

HAMPSHIRE COUNTY COUNCIL

Decision Report

Decision Maker:	Executive Member for Environment and Transport
Date:	11 July 2017
Title:	Transport Improvement Scheme Update: A27 The Avenue / Gudge Heath Lane Fareham
Report From:	Director of Economy, Transport and Environment

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1. Executive Summary

- 1.1 This report follows a decision of the Executive Member for Environment and Transport, on 30 June 2016, to carry out monitoring of the temporary at-grade crossing at the head of the A27, which was installed as part of the works programme for the Transport Improvement Scheme at A27 The Avenue / Gudge Heath Lane, Fareham (“the Scheme”) while the underpass was closed, and to make the crossing permanent provided that no significant adverse impacts on traffic flow were observed during the monitoring phase.
- 1.2 Since this decision, and in line with the recommendations of an initial assessment report, a decision was taken to follow due process and advertise the proposal to make the crossing permanent. Since then 31 objections have been received on a variety of grounds, with particular concerns about traffic delay and value for money.
- 1.3 The high number of objections prompted a further technical analysis, which concluded that the traffic flow impact would place the objectives of the scheme at risk if a permanent crossing were to be implemented.
- 1.4 This report provides the background to the reasons for considering a permanent crossing, and further detail as to the content of the objections and technical reports, on which the recommendations of this report are based.

2. Background

- 2.1 The wider transport scheme comprising highway and train station improvements was approved at the Executive Member for Economy, Transport and Environment’s Decision Day on 9 September 2014. This scheme did not include a permanent controlled crossing.

2.2 The wider scheme aims are to:

- Increase the highway capacity to improve the flow of traffic; to reduce congestion and improve access to encourage local investment, growth and retention of existing employment;
- Improve the train station and interchange facilities to better connect travel modes; and
- Improve provision for cyclists from the train station.

2.3 A report to revise the approved scheme to provide improved at-grade accessibility across the A27 at Fareham train station was considered by the Executive Member for Environment and Transport on 30 June 2016. The Executive Member made a decision to measure the impact of a temporary at-grade staggered Pelican crossing installed to facilitate the subway closure during the works, and subject to no significant adverse impact to traffic, to replace the temporary crossing with a permanent staggered Puffin facility.

2.4 The Executive Member decision delegated authority to officers to approve the installation of a permanent crossing should specific determining criteria be met, namely;

‘That traffic monitoring is carried out to measure the impact of the temporary at-grade crossing at the head of the A27 to be installed as part of the works programme for the Scheme.

‘That, subject to no significant adverse impacts on traffic flow being observed during the monitoring of the temporary crossing, approval is given to make the temporary crossing permanent.’

2.5 A technical assessment report issued in January 2017 forecast the peak time traffic impact to be limited, whilst also identifying a further potential for queuing to negatively affect the flow of traffic at Station roundabout (a copy of that report is included in Appendix 1). On the basis of the report’s recommendation, an officer decision was taken to follow due process with a view to making the crossing permanent.

2.6 Prior to installing a permanent crossing it is a statutory requirement under the Road Traffic Regulation Act 1984 to give notice of the proposal and provide opportunity for comment. A public notice was advertised on the 8th May 2017 for a fixed period of 28 days, in response to which a high number of objections have been received.

2.7 In order to address the objections, and the noted potential in the technical assessment report for Station roundabout to become increasingly queue affected, a further technical review was undertaken as an addendum to the original report, to more accurately determine the potential for traffic delays. In the light of the findings of that review the matter has been returned to the Executive Member for Environment and Transport for a further decision.

3. Representations

- 3.1 A notice publicising the permanent crossing proposal was advertised on the 8 May 2017, providing a 28 day period for public comment.
- 3.2 Of the 37 responses received, there were 35 clear objections and 2 comments in favour. The latter cited the desirability of having a permanent crossing for those who do not want to use the subway, or who find it difficult to do so.
- 3.3 The objections for installing a permanent crossing raised the following concerns:
- That any additional delay to traffic runs contrary to the objectives of the wider scheme;
 - Questionable value for money given the limited known demand of manual wheel chair users;
 - The general desirability of providing a crossing given the existing alternative subway provision; and
 - That the crossing does not meet the minimum criteria (PmV^2) used by Hampshire County Council to justify the installation of a controlled crossing.
- 3.4 In addition, Suella Fernandes, MP for Fareham, has written separately to urge the County Council to avoid impeding the clear benefits of the scheme for the local economy and community as a whole, particularly citing infrastructure and traffic flow benefits, whilst also urging the Authority to have appropriate consideration for residents affected by a disability, and wherever possible to make provision to improve access for such constituents.

4. Technical Assessment

- 4.1 In line with the Executive Member for Environment and Transport's Decision in June 2016, a technical report to assess the traffic impact of replacing the temporary crossing with a permanent Puffin facility was issued in January 2017.
- 4.2 In compiling the report Hampshire County Council's Intelligent Transport System (ITS) Group undertook three separate surveys to assess the traffic impact of the temporary crossing operation. Morning and evening peak time surveys on 16 and 29 September 2016 assessed the operation of the crossing during a period of maximum pedestrian demand, when the subway was closed due to the works. A further peak time survey on the 18 November 2016 assessed the impact of the crossing on traffic with the subway reopened.
- 4.3 The survey findings were adjusted to model the traffic impacts with the capacity improvements in place and two ahead lanes available for westbound A27 traffic at the A27/Redlands Lane/Gudge Heath Lane junction.

- 4.4 A future year assessment for 2026 was also modelled to consider the impact of traffic growth on the crossing operation.
- 4.5 The modelled A27 westbound average queue lengths were not predicted to extend back to Station Roundabout. However by 2026 the modelled results show Station Roundabout as increasingly queue affected during the evening peak periods.
- 4.6 It is important to note that the modelled queues supporting the ITS report are mean maximum queues and may be exceeded 50% of the time. Consequently the negative impacts to traffic of an at-grade crossing may be greater at times than the average conditions referred to in this assessment. It is also the case that installing an at-grade facility would introduce delay through its operation where none existed previously, further detracting from the overall scheme objectives.
- 4.7 The assessment forecasts the evening peak time appearance interval of the more critical westbound crossing at every 2 minutes.
- 4.8 The original ITS technical assessment report recommends retaining an at-grade crossing facility on the basis that the crossing is preferred by pedestrians over the subway, and that predicted queues are offset by the additional capacity provided by the improvement scheme. This assessment considers traffic impacts based on average queue lengths and predicted lane usage. To give greater certainty in the report's recommendation, further analysis was necessary to determine the likely impacts of variance in queue length and lane usage.
- 4.9 To assist in determining the validity of the concerns raised during the public notice period, and the findings of the original technical report that Station Roundabout will become increasingly queue affected, an addendum to the original report was produced and issued in June 2017. The addendum report applies sensitivity testing to further develop the analysis of the forecast peak time traffic impacts, and gives particular focus to the identified potential for A27 westbound peak time delay. A copy of that report is included in Appendix 2.
- 4.10 The further sensitivity tests undertaken in this addendum help clarify the traffic impact at Station roundabout and provide greater detail on the impact of delay on the critical A27 westbound traffic movement.
- 4.11 This developed analysis tests variance to the assumed lane usage and periods where there are consecutive crossing demands, and finds a marked effect on queuing back to Station roundabout during the PM peak period.
- 4.12 At times of consecutive crossing demands, the westbound queue in the 2016 PM peak would start to reach the roundabout, and with increased flows in the 2026 PM peak, the queues will extend into the roundabout itself.

4.13 When less balance lane use is also taken into consideration, the results show westbound queues extending into the roundabout in both the 2016 and 2026 PM peaks. Added to this is the secondary impact of vehicles impeded by the static queue being required to slowdown. This developed analysis demonstrates a permanent crossing to have a significant detrimental impact on the operation of the roundabout. Whilst it is difficult to determine the individual durations of these occurrences, the survey data predicts 8 occasions of extended queuing during each PM peak hour.

5. Accessibility

- 5.1 The County Council's Traffic Management and Guidance Policy recommends suitable crossing sites based on a PmV² assessment, which quantifies the pedestrian demand relative to the flow of traffic. Sites which score a value below 1.0×10^8 would not normally be recommended for a controlled crossing other than where there is a wider perceived need for pedestrian safety, considered against traffic impacts and compatibility to corporate goals. As previously reported to the Executive Member in June 2016, at this location, even assuming all pedestrians opt to cross at-grade rather than via the subway, the forecast crossing demand fails to meet the minimum PmV² requirement with a surveyed value of 0.41×10^8 .
- 5.2 A longer route via the signal controlled crossing at the A27/Redlands Lane/Gudge Heath Lane junction is available. This signal controlled crossing is located approximately 330 metres from the underpass. It should be noted that using this crossing will increase the journey time for manual wheel chair users travelling between Fareham train station and the BRT bus stop on the southern side of the A27.
- 5.3 The subway ramp gradients remain unchanged within the current improvement scheme and conformed to subway access requirements at the time of construction.
- 5.4 Options to revise and extend the existing subway ramps were discounted due to design and budgetary constraints. Options to provide more direct alternative at-grade routes via Western Way and West Street have been investigated but none proved suitable or achievable due to safety concerns related to poor driver visibility and sight stopping distances, and as such any solutions via this route were discounted.
- 5.6 The subway provides access for rail and bus services without compromising congestion improvements achieved through the major improvement scheme, and while pedestrians may prefer an at-grade crossing facility, their access for the most part is not compromised by its removal.
- 5.7 Many mobility impaired pedestrians will be able to use the underpass. For those not able to do so, an alternative at-grade crossing remains available as before, though at some further distance. As this decision will not alter the existing permanent crossing provision, it is not considered that the recommendation of this report will cause substantial disadvantage requiring reasonable adjustments to be made for the purposes of the Equality Act 2010. As appropriate, the County Council will work with affected parties to

look at route planning, financial assistance for travel, and the availability of grant assistance for powered wheel chair provision.

6. Finance

6.1 The current estimated cost of installing a permanent crossing is £100,000.

6.2 Whilst it had been previously reported that the additional cost of making the temporary crossing permanent could be accommodated within the existing scheme budget, with the scheme now under construction and the costs better understood, it is clear that the additional cost will exceed budgets, and additional funding to the full value of the crossing will need to be secured.

7. Legal Context

7.1 Section 149 of the Equality Act 2010 ('the Act') places a duty upon the County Council known as the Equality Duty. This duty requires the County Council, in the exercise of its functions, to have due regard to the need to:

- Eliminate discrimination, harassment and victimisation and any other conduct prohibited under the Act;
- Advance equality of opportunity between persons who share a relevant protected characteristic (age, disability, gender reassignment, pregnancy and maternity, race, religion or belief, gender and sexual orientation) and those who do not share it;
- Foster good relations between persons who share a relevant protected characteristic and persons who do not share it

7.2 Having "due regard" can be interpreted as consciously and demonstrably giving advance consideration to the three arms of the Equality Duty as part of the decision making process and the provision of services. How much regard is "due" depends on the circumstances and the relevance of the aims of the Equality Duty to the decision or function in question.

7.3 The courts have confirmed that due regard is fulfilled before and at the time that a particular policy that will or might affect people with protected characteristics is under consideration as well as at the time that a decision is taken (*R (Brown) v Secretary of State for Work and Pensions* (2008) EWHC 3158). The Equality Duty was considered in the preparation of the County Council's Traffic Management and Guidance Policy. That policy will form the basis of any decision that may be made for the provision of an additional at-grade crossing, notwithstanding that in this instance an exception could be made to reflect exceptional circumstances.

7.4 The Equality Duty is pertinent to this decision and an impact assessment which considers this duty is attached to this report.

8. Key factors for consideration

- 8.1. The queues predicted by the model from the westbound crossing will have an increasingly significant adverse impact on the flow and operation of Station Roundabout. The forecasts of the developed model in the addendum report predict queues from the crossing blocking back to, and through, the roundabout by 2026. At each appearance, when called by a waiting pedestrian, the crossing will introduce queuing throughout the day, leading to avoidable delay for other road users where none previously existed.
- 8.2. The capacity objectives supporting the business case for the scheme are to reduce congestion and improve the flow of traffic at Station Roundabout. The impact identified above runs contrary to those objectives.
- 8.3. The additional crossing cost, at circa £100,000, exceeds the financial parameters of the scheme.
- 8.4. Whilst not providing a permanent Puffin crossing restricts access for manual wheel chair users at this particular location, an alternative unopposed at-grade route remains available, which will continue to enable such users to access rail and bus services.
- 8.5. The proposed scheme does not introduce any additional disadvantage for manually assisted wheel chair users over and above the current arrangement, as the ramp gradients at the subway which have been in place for many years, remain unchanged by this scheme.
- 8.6. Installing a permanent puffin crossing at this location to further improve access for manual wheelchair users is in excess of the 'reasonable adjustment' required by the Equality Act 2010, due to a notable predicted disruption to other road users, the physical constraints of the site, and the increased financial burden when considered in accordance with the financial limits of the scheme.

9. Recommendation

- 9.1 That the Executive Member for Environment and Transport, having considered the objections received and the forecast traffic delays detailed within this report, gives approval for the removal of the temporary crossing installed to mitigate the closure of the subway during the period of construction of the Transport Improvement Scheme at A27 The Avenue / Gudge Heath Lane, Fareham, and that in order to maintain the journey time improvements that formed the business case for the scheme, the proposed permanent at-grade crossing facility is not implemented.

CORPORATE OR LEGAL INFORMATION:**Links to the Corporate Strategy**

Hampshire safer and more secure for all:	yes
Maximising well-being:	yes
Enhancing our quality of place:	yes

Other Significant Links

Links to previous Member decisions:		
<u>Title</u>	<u>Reference</u>	<u>Date</u>
<i>From and including EMET 30 June 2016 reports.</i>		
Direct links to specific legislation or Government Directives		
<u>Title</u>	<u>Date</u>	
<i>Equality Act 2010 Road Traffic Regulation Act 1984</i>		

Section 100 D - Local Government Act 1972 - background documents

The following documents discuss facts or matters on which this report, or an important part of it, is based and have been relied upon to a material extent in the preparation of this report. (NB: the list excludes published works and any documents which disclose exempt or confidential information as defined in the Act.)

<u>Document</u>	<u>Location</u>
None	

Impact Assessments

1. Equality Duty

1.1 The County Council has a duty under Section 149 of the Equality Act 2010 ('the Act') to have due regard in the exercise of its functions to the need to:

- Eliminate discrimination, harassment and victimisation and any other conduct prohibited under the Act;
- Advance equality of opportunity between persons who share a relevant protected characteristic (age, disability, gender reassignment, pregnancy and maternity, race, religion or belief, gender and sexual orientation) and those who do not share it;
- Foster good relations between persons who share a relevant protected characteristic and persons who do not share it.

Due regard in this context involves having due regard in particular to:

- a) The need to remove or minimise disadvantages suffered by persons sharing a relevant characteristic connected to that characteristic;
- b) Take steps to meet the needs of persons sharing a relevant protected characteristic different from the needs of persons who do not share it;
- c) Encourage persons sharing a relevant protected characteristic to participate in public life or in any other activity which participation by such persons is disproportionately low.

1.2 The Act makes it unlawful for public authorities, including Highway Authorities, to discriminate in the exercise of a public function. This includes the highways function. Section 20(4) of the Act requires that where a physical feature puts a disabled person at a substantial disadvantage in comparison to a person who is not disabled, an authority is required to take such steps as is reasonable to remove the disadvantage. The Equality Act 2010 Code of Practice ('the Code of Practice') provides at para 7.52 that "taking steps to avoid the disadvantage" includes:

- removing the physical feature in question;
- altering it; or
- providing a reasonable means of avoiding it

1.3 There is one threshold for the reasonable adjustment duty being at a "substantial disadvantage".

1.4 The Code of Practice provides at para 7.19 that the duty to make reasonable adjustments is owed to disabled persons in general. It is not a duty that is weighed in relation to each individual person affected by the exercise of a public function.

1.5 The term 'reasonable' in relation to the adjustments required is dependent on a number of factors: the type of service being provided, the nature of the

service provider, its size and resources, and the effect of the disability on the individual disabled person. Para 7.30 of the Code of Practice indicates factors which might be taken into account when considering what is reasonable as:

- whether taking any particular steps would be effective in overcoming the difficulty that disabled people face in accessing the service in question;
- the extent to which it is practicable for the service provider to take the steps;
- the financial and other costs of making the adjustment;
- the extent of any disruption which taking the steps would cause;
- the extent of the service provider's financial and other resources;
- the amount of any resources already spent on making adjustments;
- the availability of financial or other assistance.

1.6 Where the physical features are within the remit of a highway authority and the highway authority is the service provider, it will have the duty to make reasonable adjustments. These requirements apply to facilities and services in the pedestrian environment and in transport-related infrastructure

1.7 Equality Impact Assessment:

This decision preserves the overall approach of the scheme to improve journey times for all road users, and in that respect has a neutral impact on people with disabilities. Although it is recommended that the temporary crossing be removed, an alternative at-grade crossing remains available as before, though at some further distance. As this decision will not alter the existing permanent crossing provision, it is not considered that the recommendation of this report will cause substantial disadvantage requiring reasonable adjustments to be made for the purposes of the Equality Act 2010. As appropriate, the County Council will work with affected parties to look at route planning, financial assistance for travel, and the availability of grant assistance for powered wheel chair provision.

2 Impact on Crime and Disorder:

2.1 None.

3 Climate Change:

- a) How does this proposal impact on carbon footprint and energy consumption?
- b) How does what is being proposed consider the need to adapt to climate change, and be resilient?

The specific recommendations made in this report have very little impact upon climate change, though the decision not to adjust the scheme could save on works activity and the on-going requirements of maintaining a staggered signal crossing, thereby making a minor reduction in the carbon emissions associated with delivery and operation. However, the decision will

help enable the successful delivery of the scheme generally. On that basis the climate change impact assessments included in the original PA documents (linked to this report) are relevant.

ITS Group**ETE Department****Hampshire County Council****A27 Station roundabout pedestrian facilities across A27 The Avenue****Pedestrian crossing technical report****Introduction**

This report considers the impact of providing a signal controlled Puffin crossing on A27 The Avenue arm of Station roundabout in Fareham.

Background

The County Council are undertaking improvement works at the roundabout of A27 The Avenue/Western Way/West Street in Fareham. Known as 'Station roundabout' the works include the provision of a new bus layby and stop on The Avenue approach. This element of the scheme required the existing pedestrian subway beneath The Avenue to be closed. In order to maintain safe a means of crossing The Avenue a temporary signal controlled Pelican crossing was installed adjacent to the subway. This report explores the impact of providing a permanent Puffin crossing at this location.

Description of site

The subway is located within 50 metres of the Station roundabout and runs north/south beneath The Avenue. The north side is accessed by both a ramp and steps but the southern side is accessed by a ramp only. Throughout the duration of the subway closure a staggered Pelican crossing was provided immediately to the west of the subway. The subway was re-opened on 11th November 2016. The temporary Pelican crossing remains in place pending the decision on its retention or removal.

Proposal

The proposal would see a permanent staggered Puffin crossings put in place of the temporary staggered Pelican crossings. The layout and position of permanent Puffin crossings would be similar to the temporary crossings. In the westbound direction 10 vehicles could be stored between the roundabout exit and crossing (60 metres distance). In the eastbound direction the staggered layout means that around 6 vehicles (around 35 metres) could queue back from the roundabout entry before they reached crossing.

The temporary crossing is a staggered Pelican crossing which includes far sided pedestrian signals. Each crossing operates on demand and pedestrians treat each part of the staggered crossing separately waiting at each. A permanent crossing would be a staggered Puffin crossing with nearside pedestrian signals. A layout for a permanent staggered Puffin crossing is shown on drawing F6052/Detail/LY in the Appendix.

Survey data

The opportunity was taken to conduct a series of surveys at the crossing when the subway was closed and also after it re-opened. This objective was to determine pedestrians' preference between the subway and Pelican crossings and to understand the impact of the crossing on traffic conditions.

An initial traffic and pedestrian survey was conducted at this location on 24th October 2012. This survey was part of a full turning count survey for Station roundabout which include pedestrian crossing movements across The Avenue arm.

Updated surveys arranged for September and November 2016 recorded the numbers of pedestrians using the temporary Pelican crossings and subway (when re-opened), the number of appearances for the Pelican crossings and the queue lengths generated by them.

The first survey during the construction phase was undertaken on Friday 16th September 2016. The westbound queue length observations only extended back to the Station roundabout and no record was made of when they extended beyond this junction.

The second survey was conducted approximately 2 weeks later on Thursday 29th September 2016 and was undertaken as a supplementary measure. This opportunity was taken to increase the extents of the queue length survey beyond the Station roundabout.

A final survey was arranged once the subway had been re-opened. This survey was to understand pedestrians' preference for using the temporary crossing and subway. This survey was undertaken on Friday 18th November around a week after the subway had been re-opened. This allowed sufficient time for pedestrians to decide whether to revert back to using the subway or continue using the temporary Pelican crossings.

For the purposes of this assessment the peak period for crossing movements has been taken as 07:00-09:30 in the morning and between 16:00 and 18:30 in the evening. It is these 2 ½ hour time periods that have been considered in this report.

Queue length data

At each survey the queue lengths generated by the appearance of the temporary Puffin crossings was noted. With the proximity of congestion bottlenecks nearby, at the entry to Station roundabout and Gudge Heath Lane signal junction, each produced queuing through the crossing. This led to difficulties for the enumerators in differentiating between queuing associated with the crossing and the above mentioned remote influences.

In the AM peak the eastbound queues towards the roundabout were longer in the outside lane. The maximum queue length seen was over 20 vehicles which extended back beyond the Paxton Road junction. For the PM peak the eastbound queue lengths were more variable between the nearside and offside lanes. The maximum queue length was less than the in the morning peak with the longest queue back to the Paxton Road junction.

In the westbound direction the queues in the AM peak were much less than during the evening peak. Typically queues extended back to the Station roundabout but not on to it. During this period the nearside lane queue was slightly longer than the offside lane.

The greatest congestion noted occurred in the PM peak in the westbound direction. The recorded queue lengths in the nearside lane extended some way along Western Way. However there was difficulty in identifying the effect of the Pelican crossing on this queue which occurs most evening peak originating from the Gudge Heath Lane signal junction. The queue in the offside lane westbound was much shorter and for the most part did not extend back to Station roundabout.

An improvement scheme is being constructed at the A27 Gudge Heath Lane/Redlands Lane junction which will provide 2 ahead lanes in the westbound direction. Under this new arrangement the queuing in both westbound lanes at the crossing is likely to change. Drivers travelling westbound through the Gudge Heath Lane junction will be able to use the offside lane. Additionally the predicted queue in the westbound direction from the Gudge Heath Lane signal junction is not expected to extend much past Paxton Road and therefore is not expected to affect the crossing.

Crossing demand

The number of demands for each part of the staggered Pelican crossing is contained in tables 1 to 6 within the Appendix.

The only survey which was undertaken when users had a choice of using the Puffins or subway was that carried out on 18th November. Looking at the actual numbers of users recorded on this survey in the AM period a total of 84 people crossed between 07:00 and 09:30. Of these almost 2/3rds used the Puffin crossing with the remaining 1/3rd using the subway. While the total number who crossed in the PM period (16:00-18:30) was higher at 194 people the overall proportion using the Puffins compared to the subway was virtually the same as the morning period.

The waiting times for pedestrians at each temporary Pelican crossing is around 30 seconds. The overall waiting time to use both crossings is approximately 1 minute. Pedestrians using the subway are not subjected to any waiting delay.

The number of appearances for the Pelican crossing remained reasonably unchanged from the first survey through to the last survey even when the subway was re-opened. Despite users having the choice of the Pelican crossings or subway, the number of demands for the Pelican remained largely unaffected.

Modelling (traffic impact)

The predicted impact of the Pelican crossing on traffic flows has been assessed. This is important as despite having observed queue length data in the westbound direction the lane usage in this direction is heavily influenced by the layout at the Gudge Heath Lane junction. Even at the crossing the nearside lane is used by traffic headed westbound to Bishopsfield Road junction beyond and the offside lane by those turning into Gudge Heath Lane. The westbound dualling currently being constructed is expected to significantly alter the lane usage through the crossing. Drivers travelling westbound towards Bishopsfield Road junction will be able to use both lanes and the modelling allows this future behaviour to be assessed. The modelling supplements the

eastbound observed queue length data. It also offers a future assessment of the impact on traffic conditions.

The crossing has been modelled using Linsig software. The traffic flows have been taken from the most recent survey data (16th October 2012). The morning peak traffic flow period was 07:30 to 08:30 and the evening peak was 17:00-18:00.

The 2012 traffic data was increased to 2016 based on TEMPRO rates. A future year assessment for 2026 has also been undertaken to test the impact of the crossings to tie in with the Sub Regional Transport Model (SRTM). TEMPRO growth factors used in the SRTM have overall growth rates of 14% in the AM peak and 15% in the PM peak between 2010 and 2026. Pro-rata the growth rates between 2012 and 2016 have been calculated as 3.5% in the AM and 3.75% in the PM peak. Projecting ahead to 2026 the growth rates applied to the 2012 survey flows are 12.25% in the AM peak and 13.13% in the PM peak. No growth rate has been applied to the number of crossing appearances.

The crossing demand levels were taken from the 18th November 2016 survey data. For the morning period the crossings were demanded 18 times during the corresponding peak traffic hour and 29 times in the evening peak traffic hour. Taken as an average the crossings would appear every 3 1/3 minutes in the morning peak and every 2 minutes in the evening peak.

At these levels of modelled demand frequency for the crossings, altering the on street pedestrian waiting times would have little bearing on the modelling results. Therefore increasing the maximum pedestrian waiting time from 30 seconds under the temporary Pelican arrangement, to say 1 minute, would not affect the modelling. However making pedestrians wait longer, either throughout the day or at peak traffic flows periods, could influence the decision to use the subway in preference as no waiting delay would be incurred. Overall this may affect the number of times that the crossings are called in the peak periods but it would not alter the queues generated each time they did stop traffic. Any assumptions based on a reduced number of appearances for the crossing would be difficult to assess.

The modelling does not take into account the effect of the entry to the roundabout in the eastbound direction. The modelling assesses the crossing in an isolated situation with traffic able to freely flow at all times. Therefore the modelling results for the eastbound direction should be treated with caution when compared with the observed queue lengths.

A27 westbound drivers able to use either lanes once the Gudge Heath Lane dual scheme has been completed. To provide a robust set of results an assumption has been used that 2/3rd of the drivers will remain in the nearside lane to travel ahead with the remaining 1/3rd using the offside lane to travel ahead and turn right into Gudge Heath Lane. In the eastbound direction headed towards the roundabout the overall traffic flow has been split according to the lane markings.

The completion of the Gudge Heath Lane scheme is anticipated to remove the westbound queuing back from that junction through the crossing and on to Station roundabout. Therefore the modelling results carry greater insight into the impact of the crossing in isolation.

Modelling results

The Linsig results for the 2016 peaks are located in tables 7 and 8 and the results for the 2026 peaks are outlined in tables 9 and 10 in the Appendix.

Westbound direction

Based on the assumption that the existing A27 westbound congestion no longer exists following the implementation of the Gudge Heath Lane dual scheme, in 2016 the westbound queue generated by the crossing is not predicted to extend back on to the Station roundabout. Projecting ahead to 2026 the average maximum queue is likely to reach the roundabout. There will be increasing occasions in the 2026 PM peak when the generated queue will affect traffic using the roundabout.

Compared with the current situation the queuing associated with the crossing in isolation is considerably less than current levels experienced westbound in the PM peak. Undoubtedly the crossing would introduce queuing throughout the day when demanded, where none previously existed. However the level of queuing from the crossing would be relatively low and short lived.

Eastbound direction

In the eastbound direction heading towards the roundabout the modelling is unable to reflect the queuing caused by the roundabout that will continue to exist. Taken in isolation the crossing would generate average maximum queues of around 60 metres in the AM peak and 40 metres in the PM peak. Based on the continuing presence of queuing at the A27 The Avenue approach to the Station roundabout this is unlikely to be particularly significant when set against the background congestion.

Operation

The associated scheme at the A27 Redlands Lane/Gudge Heath Lane junction has been designed to alleviate the congestion currently experienced on The Avenue westbound particularly in the PM peak. The introduction of a Puffin crossing close to the Station roundabout should be carefully consider in this context.

To assist The Avenue westbound movement it may be desirable to link the appearance of the westbound crossing with the operation of the Redlands Lane/Gudge Heath Lane signals. This would be beneficial during the main road stage and right turn stage (stages 1 and 2 respectively). The Gudge Heath Lane signals would continue to operate under MOVA control which currently runs the duration of stages 1 and 2 well in excess of 1 minute in the PM peaks. Linking the westbound crossing with the operation of the signals would lead to considerable waiting times for users at this crossing. To ensure that the congestion benefits are realised for The Avenue westbound in the PM peak it may be necessary to link the crossing with the signals at these times. At other times of lighter traffic flow the crossing could operate independently greatly reducing waiting times for users. It should be remembered that users would still have the choice of using the adjacent subway should they find the waiting time at the crossing unacceptable in the PM peak.

Conclusions

The background level of queuing along The Avenue in both directions due to the Gudge Heath Lane signal junction and the Station roundabout make it difficult to isolate and identify the current congestion produced by the temporary Pelican crossing. Indeed in the westbound direction traffic conditions will change significantly once the Gudge Heath Lane dual scheme has been introduced.

In general queuing from the crossing in the westbound direction is not expected to extend on to the Station roundabout in the 2016 peaks. As traffic levels increase towards 2026, there will be increasing instances of queues forming on this roundabout in from the nearside lane in the PM peak. Compared with the current heavily congested conditions in the PM peak this should be greatly reduced and more sporadic in nature.

When demanded, a Puffin crossing would generate queuing in the westbound direction when none previously existed. However the duration of queueing from the crossing would be relatively short on most occasions. The benefits derived from the westbound capacity improvements at Gudge Heath Lane junction are expected to significantly outweigh the impact of a staggered Puffin crossing particularly in the evening peak.

In the eastbound direction the queueing back from the entry to Station roundabout will continue to extend through the crossing. At peak times the crossing is likely to have little additional impact on this queuing.

The level of demand for the temporary Pelican crossing remained high despite the alternative subway being available. Deliberately increasing the waiting time may encourage more pedestrians to return to using the subway. This effect would reduce the number of occasions that traffic would be stopped in The Avenue although when stopped the predicted queuing would still occur. The demand levels demonstrate that users prefer to use the Puffin crossing rather than the adjacent subway. This would underline the desire and need for a Puffin crossing,

Recommendation

It is recommended that the temporary Pelican crossing is replaced with a permanent staggered Puffin crossing for the following reasons;

1. There is a demonstrated preference in terms of usage towards a staggered Pelican crossing compared with the adjacent subway.
2. The impact of a staggered Puffin crossing on traffic would be marginal in the eastbound direction due to the overriding effect of queuing caused by the nearby roundabout.
3. The impact on westbound traffic from a staggered Puffin crossing would be relatively small and short lived. This would be mainly due to the capacity benefits derived from the widening scheme at the Gudge Heath Lane junction which are expected to outweigh the traffic delay caused by a staggered Puffin crossing.

Jonathan Mundy

Issue 1 January 2017

Permanent staggered Puffin crossing layout drawing (F6052/Detail/LY)

AM peak 16th September 2016 (surveyed data)

	Eastbnd crossing	Eastbound nearside lane		Eastbound offside lane		Westbnd crossing	Westbound nearside lane		Westbound offside lane	
	No of demands	Ave queue	Max queue	Ave queue	Max queue	No of demands	Ave queue	Max queue	Ave queue	Max queue
07:00 - 07:30	14	3.4	14	4.8	12	7	1	3	0.4	1
07:30 - 08:00	14	7.1	12	12.4	21	8	3.1	4	1	2
08:00 - 08:30	10	7.6	14	10.1	20	9	4	6	0.6	2
08:30 - 09:00	10	6.2	15	6.9	18	7	4.7	8	0.9	4
09:00 - 09:30	5	7.8	18	4	8	4	3	4	1	2

Table 1

PM peak 16th September 2016 (surveyed data)

	Eastbnd crossing	Eastbound nearside lane		Eastbound offside lane		Westbnd crossing	Westbound nearside lane		Westbound offside lane	
	No of demands	Ave queue	Max queue	Ave queue	Max queue	No of demands	Ave queue	Max queue	Ave queue	Max queue
16:00 - 16:30	7	7.9	>20	1	2	7	>12	>12	0.6	2
16:30 - 17:00	9	14.2	>20	4.4	10	12	>12	>12	2	7
17:00 - 17:30	6	4.8	10	2.1	4	11	>12	>12	1.1	4
17:30 - 18:00	6	6	>20	4.7	8	9	>12	>12	1.6	3
18:00 - 18:30	6	8.5	15	3	6	12	>12	>12	1.7	5

Table 2

AM peak 29th September 2016 (surveyed data)

	Eastbnd crossing	Eastbound nearside lane		Eastbound offside lane		Westbnd crossing	Westbound nearside lane		Westbound offside lane	
	No of demands	Ave queue	Max queue	Ave queue	Max queue	No of demands	Ave queue	Max queue	Ave queue	Max queue
07:00 - 07:30	13	6.7	20	13.6	20	6	3.8	5	5	10
07:30 - 08:00	15	15.2	20	15	20	15	9.3	15	4.4	12
08:00 - 08:30	11	17.7	20	20	20	12	15.5	25	1.7	5
08:30 - 09:00	11	17.3	20	15.3	20	10	18.7	25	1.7	4
09:00 - 09:30	11	17.3	20	15.5	20	11	20.3	25	1.5	6

Table 3

PM peak 29th September 2016 (surveyed data)

	Eastbnd crossing	Eastbound nearside lane		Eastbound offside lane		Westbnd crossing	Westbound nearside lane		Westbound offside lane	
	No of demands	Ave queue	Max queue	Ave queue	Max queue	No of demands	Ave queue	Max queue	Ave queue	Max queue
16:00 - 16:30	11	5	18	8.4	20	12	20	28	2.2	4
16:30 - 17:00	12	8.6	17	12.5	20	15	37	40	2.3	6
17:00 - 17:30	12	12.6	20	14.9	20	16	37	40	1.6	5
17:30 - 18:00	12	4.8	17	5.2	17	16	37	40	1.6	5
18:00 - 18:30	10	6.5	14	5.5	12	11	22	28	1.7	4

Table 4

AM peak 18th November 2016 (at-grade crossing) – (surveyed data)

	Eastbnd crossing	Eastbound nearside lane		Eastbound offside lane		Westbnd crossing	Westbound nearside lane		Westbound offside lane	
	No of demands	Ave queue	Max queue	Ave queue	Max queue	No of demands	Ave queue	Max queue	Ave queue	Max queue
07:00 - 07:30	9	7.2	>10	9	10	6	3	4	1.5	3
07:30 - 08:00	10	>10	>10	>10	>10	7	8.4	9	4.1	9
08:00 - 08:30	9	>10	>10	>10	>10	10	7.1	10	2.1	10
08:30 - 09:00	8	8	>10	8.1	>10	7	9	12	0.7	2
09:00 - 09:30	7	4.8	>10	3.6	>10	5	5.8	9	2.4	5

Table 5

PM peak 18th November 2016 (at-grade crossing) – (surveyed data)

	Eastbnd crossing	Eastbound nearside lane		Eastbound offside lane		Westbnd crossing	Westbound nearside lane		Westbound offside lane	
	No of demands	Ave queue	Max queue	Ave queue	Max queue	No of demands	Ave queue	Max queue	Ave queue	Max queue
16:00 - 16:30	8	6.8	>10	7.75	>10	12	32	>40	1.6	3
16:30 - 17:00	8	6.4	>10	5.2	>10	11	28	28	1.6	4
17:00 - 17:30	9	8.9	>10	>10	>10	14	28	28	2.1	5
17:30 - 18:00	9	4.9	>10	6.7	>10	15	28	28	1.8	4
18:00 - 18:30	6	4.3	10	7	10	8	20.9	>40	2.6	5

Table 6

2016 Linsig modelling results

2012 AM peak	Eastbnd crossing	Eastbound nearside lane	Eastbound offside lane	Westbnd crossing	Westbound nearside lane	Westbound offside lane
	No of demands	Max ave queue	Max ave queue	No of demands	Max ave queue	Max ave queue
07:30-08:30	18 (200 sec cyt)	8	9	18 (200 sec cyt)	5	2

Table 7

2012 PM peak	Eastbnd crossing	Eastbound nearside lane	Eastbound offside lane	Westbnd crossing	Westbound nearside lane	Westbound offside lane
	No of demands	Max ave queue	Max ave queue	No of demands	Max ave queue	Max ave queue
17:00-18:00	29 (120 sec cyt)	5	4	29 (120 sec cyt)	8	3

Table 8

2026 Linsig modelling results

2026 AM peak	Eastbnd crossing	Eastbound nearside lane	Eastbound offside lane	Westbnd crossing	Westbound nearside lane	Westbound offside lane
	No of demands	Max ave queue	Max ave queue	No of demands	Max ave queue	Max ave queue
07:30-08:30	18 (200 sec cyt)	9	11	18 (200 sec cyt)	6	2

Table 9

2026 PM peak	Eastbnd crossing	Eastbound nearside lane	Eastbound offside lane	Westbnd crossing	Westbound nearside lane	Westbound offside lane
	No of demands	Max ave queue	Max ave queue	No of demands	Max ave queue	Max ave queue
17:00-18:00	29 (120 sec cyt)	7	5	29 (120 sec cyt)	10	3

Table 10

Usage comparison between subway and temporary Puffin crossing

18 th Nov 2016	At-grade crossing		Subway	
	Total no of users	% split	Total no of users	% split
07:00-07:30	12	86%	2	14%
07:30-08:00	10	40%	15	60%
08:00-08:30	14	70%	6	30%
08:30-09:00	8	80%	2	20%
09:00-09:30	9	60%	6	40%
Overall	53	63%	31	37%

Table 11

18 th Nov 2016	At-grade crossing		Subway	
	Total no of users	% split	Total no of users	% split
16:00-16:30	21	61%	13	39%
16:30-17:00	23	55%	19	45%
17:00-17:30	31	74%	11	26%
17:30-18:00	41	73%	15	27%
18:00-18:30	15	75%	5	25%
Overall	131	67%	63	33%

Table 12

ITS Group

ETE Department

Hampshire County Council

DRAFT

A27 Station roundabout pedestrian facilities across A27 The Avenue

Pedestrian crossing technical report ADDENDUM

Introduction

A technical report was produced by the ITS Group dated 9th January 2017 which considered the impact of providing a signal controlled Puffin crossing on A27 The Avenue arm of Station roundabout in Fareham. Subsequent to producing this technical report a public notice was published at the site from 28th May 2017 for 28 days. The notice period informed members of the public of the proposals and sought their views on its provision. This public notice process resulted in 33 responses of which 31 objected to the proposal and 2 were in favour of the providing the Puffin crossing.

This technical report has been produced as an addendum to the original technical report and seeks to address the concerns identified from the public notice period.

From a technical perspective the area of concern raised was the additional traffic delay caused by the crossing which would be contrary to the overall scheme objectives of improving traffic flow along this section of the A27 particularly in the westbound direction. Queuing generated from the Puffin crossing has the potential to affect the operation of the Station roundabout which is located 60 metres to the east. This addendum seeks to explore queuing on the westbound approach to the crossing in greater detail and to further assess the potential impact on the roundabout.

Linsig results

The performance of the crossings was modelled in the original technical note using Linsig software. This is based on typical conditions with both traffic and pedestrian flows and demand spread evenly across each modelled period. This approach is normal practice for a Linsig model and for most crossings this is satisfactory and it would be unnecessary to consider their operation in greater detail.

In practice it can be expected that fluctuations will occur both daily and hourly in both the traffic flows and in the number of demands and actual times that the crossings are demanded. This will take the real-time performance of the crossing away from the modelled average results.

It is important to recognise that the results output from Linsig are averages. Therefore for 50% of the time the maximum queue generated by the crossing may be less than the quoted figure but for the other 50% it will be longer. Where the maximum average queue length is quoted this

provides a typical queue length but not an absolute maximum. Therefore some degree of caution should be given to the impact of queuing particularly where it may have secondary effects such as a nearby roundabout.

It is also worth recognising that the Linsig results relate to static queuing and does not include any following vehicles that may be slowed down by the static queue.

In response to the high number of objections to this crossing and the potential to adversely affect traffic flow along the A27 westbound and on Station roundabout, a closer more refined set of sensitivity models have been run to gain a greater understanding of how the crossing would be likely to operate.

Pedestrian crossing demand

The original modelling considered the surveyed appearances of the temporary Pelican crossing across the peak traffic periods. During the surveyed AM peak hour (07:30-08:30) the westbound crossing was demanded on 18 occasions. This produced an average period of 3 1/3 minutes (200 seconds) between crossing demands. In the PM peak hour (17:00-18:00) there was higher demand for the westbound crossing with 29 appearances. The average duration between demands was 2 minutes (120 seconds). These average periods between demands were used in the Linsig modelling to determine the typical cycle time of the crossing.

As part of the pedestrian survey the real time was noted on each occasion the crossing stopped the traffic. From this high level of data the actual durations between the crossing appearances can be examined more accurately.

Based on the crossing appearing on average every 3 1/3 minutes in the AM peak and every 2 minutes in the PM peak the previous modelling showed queues to clear after each demand with the Degree of Saturation (DoS) being less than 90%.

At a standalone crossing the maximum waiting time from when pedestrians demand the crossing to traffic being stopped is generally 30 seconds. When pedestrians arrive at the crossing in close succession, consecutive demands for the crossing could occur. Under these conditions there may be insufficient time for the traffic queue to clear before traffic is stopped again. From the survey times when the crossing appearances were less than 50 seconds apart the crossing had been demanded immediately after it had previously run.

In the AM peak survey the westbound crossing only appeared consecutively on 1 occasion. However in the PM peak the number of consecutive demands was much higher occurring on 8 occasions.

A sensitivity test has been run on the Linsig model to determine the effect of consecutive demands on traffic conditions. A cycle time of 50 seconds (vehicle green 30 seconds) has been applied to replicate this situation in both the 2016 and 2026 AM and PM peaks. With queuing back from the crossing potentially affecting Station roundabout the sensitivity test has only been applied to the westbound crossing. The sensitivity test results for the westbound crossing are shown below in tables 1 and 2.

Sensitivity test A- 2016 Linsig modelling results (consecutive demands)

2016 AM peak	Westbound nearside lane	s
	Max ave queue	Max ave queue
07:30- 08:30	5	2

Table 1

2016 PM peak	Westbound nearside lane	Westbound offside lane
	Max ave queue	Max ave queue
17:00- 18:00	9	3

Table 2

Sensitivity test A- 2026 Linsig modelling results (consecutive demands)

2026 AM peak	Westbound nearside lane	Westbound offside lane
	Max ave queue	Max ave queue
07:30- 08:30	6	2

Table 3

2026 PM peak	Westbound nearside lane	Westbound offside lane
	Max ave queue	Max ave queue
17:00- 18:00	11	3

Table 4

There is storage for around 10 vehicles before the queue would extend on to the roundabout itself. From the above results it can be seen in the 2016 and 2026 AM peaks that even with consecutive demands the queue generated from the crossing is unlikely to affect the roundabout. Queuing would be greater in the PM peaks and for 2016 the static queue would almost reach the roundabout. Projecting ahead to 2026 with consecutive demands the queue would spill on to the roundabout itself.

Lane usage

A27 westbound drivers will be able to use either westbound lanes once the Gudge Heath Lane dual scheme has been completed. Linsig would usually seek to balance the traffic evenly across the available lanes to provide the optimum performance. However the original technical report took a more robust approach and the traffic flows were manually adjusted so that 66% of the drivers would remain in the nearside lane to travel ahead with the remaining 33% using the offside lane to travel ahead and turn right into Gudge Heath Lane. This proportion has been applied to the above results (tables 1 – 4) for consistency with those originally modelled.

The usage of the lanes has a large bearing on the resultant queues at the crossing. In this addendum a sensitivity test has been produced to determine the effect of a lower transfer of vehicles from the nearside lane across to the offside lane. For the purposes of this sensitivity test 75% of the vehicles have been assigned to the nearside lane and 25% to the offside lane.

The results based on the same cycle time as originally used to represent average conditions are outlined below in tables 5-8.

Sensitivity test B- 2016 Linsig modelling results (westbound - 75% use of nearside lane; 25% use of offside lane)

2016 AM peak	Eastbnd crossing	Eastbound nearside lane	Eastbound offside lane	Westbnd crossing	Westbound nearside lane	Westbound offside lane
	No of demands	Max ave queue	Max ave queue	No of demands	Max ave queue	Max ave queue
07:30-08:30	18 (200 sec cyt)	8	9	18 (200 sec cyt)	6	1

Table 5

2016 PM peak	Eastbnd crossing	Eastbound nearside lane	Eastbound offside lane	Westbnd crossing	Westbound nearside lane	Westbound offside lane
	No of demands	Max ave queue	Max ave queue	No of demands	Max ave queue	Max ave queue
17:00-18:00	29 (120 sec cyt)	5	4	29 (120 sec cyt)	10	2

Table 6

Sensitivity test B- 2026 Linsig modelling results (westbound - 75% use of nearside lane; 25% use of offside lane)

2026 AM peak	Eastbnd crossing	Eastbound nearside lane	Eastbound offside lane	Westbnd crossing	Westbound nearside lane	Westbound offside lane
	No of demands	Max ave queue	Max ave queue	No of demands	Max ave queue	Max ave queue
07:30-08:30	18 (200 sec cyt)	9	11	18 (200 sec cyt)	7	2

Table 7

2026 PM peak	Eastbnd crossing	Eastbound nearside lane	Eastbound offside lane	Westbnd crossing	Westbound nearside lane	Westbound offside lane
	No of demands	Max ave queue	Max ave queue	No of demands	Max ave queue	Max ave queue
17:00-18:00	29 (120 sec cyt)	7	5	29 (120 sec cyt)	13	2

Table 8

Examining the westbound queues with less balanced lane usage indicates that in both the 2016 and 2026 AM peaks the queue could still be contained without affecting the roundabout.

Looking at the 2016 PM peak indicates that the average queue would reach the roundabout. With traffic flows increasing to 2026 in the PM peak static queues would extend further on to the roundabout. Consequently they would take longer to clear affecting the operation of the roundabout for more sustained periods although it would not be possible to quantify this duration.

Consecutive crossing demands with less balanced lane usage

A further sensitivity test has been run to determine the effect of consecutive crossing demands together with the above less balanced lane usage of the A27 westbound. Similarly to before the cycle time has been run at 50 seconds to replicate consecutive demands and a 75%/25% traffic split has been applied across the westbound lanes. The results for this situation are outlined below in tables 9 -13.

Sensitivity test C - 2016 Linsig modelling results (consecutive crossing demands; westbound - 75% use of nearside lane; 25% use of offside lane)

2016 AM peak	Eastbnd crossing	Eastbound nearside lane	Eastbound offside lane	Westbnd crossing	Westbound nearside lane	Westbound offside lane
	No of demands	Max ave queue	Max ave queue	No of demands	Max ave queue	Max ave queue
07:30-08:30	18 (200 sec cyt)	8	10	18 (200 sec cyt)	6	2

Table 9

2016 PM peak	Eastbnd crossing	Eastbound nearside lane	Eastbound offside lane	Westbnd crossing	Westbound nearside lane	Westbound offside lane
	No of demands	Max ave queue	Max ave queue	No of demands	Max ave queue	Max ave queue
17:00-18:00	29 (120 sec cyt)	6	4	29 (120 sec cyt)	12	2

Table 10

Sensitivity test C - 2026 Linsig modelling results (consecutive crossing demands; westbound - 75% use of nearside lane; 25% use of offside lane)

2026 AM peak	Eastbnd crossing	Eastbound nearside lane	Eastbound offside lane	Westbnd crossing	Westbound nearside lane	Westbound offside lane
	No of demands	Max ave queue	Max ave queue	No of demands	Max ave queue	Max ave queue
07:30-08:30	18 (200 sec cyt)	10	13	18 (200 sec cyt)	7	2

Table 11

2026 PM peak	Eastbnd crossing	Eastbound nearside lane	Eastbound offside lane	Westbnd crossing	Westbound nearside lane	Westbound offside lane
	No of demands	Max ave queue	Max ave queue	No of demands	Max ave queue	Max ave queue
17:00-18:00	29 (120 sec cyt)	7	5	29 (120 sec cyt)	15	2

Table 12

Under these conditions westbound queuing in the AM peaks would be unlikely to extend back on to the roundabout. In the 2016 PM peak the queue would back on to the roundabout and with

higher flows in the 2026 PM peak extensive queues would form around the roundabout with consecutive demands for the crossing.

Conclusions

The conclusion from the January 2017 technical report on the impact of the crossing on Station roundabout was

“In general queuing from the crossing in the westbound direction is not expected to extend on to the Station roundabout in the 2016 peaks. As traffic levels increase towards 2026, there will be increasing instances of queues forming on this roundabout in from the nearside lane in the PM peak.”

The further sensitivity tests undertaken in this addendum to the technical note provide greater detail on these occurrences for the critical westbound direction helping to clarify the impact on Station roundabout.

In the AM peaks even with westbound traffic being less balanced than previously assumed and with consecutive crossing demands it is unlikely that queues would extent back on to the roundabout.

It is the PM peak changes to the assumed lane usage or under periods of consecutive demands for the crossing would have a marked effect on queuing back to the roundabout.

At times of consecutive crossing demands the westbound queue in the 2016 PM peak would start to reach the roundabout. With increasing flows in the 2026 PM peak the queues would extend on to the roundabout with consecutive demands.

When less balance lane use is also taken into consideration the results suggest that westbound queues would extend on to the roundabout in both the 2016 and 2026 PM peaks. Added to this is the secondary impact of vehicles slowing down being impeded by the static queue.

It can be seen that the crossing would potentially have a detrimental impact on the operation of the roundabout. It is difficult to determine the individual durations of these occurrences although based on the survey data they would occur on 8 occasions during the PM peak hour.

Jonathan Mundy

June 2017