queue – the maximum queue in vehicles predicted in the peak hour

The results indicate that the localised carriageway widening on Warsash Road west would be sufficient to accommodate the Local Plan traffic in both 2036 AM and PM peaks. The RFC value on Warsash Road west would reduce to comfortably below 0.85 RFC capacity threshold. The remaining arms would also remain well below the RFC capacity threshold.

Junction summary

The modelling of the existing junction layout with the Local Plan traffic accords with the Strategic Model which demonstrates that the Warsash Road west arm would be significantly over capacity. The proposal for localised carriageway widening on this arm to form a two lane give way on to the roundabout would be sufficient to accommodate the Local Plan traffic.

Recommendation

It is recommended that the mitigation measures (Appendix diagram 2) be implemented to accommodate the Local Plan traffic flows.

Future pedestrian/cyclist improvements

The existing centre island on the Warsash Road west arm of the roundabout would be retained. Although there are no footways on the southern side of Warsash Road or along Little Abshot Road, the island could be changed to provide a designated crossing point for pedestrians and cyclists. An uncontrolled crossing exists on the Abshot Road arm and separating the traffic movements into individual lanes should make crossing this arm easier.

Junction 26: Delme Roundabout: Significant

Background

This is a grade separated roundabout located directly to the east of Fareham town centre. It is a major intersection on the network which has six arms. The main route through is the A32 Eastern Way which is a dual carriageway that runs above the roundabout broadly north-south. Slip roads from both carriageways join the roundabout below, which are controlled by traffic signals. There are two major arms which join the roundabout from the northwest and southeast. These are A32 Wallington Way and A27 Cams Hill respectively which are both dual carriageways and operate as give ways. There are two local roads which also join the roundabout. On the west side of the roundabout East Street links with the town centre. Across on the north side Wallington Shore Road accesses a mainly residential area. Both of these arms join under give way control.

As a major intersection the roundabout currently suffers from congestion at peak times. Based on empirical site knowledge in the morning peak the highest level of congestion occurs on the A27 Cams Hill approach where extensive queuing forms. Wallington Way also incurs significant levels of delay during this period. While the remaining arms also incur delay it is generally at a much lower level. In the evening peak the area suffers even greater levels of congestion and delay. There is a high level of delay on the A27 Eastern Way in the westbound direction on the dual carriageway above the roundabout. This results in traffic from the roundabout being unable to freely exit the roundabout onto Eastern Way which in turn causes congestion on the circulatory areas and the major arms which feed into it. This forms a major contributory factor to the high level of delay and congestion which occurs on the A27

Cams Hill approach. As in the morning peak, this arm suffers from the greatest level of congestion. While delays also occur on Wallington Way and East Street they are to a lesser extent.

The Strategic Regional Transport Model indicates that the Local Plan traffic would have a significant impact on the capacity of the A27 Cams Hill arm of the roundabout. The report concentrates on addressing the capacity impact on that arm.

Option – Increased signalisation of roundabout

Currently only the A27 Eastern Way off slips operate under traffic signal control with the remaining arms operating as give way entries to the roundabout. In developing proposals for the Department of Transport's Transforming Cities Fund (TCF) , Hampshire County Council has identified improvement measures for this roundabout to prioritise bus rapid transit. The design work for the roundabout is at an advanced stage. Should funding not be available on this occasion, bus rapid transit improvements would still remain the ambition of the County Council at this location.

The TCF scheme at this location comprises

- Signalisation of A27 Cams Hill entry including bus gate signals
- Signalisation of A32 Wallington Way entry
- Retention of traffic signals on A27 Eastern Way off slip roads
- East Street and Wallington Shore Road arms remain as give way entries
- Localised carriageway widening on northwest, northeast and southeast sections of the roundabout
- Localised widening of East Street approach to roundabout
- New pedestrian/cyclist controlled crossings on Wallington Way and A27 Eastern Way (north side).

Local Plan traffic has been applied to this junction layout for modelling. Given that the TCF scheme would be expected to be introduced in advance of 2036 Local Plan modelling year this approach was agreed by the Highway Authority.

This option was modelled using Linsig software. The modelling does not take into account the PM peak congestion which occurs on the A27 westbound on slip which affects parts of the roundabout and some of the entry arms. This has been excluded so that the impact of mitigation measures can be clearly identified, in isolation from peripheral traffic conditions. The modelling results with the 2036 Local Plan (DM) traffic are summarised below in table 4.

	DM 2036 AM peak		DM 2036 PM peak	
	DoS	MMQ	DoS	MMQ
A27 (SW b'nd offslip) n'side	60.7%	9	23.1%	3
A27 (SW b'nd offslip) offside	64.6%	9	66.9%	9
Circulatory lane	70.4%	5	8.9%	29
A27 Cams Hill n'side lane	67.2%	14	60.0%	11
A27 Cams Hill offside lane	69.0%	16	80.3%	19
Circulatory outside lane 1	6.5%	0	3.7%	0
Circulatory inside lane 2	60.3%	1	44.5%	10
A27 (NE b'nd offslip) n'side	13.3%	2	10.5%	1
A27 (NE b'nd offslip) offside	57.0%	8	88.8%	19
Circulatory outside lane 1	63.3%	12	61.5%	18
Circulatory inside lane 2	41.3%	8	42.2%	12
East Street n'side lane	65.1%	4	**90.0%**	12
East Street offside lane	63.5%	4	**91.0%**	13
Circulatory outer lane 1	21.5%	0	17.5%	0
Circulatory middle lane 2	7.9%	0	10.8%	0
Circulatory middle lane 3	21.5%	0	26.6%	0
Circulatory inner lane 4	17.7%	0	30.6%	0
A32 Wallington Way n'side lane	25.2%	3	23.9%	2
A32 Wallington Way offside lane	67.1%	9	73.4%	8
Circulatory outer lane 1	63.3%	8	61.4%	14
Circulatory inner lane 2	47.8%	15	67.3%	16
Wallington Shore Rd	76.4%	6	89.8%	7
Circulatory outer lane 1	38.6%	0	41.0%	0
Circulatory inner lane 2	46.6%	10	61.1%	11
Cycle time	90 seconds		90 seconds	
Practical reserve capacity	17.7%		-1.2%	

Table 4

DoS – Degree of saturation (%) where this is 90% or greater the lane is at or over capacity (highlighted in bold red)
MMQ – Mean maximum queue length in vehicles

The results indicate that the TCF increased signalisation scheme has sufficient capacity to accommodate the 2036 Local Plan traffic in the AM peak showing a healthy 17.7% reserve capacity. Focussing specifically on the A27 Cams Hill arm, both lanes on this approach would be well within capacity operating below 70% Degree of Saturation. The PM peak does demonstrate that the junction capacity is exceeded slightly (-1.2% reserve capacity). Examining the results this can be attributed to the East Street approach which has a Degree of Saturation of 91%. As this is only marginally over capacity a further enhancement (not included in the design appended) to the road alignment on this arm would probably be sufficient to draw this arm back within capacity. Widening with the realignment of the kerbs is a feature of the TCF scheme and a further change could be investigated and tested in the future. Looking at the A27 Cams Hill approach this would be within capacity with a Degree of Saturation of 80.3%.

Junction summary

The modelled Do Minimum (DM) 2036 Local Plan traffic can be accommodated within the proposed TCF scheme in the morning peak. Further investigation would be required to provide a marginal capacity improvement on the East Street arm to bring the overall junction performance within capacity in the 2036 DM PM peak.

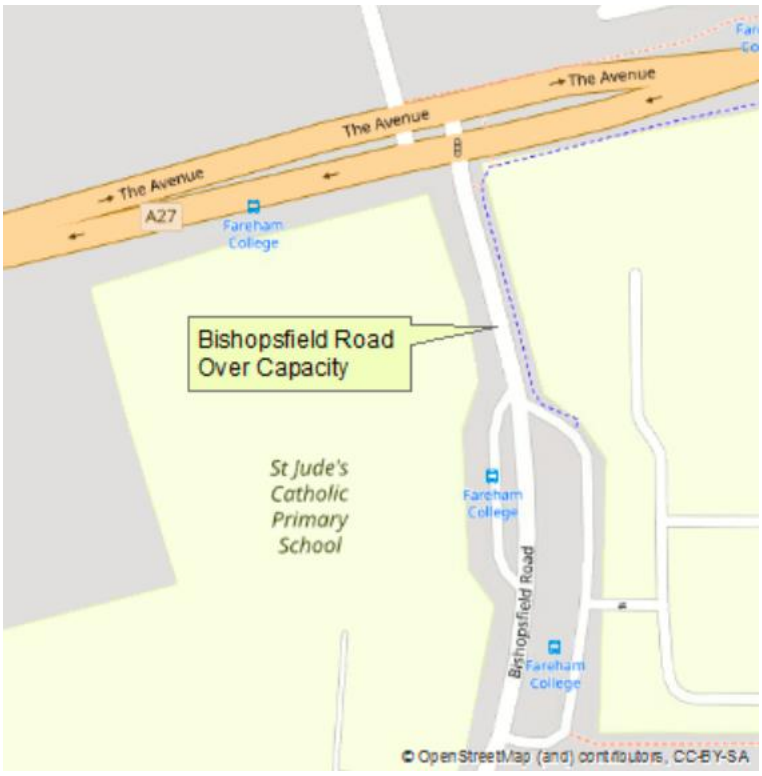
Recommendation

It is recommended that the TCF scheme should be implemented and would be sufficient to accommodate the 2036 (DM) Local Plan traffic.

Future pedestrian/cyclist improvements

The TCF features several enhancements to the existing pedestrian and cyclist networks around the roundabout and as such the impact of the Local Plan traffic would not affect the deliverability of these.

Junction 46: A27 The Avenue/Bishopsfield Road: Significant



Background

This is a four arm junction which is controlled by traffic signals. It is located to the west of Fareham town centre along the A27. The main road, A27 The Avenue, runs west-east and carries the highest flows. To the south is the main side road which is Bishopsfield Road. This road links through a residential area. The adjacent St Jude's Catholic Primary School and Fareham College are accessed from this side road. Joining the junction from the north is Veryan which is a cul-de-sac serving a residential area.

The Strategic Regional Transport Model (SRTM) highlighted that the Local Plan traffic (DM) would have a significant impact on congestion on the Bishopsfield Road arm. The report focuses on mitigating the impact on the Local Plan traffic on this approach.

Do-Nothing option

The existing traffic signal junction has been modelled using Linsig software. The current signal staging arrangement has been tested which is

Stage 1 – A27 The Avenue ahead and left turn in both directions

Stage 2 – A27 The Avenue right turn movements into Bishopsfield Road and Veryan

Stage 3 – Bishopsfield Road

Stage 4 – Veryan

The existing layout which has been modelled is shown in Appendix diagram 3. The junction has been tested with the baseline 2036 traffic flows and the results are summarised in table 5 below.

	Baseline 2036 AM peak		Baseline 2036 PM peak	
	DoS	MMQ	DoS	MMQ
A27 east ahead and left lane	70.7%	10	71.1%	11
A27 east right and ahead lane	71.0%	10	71.7%	11
Bishopsfield Road	78.0%	10	83.1%	9
A27 west ahead and left lane	79.0%	12	85.0%	16
A27 west right and ahead lane	80.6%	13	83.8%	6
Veryan	6.3%	1	6.3%	1
Cycle time	90 seconds		90 seconds	
Practical reserve capacity	11.6%		5.9%	

Table 5

DoS – Degree of saturation (%) where this is 90% or greater the lane is at or over capacity (highlighted in bold red)

MMQ – Mean maximum queue length in vehicles

The results indicate that the existing signal junction arrangement would operate within capacity for both 2036 baseline peak periods. This suggests that the existing junction could accommodate additional traffic flows without exceeding capacity.

On this basis the same existing arrangement has been tested with the Local Plan (DM) flows applied. The results for this scenario are shown below in table 6.

	DM 2036 AM peak		DM 2036 PM peak	
	DoS	MMQ	DoS	MMQ
A27 east ahead and left	72.9%	10	78.2%	14
A27 east right and ahead	73.0%	11	78.4%	14
Bishopsfield Road	83.5%	12	80.3%	11
A27 west ahead and left	85.0%	14	83.8%	16
A27 west ahead and right	84.9%	14	76.5%	5
Veryan	6.3%	1	6.9%	1
Cycle time	90 seconds		100 seconds	
Practical reserve capacity	5.1%		7.4%	

Table 6

DoS – Degree of saturation (%) where this is 90% or greater the lane is at or over capacity (highlighted in bold red)

MMQ – Mean maximum queue length in vehicles

With the 2036 Local Plan traffic applied to the model, the junction would still remain within capacity in both peak hours. There is a small increase in queuing of 1-2 vehicles in the AM peak and up to 3 vehicles in the PM peak when the Local Plan traffic is introduced. The model has optimised the signal timings to achieve these results.

Junction summary

The modelling indicates that the existing junction arrangement could accommodate both the modelled 2036 baseline and Local Plan (DM) flows subject to adjustments to the signal timings

Recommendation

It is recommended that the existing junction layout (Appendix diagram 3) and operation can be maintained to accommodate the Local Plan traffic and that incremental timing changes are made as necessary.

Future pedestrian/cyclist improvements

The junction is located adjacent to St Jude's Catholic Primary School and Fareham College. At the start and end of the day there is likely to be a high level of pedestrian and cycling activity crossing at the junction associated with these facilities. While the junction currently includes dropped crossings there are no formal facilities within the signal operation to allow users to cross. Historically a school crossing patrol has operated here.

The emerging LCWIP identifies a continuous cycle route east-west alongside The Avenue. These aspirations are evidenced within the emerging Local Cycling and Walking Infrastructure Plan for Fareham.

This report has not specifically investigated enhanced crossing facilities but the provision of push button crossings on all four arms of the junction within an all red to traffic stage would be beneficial. This would fit into the strategy for east-west cycle route through this junction. The morning peak model for the 2036 (DM) Local Plan traffic indicates a small amount of reserve capacity (5.1%). The inclusion of an all red to traffic stage would erode into this spare capacity. No modelling has been undertaken corresponding to the school afternoon peak and a low level of crossing activity would be anticipated to coincide with the modelled PM peak. Further modelling would be required to test the capacity impact of providing enhance crossing facilities through an all red to traffic stage.

Overall summary

It is recommended that the following measures should be tested through the Do Something SRTM run to accommodate the 2036 Local Plan (DM) traffic flows within capacity.

Junction number in SRTM	Junction	Severity	Mitigation measure
80	Parkway/Leafy Lane	Severe	Signalisation with local widening on Parkway and Leafy Lane approaches. Remove on street parking from Parkway
6	A27 The Avenue/Redlands Lane/Gudge Heath Lane	Significant	Optimise signal timings. No physical measures required.
17	Warsash Road/Abshot Road	Significant	Widen Warsash Road west approach to mini roundabout
26	Delme Roundabout	Significant	Partial signalisation of roundabout with widening on Cams Hill approach and circulatory sections (TCF scheme)
40	A27 The Avenue/Bishopsfield Road	Significant	Optimise signal timings. No physical measures required.

Further actions

It should be noted that none of the mitigation measures have been subject to a Road Safety Audit. It is advised that the physical mitigation measures should have a stage 1 Road Safety Audit completed before progressing to any further stage of design. As above, the mitigation presented in this report is to demonstrate that the level of development proposed is capable of mitigation – it is not intended to present a preferred package of works or to advocate specific junction designs. The final design solutions would be developed as and when the individual site proposals come forward to take account of any changes in traffic patterns and other infrastructure schemes coming forward in intervening years; and to ensure that inclusion of infrastructure for sustainable modes is considered.

Cost estimates for these schemes will be included in the Strategic Transport Assessment document.

Jonathan Mundy

ITS Group

Hampshire County Council

17th April 2020

Updated modelling

Following the outcomes of the report detailed above these mitigation measures were fed back into the Strategic Regional Transport Model (SRTM) to test their impact on the wider highway network. The re-run of the SRTM identified that there are projected to be a total of 17 junctions that meet the “significant” change criteria and two junctions meeting the “severe” change criteria. This represents an increase in one “significant” location compared to the Do Minimum, and an increase in one “severe” location. Details of these junctions can be found in the Systra Modelling Report and the Strategic Transport Assessment.

There are seven junctions not previously identified as having “significant” or “severe” impacts in the Do Minimum. New junctions triggering one of the ‘significant’ or ‘severe’ criteria are not entirely unexpected, due to the mitigation measures incorporated potentially releasing bottlenecks that then impact downstream locations or changing the assignment of vehicles through the network. Full details can be found in the Systra SRTM model output report and the Strategic Transport Assessment.

Following further assessment of the Do Something model outputs, using the same thresholds as with the Do Minimum run (see Figure 1) based on traffic volume, delay per vehicle, total queues and stacking room, four junctions remained for further investigation as follows:

These junctions were:

- A27 The Avenue/Redlands Lane/Gudge Heath Lane
- A27 The Avenue/Peak Lane/Catisfield Lane
- Segensworth Road East/Cartwright Drive
- J9 M27 Westbound off-slip

It should be noted that A27 The Avenue/Redlands Lane/Gudge Heath Lane also flagged as significant in the Do Minimum Run.

This part of the report discussed the results of further investigation; and tests the updated SRTM Local Plan 2036 traffic flows (DM1) on both of these junctions for two junctions on the A27.

A27 The Avenue/Redlands Lane/Gudge Heath Lane: Severe

This junction was identified in the original SRTM run where 2036 Local Plan traffic would have a severe impact on junction capacity. The first tranche of this report identified that these Local Plan flows could be accommodated by optimising the signal timings. This would require no physical changes to the junction layout or signal operation.

The re-run SRTM has identified this junction has having a significant capacity issue. This reflects the nature of the Strategic Model; whilst the local modelling set out above demonstrated that the proposed mitigation measure could accommodate Local Plan growth; the Strategic Model allows for rerouting of traffic across the network, including rerouting to locations where more capacity has been created.

The report has been revisited the local modelling using the updated SRTM 2036 Local Plan traffic flows.

Do Nothing Option

The 2036 (DM1) traffic flows have been tested on the existing junction layout and operation of the signals. The signal staging is same as detailed on page 4. The layout is shown in the Appendix diagram 1. The summarised results are shown below in table 10.

DM1 flows	2036 AM peak		2036 PM peak	
	DoS	MMQ	DoS	MMQ
Gudge Heath Lane	83.8%	9	77.0%	8
A27 eastbound Ahead and left	84.9%	18	60.4%	9
A27 eastbound ahead	86.1%	20	61.8%	11
Redlands Lane	86.1%	20	76.8%	9
A27 westbound ahead and left	81.4%	19	65.2%	12
A27 westbound ahead and right	79.7%	19	77.1%	14
Westbound exit lane 1	3.3%	0	18.2%	1
Westbound exit lane 2	38.6%	1	37.4%	1
Cycle time	110 seconds		90 seconds	
Practical reserve capacity (%)	4.6%		16.7%	

Table 10

DoS – Degree of saturation (%) where this is 90% or greater the lane is at or over capacity (highlighted in bold red)

MMQ – Mean maximum queue length in vehicles

The results indicate that the updated 2036 Local Plan traffic flows could again be accommodated within the current junction operation. The timings have been re-optimised to seek the best overall junction performance and show that in both 2036 AM and PM peaks the junction would operate within capacity (4.6% in the AM and 16.7% in the PM).

Junction summary

The mitigation measure of adjusting the signal timings demonstrates that this would be sufficient to accommodate the modelled 2036 (DM1) Local Plan traffic at this junction. No physical measures would be required.

Recommendation

It is recommended that the existing junction layout (Appendix diagram 1) and operation can be maintained to accommodate the Local Plan traffic and that incremental timing changes are made as necessary.

Future pedestrian/cyclist improvements

As in the Do Minimum mitigation section above, there is a reasonable level of crossing movements on the Gudge Heath Lane arm of the junction which is on main route between Fareham railway station/town centre and Fareham College to the west. No formal crossing facilities exist on this arm and users must cross during gaps in the traffic with the aid of a narrow central island. The pedestrian demand across Redlands Lane is much lower. No formal crossing exists across this arm either with the exception of dropped kerbs and a central island. The provision of push button controlled crossings on the Gudge Heath Lane and Redlands Lane arms would be beneficial to pedestrians and cyclists. Either crossing would require an all red to traffic stage to be included.

A27 The Avenue/Peak Lane/Catisfield Road: Significant

This junction did not flag up in the original SRTM run with a significant or severe impact from the 2036 Local Plan flows. When the SRTM was re-run with the mitigation measures applied it was identified with a severe impact on junction capacity.

It should be noted that it is intended to change the junction layout and operation in 2020/21. This work is proposed by Hampshire County Council (HCC) as part of its traffic signal refurbishment programme. The signal equipment has reached the end of its working life and is to be replaced with modern equipment. The opportunity is being taken to provide a pedestrian controlled crossing on the east arm of The Avenue. This facility has been included in response to public requests to improve the currently poor crossing provision across this arm of the A27. The left turn slip lanes into both Peak Lane and Catisfield Road would be removed to accommodate the new crossing. The scheme is not included in the SRTM model runs. For the purposes of the Local Plan modelling the updated 2036 (DM1) flows they have been applied to both the existing and proposed junction layouts.

Do Nothing Option (Existing junction layout)

The existing traffic signal junction has been modelled using Linsig software. The current signal staging arrangement has been tested which is

Stage 1 – A27 The Avenue ahead and left turn in both directions

Stage 2 – A27 The Avenue eastbound and westbound centre section right turns; Catisfield Road left turn and Peak Lane left turn

Stage 3 – Peak Lane and Catisfield Road left and right turns

The existing signal junction has been modelled with the 2036 Local Plan (DM1) traffic flows applied. The timings have been optimised to maximise capacity and the results are shown below in table 11.

DM1 flows	2036 AM peak		2036 PM peak	
	DoS	MMQ	DoS	MMQ
A27 The Avenue eastbound ahead and left	58.4%	9	35.5%	5
A27 The Avenue eastbound ahead	58.8%	9	35.8%	6
Catisfield Road	26.8%	5	35.0%	6
A27 The Avenue eastbound centre section ahead	19.2%	5	12.2%	2
A27 The Avenue eastbound centre section right	17.4%	2	37.0%	6
A27 The Avenue westbound ahead and left	19.4%	3	24.1%	4
A27 The Avenue westbound ahead	23.9%	4	27.9%	5
Peak Lane	59.3%	11	32.1%	3
A27 The Avenue westbound centre section ahead	36.3%	7	24.7%	1
A27 The Avenue westbound centre section right	25.8%	1	22.7%	2
Cycle time	120 seconds		120 seconds	
Practical reserve capacity (%)	51.8%		143.1%	

Table 11

DoS – Degree of saturation (%) where this is 90% or greater the lane is at or over capacity (highlighted in bold red)

MMQ – Mean maximum queue length in vehicles

The results indicate that the optimisation of the signal timings would allow the junction to operate within capacity in both the 2036 AM and PM peaks, including with projected Local Plan traffic.

Do Something Option (HCC proposed junction layout)

This option tests the Local Plan (DM1) flows on the HCC proposed junction layout and operation.

The proposed signal staging would be as follows

Stage 1 – A27 The Avenue ahead and left turn in both directions

Stage 2 – A27 The Avenue eastbound and westbound centre section right turns; Catisfield Road left turn and Peak Lane left turn; pedestrian crossing on A27 The Avenue westbound

Stage 3 – Peak Lane and Catisfield Road left and right turns; pedestrian crossing on A27 The Avenue westbound

Stage 4 – Pedestrian crossing on A27 The Avenue eastbound

The 2036 Local Plan (DM1) traffic flow data has been modelled on this proposed layout and signal staging. The timings have been optimised to achieve the best overall junction performance. The results are shown below in table 12.

DM1 flows	2036 AM peak		2036 PM peak	
	DoS	MMQ	DoS	MMQ
A27 The Avenue eastbound ahead and left	83.3%	7	58.2%	4
A27 The Avenue eastbound ahead	83.3%	8	58.2%	4
Catisfield Road	49.8%	5	78.7%	8
A27 The Avenue eastbound centre section ahead	43.7%	5	24.8%	2
A27 The Avenue eastbound centre section right	60.9%	4	77.0%	7
A27 The Avenue westbound ahead and left	55.0%	5	69.0%	7
A27 The Avenue westbound ahead	51.1%	5	64.2%	7
Peak Lane	85.6%	12	47.7%	3
A27 The Avenue westbound centre section ahead	75.5%	8	68.4%	5
A27 The Avenue westbound centre section right	68.9%	6	41.4%	4
Cycle time	120 seconds		120 seconds	
Practical reserve capacity (%)	5.2%		14.3%	

Table 12

DoS – Degree of saturation (%) where this is 90% or greater the lane is at or over capacity (highlighted in bold red)

MMQ – Mean maximum queue length in vehicles

The results indicate that the junction could accommodate the 2036 Local Plan (DM1) flows in both peak periods. Compared to the Do Nothing option (existing) the junction would operate with a lower level of spare capacity.

Junction summary

Whether the 2036 Local Plan (DM1) flows are applied to the Do Nothing (existing layout) or Do Something (proposed layout) options by optimising the signal timings the junction would operate within capacity. No physical changes would be required to accommodate the modelled 2036 Local Plan traffic flows on either option.

Recommendation

For either option it is recommended that the signal timings can be adjusted to accommodate the 2036 traffic flows.

Future pedestrian/cyclist improvements

It is proposed to provide a pedestrian controlled crossing on the A27 east arm of the junction in 2020/21. This crossing would be provided in response to requests from members of the public who experience difficulty in using the existing poor facility on this arm. Future provision could be considered for cycle facilities along the A27 on the approaches to and through the junction. This could involve the reallocation of existing road space

Segensworth Road East/Cartwright Drive: Significant

The junction of Segensworth Road East/Cartwright Drive flagged as a significant impact in the Do Something model run. Further analysis showed that the junction was within the threshold of practical capacity at 85% RFC and therefore not something that would require mitigation through the Strategic TA. Nevertheless, to demonstrate that mitigation would be possible, and deliverable through development led travel plans in future, a high level review of design options was undertaken as follows.

Segensworth Road is a single lane carriageway , and the traffic data indicates that right turning vehicles are queueing back from the junction blocking access for left turning vehicles. There are wide grass verges along the southbound side of Cartwright Drive either side of the junction, which could be utilised to widen the bell mouth. There is evidence of several statutory undertakers' services around the bell mouth area, including BT chambers and electricity cabinets, which could have an impact on any works around the junction.

Highway records show that the highway boundary is quite restrictive around the junction, which may inhibit any extensive junction/re-alignment options such as installing a roundabout. However, there is scope to widen the carriageway of Segensworth Road along the westbound lane. The available verge is approximately

2.4m wide and, if combined with the existing westbound lane, could potentially provide two reduced width traffic lanes of 2.7m wide. The additional lane could be developed after the Abbeycroft Nursery entrance which would provide approximately 40m of stacking length for left turning vehicles. There is a mature tree in the verge at the start of the junction bell mouth that will require removal, and an electric cabinet and BT chamber that will require a diversion or protection prior to the kerb realignment necessary to accommodate the widened lane. There is little scope to widen the eastbound carriageway due to the narrow verge of approximately 1m which is backed by a solid line of trees, all of which would require removal to achieve this.

This is the only likely highway solution that is feasible for improving the junction flows in this location, although as demonstrated this would not be required to accommodate Local Plan growth.

M27 J9, Westbound off slip: Significant

The M27 J9 westbound off slip flagged as significant in the Do Something model run taking the RFC from 85 to 90. The average queue length is projected to extend from 8 PCUs to 16. At this location, the two off slip lanes are approximately 1.75km in length each, provided ample room to accommodate the increased queue.

This information was shared with Highways England who confirmed that no further modelling was required at this location as part of the Strategic Transport Assessment.

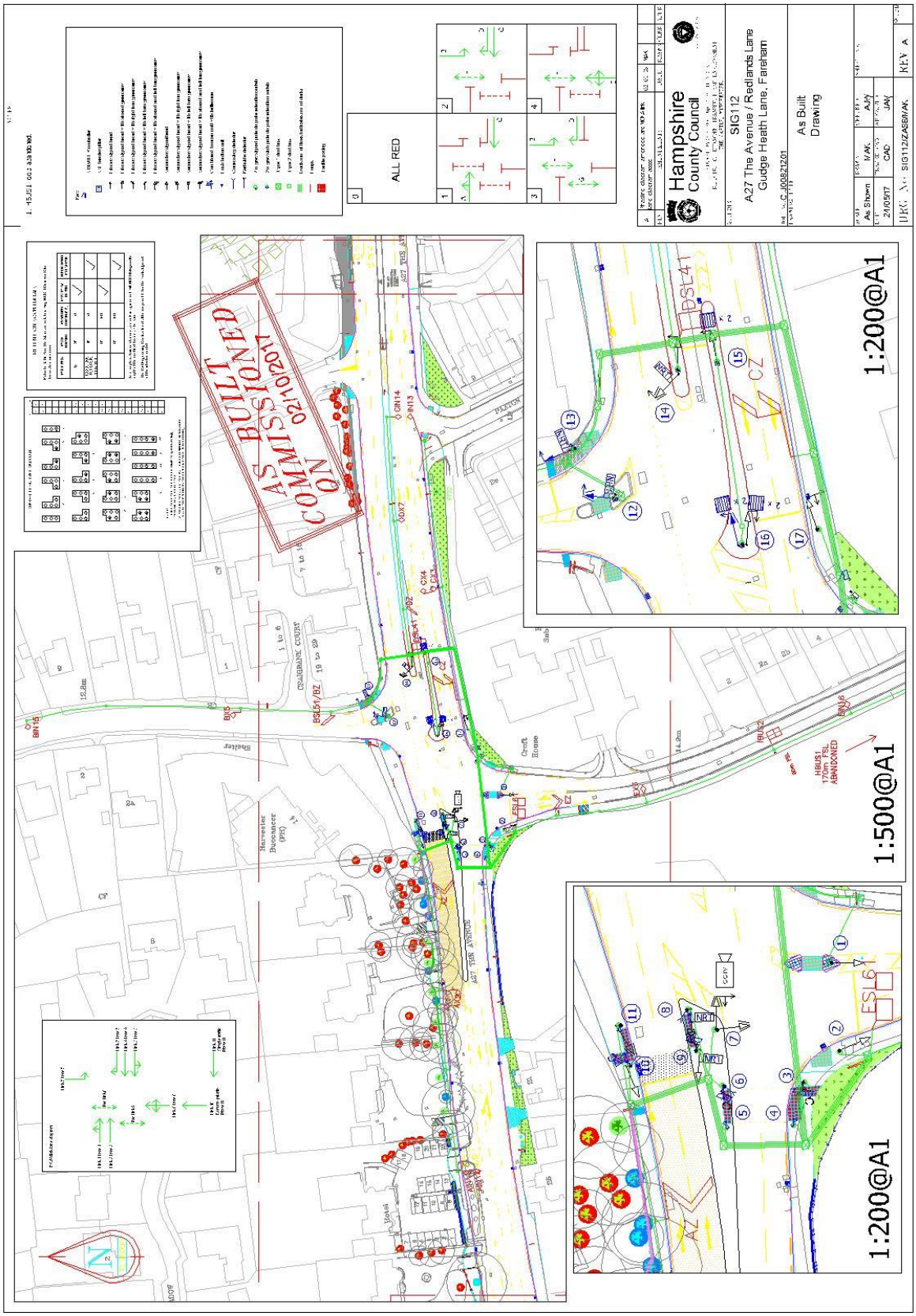
Jonathan Mundy

ITS Group

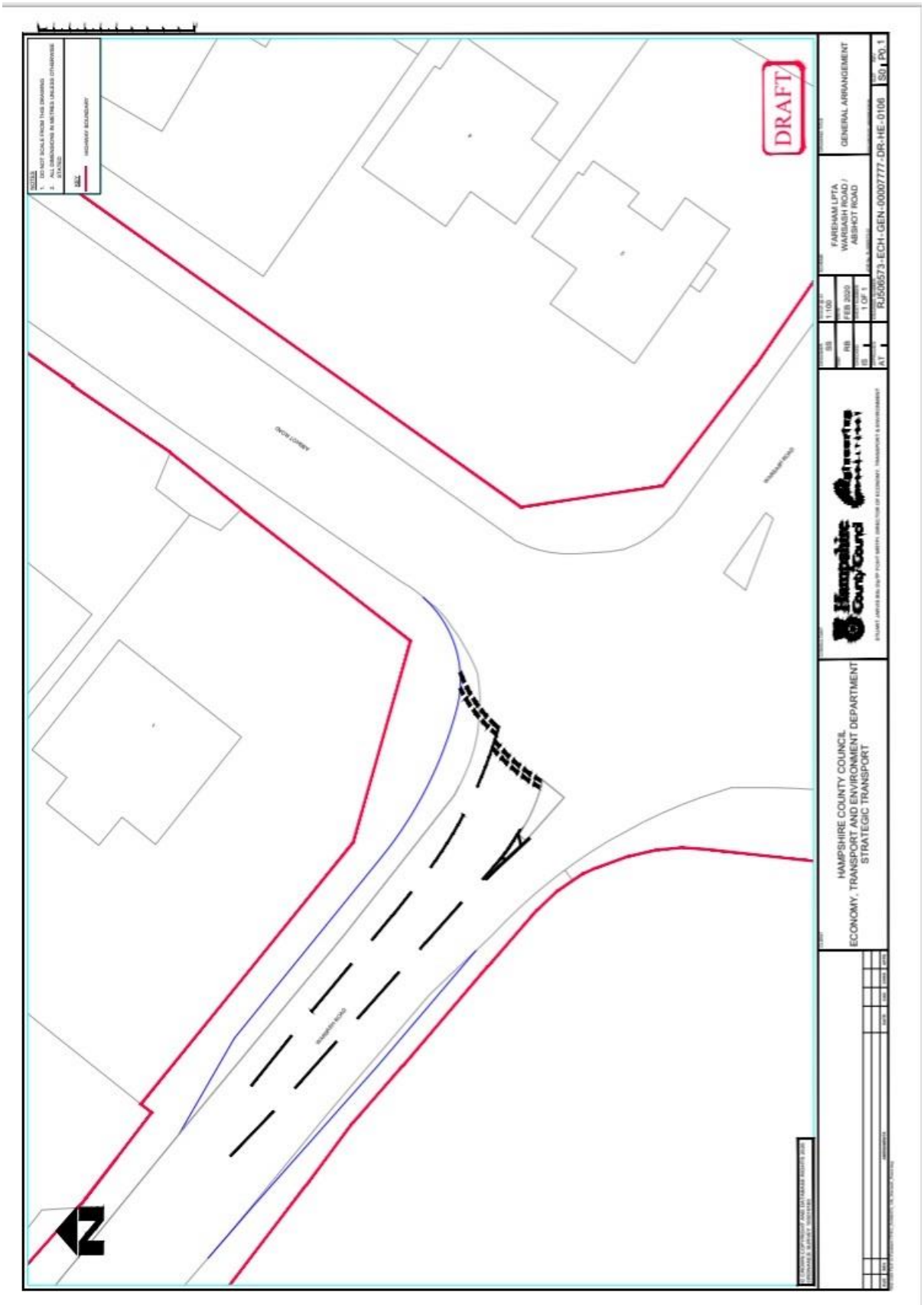
Hampshire County Council

5th August 2020

Appendix

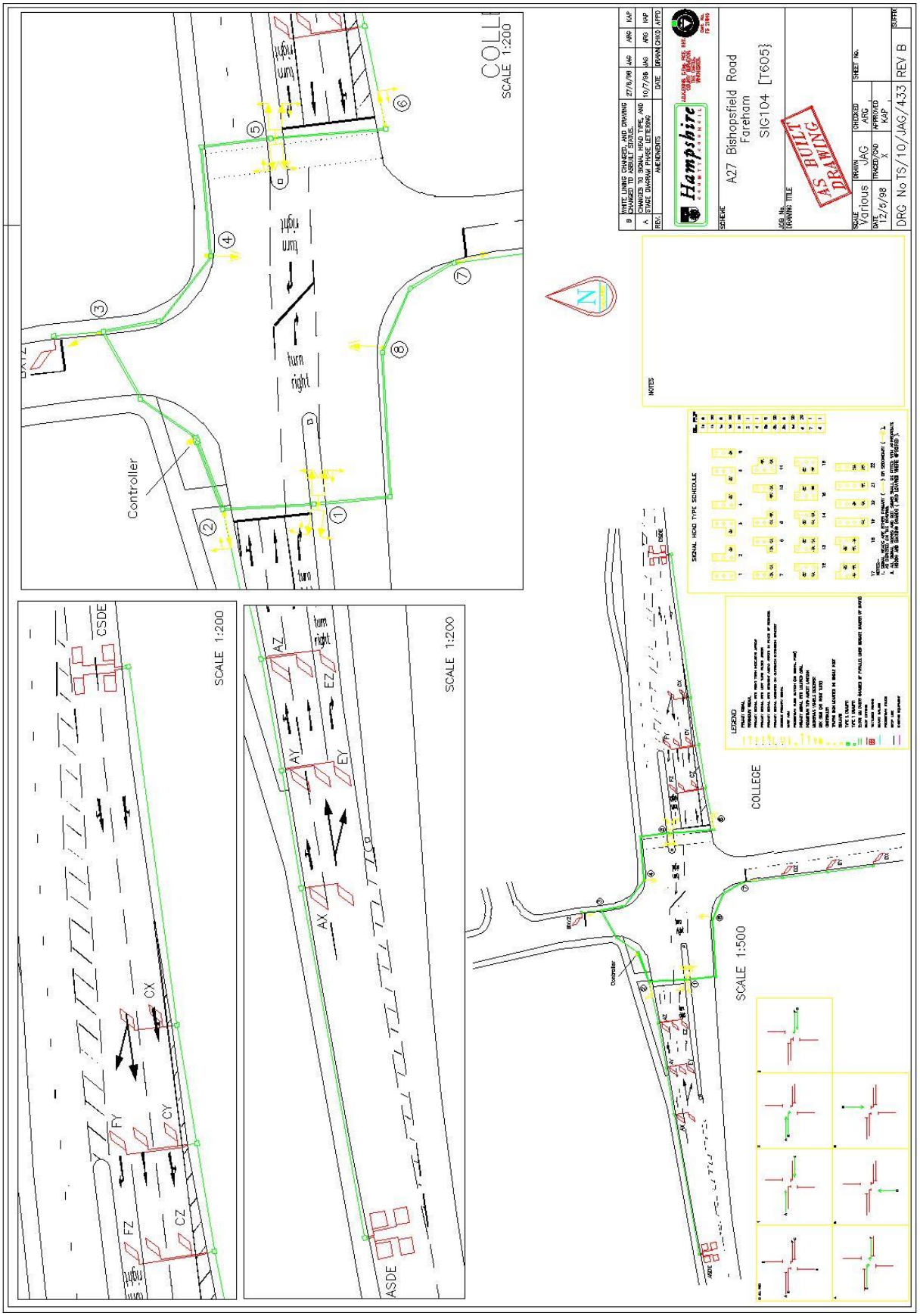


The Avenue/Gudge Heath Lane, Fareham **(existing layout)**
Diagram 1



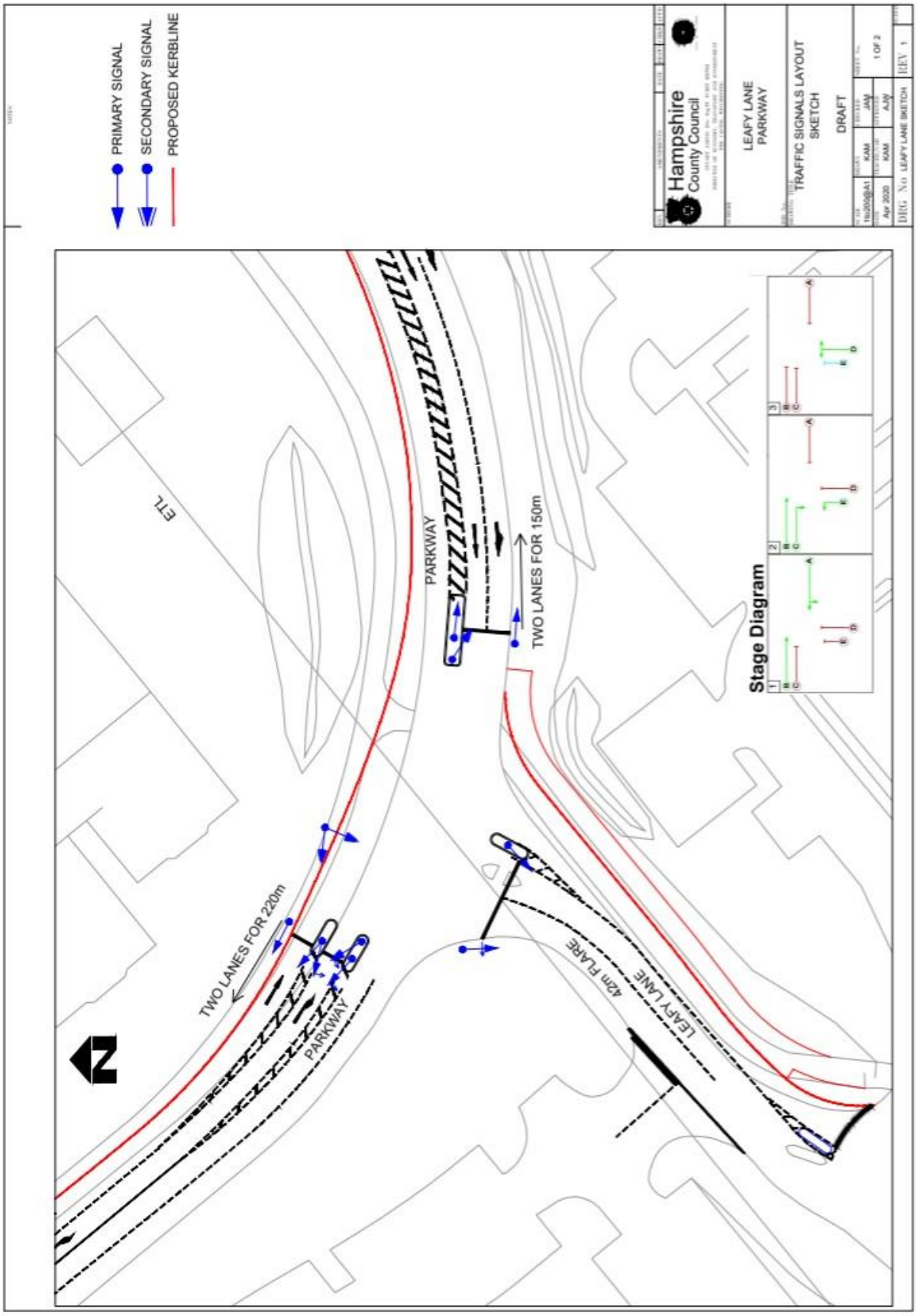
Warsash Road/Abshot Road, Locks Heath – flared approach to mini-roundabout **(Mitigation)**

Diagram 2



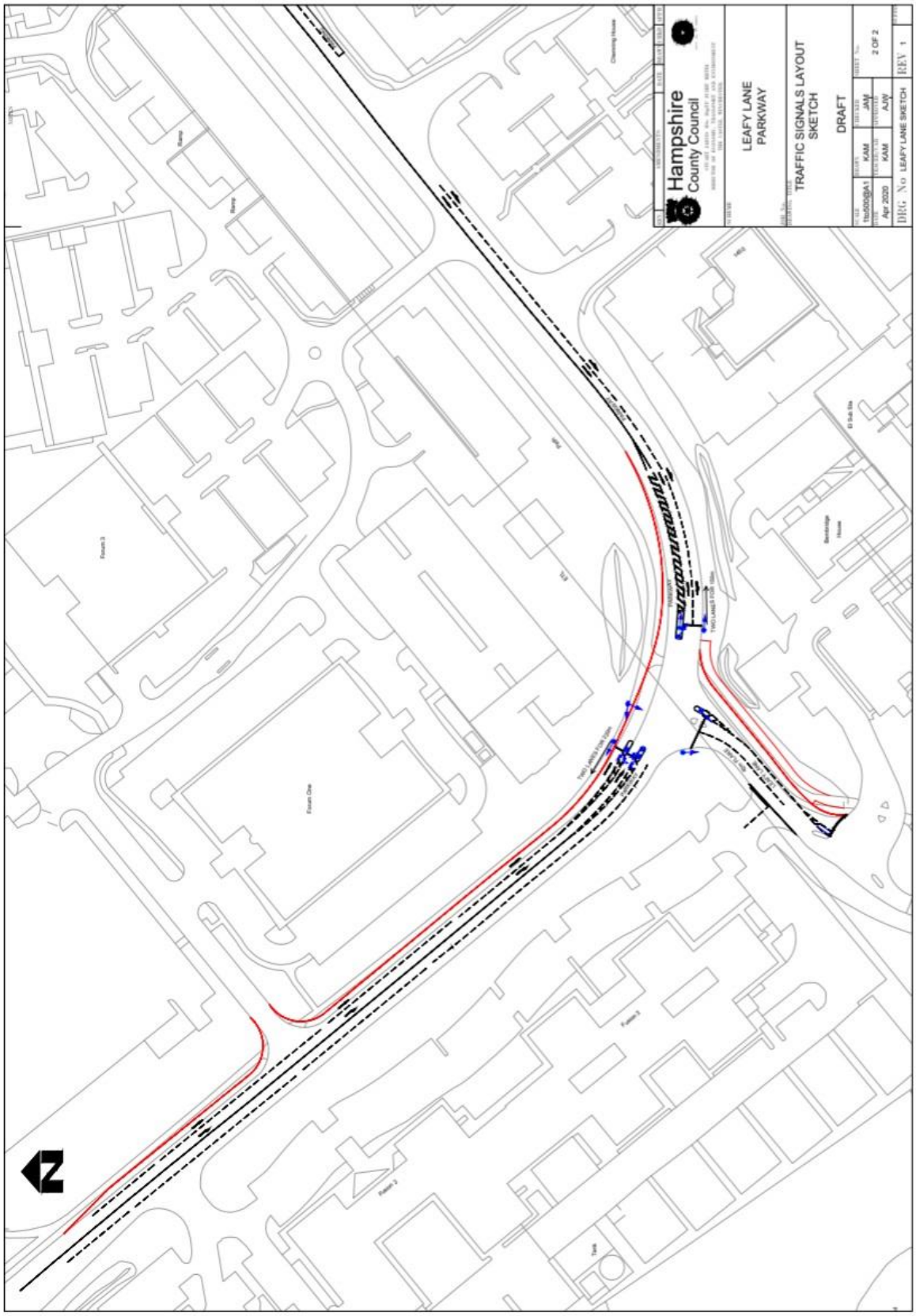
The Avenue/Bishopsfield Road, Fareham **(existing layout)**

Diagram 3



Junction 80: Parkway/Leafy Lane, Whiteley traffic signal option (large scale) **(Mitigation)**

Diagram 4



Junction 80: Parkway/Leafy Lane, Whiteley traffic signal option (small scale) **(Mitigation)**

Diagram 5