

Road Safety Schemes 2021

To: Highways and Transport

Meeting Date: 7 September 2021

From: Steve Cox, Executive Director, Place and Economy

Electoral division(s): All

Key decision: Yes

Forward Plan ref: 2021/044

Outcome: To agree road safety schemes to be delivered in 2021/22.

Recommendation: The Committee is asked to:

- a) approve the capital programme of Safety schemes for 2021/22 outlined in Appendix A.
- b) agree the preferred safety solution for Wheatsheaf Crossroads to be developed and work with partners to identify the required funding (2.5)

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1. Background

- 1.1 This paper outlines how road safety schemes are currently identified, the number of schemes that are in the pipeline, and specific funding issues relating to schemes identified for the current programme.

Site Identification Criteria

- 1.2 A list of collision 'cluster sites' is generated on an annual basis, usually in June, based on the most recent 3 calendar year period (i.e. 2020 list uses 2017-19 data). A location will be added to the list if it has a record of 3 collisions resulting in fatal or serious injury (KSI) or 6 slight injury collisions at a junction or within a 100m length. There are 45 sites on the most current list (2020), the majority of which are in Cambridge City. These sites are listed in priority order based on a weighted score using collision severity.
- 1.3 The above is based on the criteria for single junctions and 100m sections. A separate analysis is planned which will identify high risk routes or longer sections. At present routes are analysed manually based on a high number of KSI collisions over a longer length (e.g. A142 Chatteris to Ely) or highlighted by national reports (e.g. <https://roadsafetyfoundation.org/project/looking-back-moving-forward/>).

2. Main Issues

Pipeline and Funding

- 2.1 The Road Safety Budget is currently £594k per annum. This covers design and investigation for future schemes, as well as scheme delivery. Due to the cost and complexity of schemes, in many cases design and delivery cross over two or more financial years. Appendix A lists the proposed programme of capital safety schemes for 2021/22.
- 2.2 The 2021/22 budget is mostly allocated to the Swaffham Heath Road scheme for which land purchase is already in progress. Remaining budget would go towards any necessary works on Puddock Road and the W heatsheaf crossroads scheme which has presently has £500k CIL funding secured for signalisation, through options are being assessed. Current schemes, with those already allocated funding listed first, are:
- 2.3 **Swaffham Heath Road** – budget £700k (across 20/21 and 21/22 financial years)

This is a straight through crossroads with a record of high severity injury accidents (6 serious and 4 slight injury accidents between Jan 2015 and Dec 2020). Lower cost measures have been installed in the past including bollards to increase junction conspicuity, rumble strips and improved signage. Unfortunately, this has not resulted in a reduction in casualties.

The junction is now to be realigned to create a stagger between the north and south arms. This will remove any 'see through' on the side road approaches and remove the potential for drivers to misread the junction and pull into the path of an oncoming vehicle.

Construction was due to be started at the end of the 20/21 financial year but was delayed

due to Covid, resource issues and the land purchase. The land purchase is currently in process and the design is substantially completed.

2.4 **Puddock Road** – cost TBC dependent on options and any outcome from Coroner's inquest

The 2.5km single-track stretch of Puddock Road heading south from Fortyfoot Bank has seen 4 fatal collisions where a vehicle left the road and entered the adjacent drain. The Council has been named as an interested party in the inquest into the 2020 fatality by the Coroner.

Outline options have been developed, with survey work being undertaken to determine if severing the route is appropriate, as it is used as an alternative to the main routes via Ramsey or Chatteris.

Currently assessing with a view to using fatals funding

2.5 **Somersham Road/B1040 Crossroads (aka Wheatsheaf crossroads)** – est. cost £2m

This junction saw 20 injury collisions between January 2015 and December 2020 including 2 fatal and 2 serious injury collisions. The fatal and serious collisions all occurred in 2019 and 2020 and the Council has been named as an interested party in the inquest into the 2020 fatality by the Coroner. Improvements to lining and road marking were installed in 2016. At that time junction was very low on the cluster site with 6 slight injury collisions in the most recent 3 calendar year period.

In Spring 2019 an options report was commissioned for three crossroads locations on the cluster site list: Wheatsheaf crossroads (B1040); Swaffham Heath Road crossroads (A1303); Boot's Bridge (B1198). Swaffham Heath Road was highest on the cluster site list at the time so was progressed to design.

Following the fatal collision at Wheatsheaf in 2019, work was started to develop a scheme based on the initial options report. This suggested traffic signals may be an appropriate treatment, however further study showed that they could not be delivered within the existing footprint of the junction and that the cost would be significantly higher than initial estimates suggested.

A detailed options appraisal has now been completed looking at a roundabout, traffic signals and a staggered junction. The report includes high level costings, which take account of base capital and operating costs, and associated risks.

In all cases, the detail of the scheme, programme and costings will need to be further worked up. Each option will require land, and this will need to be factored into the cost and programme.

A traffic signals feasibility design was completed alongside the options report to secure £500k CIL funding from Huntingdonshire District Council. However, a different option may need to be progressed, and this would necessitate further discussions with Huntingdonshire District Council officers about the use of this funding.

Fibre optic cable in the verge will result in the scheme costs increasing significantly and it is

likely that a sum in the region of £2-£4 million will be required, depending on the option progressed.

A summary of the report is provided as Appendix C. The conclusions of the report are as follows:

An economic assessment has been undertaken to compare the operational and accident benefits of each option to the scheme cost, generating a scheme BCR. The change in delay at the junction from the capacity models was used to quantify the values of time and vehicle operating costs which informed the scheme BCR. Accident benefits have also been quantified using CoBALT and inform the scheme BCR.

To calculate the BCR, the scheme costs are compared to the change in cost of delays and accidents, showing if the scheme offers value for money (i.e., the monetised delay and accident benefits outweigh the scheme cost). The recommendation from the report is:

All the schemes provide a positive Value for Money outcome. **Overall, it is estimated that the proposed Staggered junction is the best performing of the three schemes, with a BCR of which falls in to the 'Very High' value for money category.**

All options are expected to provide accident benefits; however, the Roundabout and Signalised Junction options are expected to create operational disbenefits, resulting in increased delay and journey times.

Appendix D provides a comparison between signals and a stagger, and provides detail of how a stagger improves road safety.

Members are asked to confirm the preferred approach, mindful of the Milestone Business Case work, it is recommended that a Staggered Junction is pursued, subject to design/funding.

2.6 **A10** – est. cost £850k (initial work only)

Between January 2015 and December 2020 there were 119 injury collisions between Milton and Ely. A route study has been carried out and measures have been identified to provide consistent route, junction and hazard warning signing; improve road markings and removal of vegetation. A speed limit review has also been undertaken. These works are expected to cost £850k.

In addition to this, junction improvements at Denny End Road, Waterbeach, and Humphries Way, Milton need to be developed, as they are both individual cluster sites.

Future Schemes to be developed Some delivered through Minor Works

2.7 **Ramsey Road/Huntingdon Road/School Road crossroads** (aka Broughton crossroads) – est. cost £250k

Broughton crossroads has been on and off the cluster site list over a number of years. Another straight-through crossroads, a scheme has been designed to alter the layout

slightly but with minimal land purchase. The scheme has not been progressed to delivery due to other high-priority schemes above.

Scheme Identified but Lower Priority

3. Alignment with corporate priorities

3.1 Communities at the heart of everything we do

- Road Safety schemes are designed to reduce the risk of harm to road users from road traffic collisions

3.2 A good quality of life for everyone

- Road Safety schemes are designed to reduce the risk of harm to road users from road traffic collisions

3.3 Helping our children learn, develop and live life to the full

- Road Safety schemes are designed to reduce the risk of harm to road users from road traffic collisions

3.4 Cambridgeshire: a well-connected, safe, clean, green environment

- Road Safety schemes are designed to reduce the risk of harm to road users from road traffic collisions

3.5 Protecting and caring for those who need us

- Road Safety schemes are designed to reduce the risk of harm to road users from road traffic collisions

4. Significant Implications

4.1 Resource Implications

The following bullet points set out details of significant implications identified by officers:

- The required resources have been made available to deliver the programme of projects, which will be funded from the Highways capital budget.

4.2 Procurement/Contractual/Council Contract Procedure Rules Implications

There are no significant implications within this category

4.3 Statutory, Legal and Risk Implications

The following bullet points set out details of significant implications identified by officers:

- Under Section 39 of the Road Traffic Act 1988 the Council has a statutory duty to “prepare and carry out a programme of measures designed to promote road safety...”

must carry out studies into accidents arising out of the use of vehicles on roads or parts of roads, other than trunk roads, within their area [and] in the light of those studies, **take such measures as appear to the authority to be appropriate to prevent such accidents**, including the dissemination of information and advice relating to the use of roads, the giving of practical training to road users or any class or description of road users, the construction, improvement, maintenance or repair of roads for which they are the highway authority and other measures taken in the exercise of their powers for controlling, protecting or assisting the movement of traffic on roads.” [bold formatting added by author for emphasis]

4.4 Equality and Diversity Implications

The following bullet points set out details of significant implications identified by officers:

- Residents in lower Index of Multiple Deprivation (IMD) quintiles are at higher risk of being involved in a collision as are younger drivers.
- Older drivers are more likely to sustain serious or fatal injuries in collisions due to their frailty.
- An Equality Impact Assessment screening form for the selection of road safety schemes can be found in Appendix B.

4.5 Engagement and Communications Implications

The following bullet points set out details of significant implications identified by officers:

- Serious road traffic collisions attract significant media attention and the Council's actions to reduce their occurrence comes under regular media scrutiny.

4.6 Localism and Local Member Involvement

There are no significant implications within this category

4.7 Public Health Implications

The following bullet points set out details of significant implications identified by officers:

- Road traffic collisions have a significant burden on health services.
- Public Health indication 1.10, KSI casualties per 100,000 population, is currently red for Cambridgeshire across all districts.

4.8 Environment and Climate Change Implications on Priority Areas

4.8.1 Implication 1: Energy efficient, low carbon buildings.

Neutral Status:

Explanation: There are no significant implications within this category

4.8.2 Implication 2: Low carbon transport.

Neutral Status:

Explanation: There are no significant implications within this category

4.8.3 Implication 3: Green spaces, peatland, afforestation, habitats and land management.

Neutral Status:

Explanation: There are no significant implications within this category

4.8.4 Implication 4: Waste Management and Tackling Plastic Pollution.

Neutral Status:

Explanation: There are no significant implications within this category

4.8.5 Implication 5: Water use, availability and management:

Neutral Status:

Explanation: There are no significant implications within this category

4.8.6 Implication 6: Air Pollution.

Neutral Status:

Explanation: There are no significant implications within this category

4.8.7 Implication 7: Resilience of our services and infrastructure and supporting vulnerable people to cope with climate change.

Neutral Status:

Explanation: There are no significant implications within this category

Have the resource implications been cleared by Finance? Yes

Name of Financial Officer: Sarah Heywood

Have the procurement/contractual/ Council Contract Procedure Rules implications been cleared by the Head of Procurement? Yes

Name of Officer: Henry Swann

Has the impact on statutory, legal and risk implications been cleared by the Council's Monitoring Officer or LGSS Law? Yes

Name of Legal Officer: Fiona McMillan

Have the equality and diversity implications been cleared by your Service Contact? Yes

Name of Officer: Elsa Evans

Have any engagement and communication implications been cleared by Communications? Yes

Name of Officer: Sarah Silk

Have any localism and Local Member involvement issues been cleared by your Service Contact? Yes

Name of Officer: David Allatt

Have any Public Health implications been cleared by Public Health? Yes or No

Name of Officer: Iain Green

If a Key decision, have any Environment and Climate Change implications been cleared by the Climate Change Officer? Yes

Name of Officer: Sheryl French

5. Source documents guidance

5.1 Source documents

List of Road Safety schemes for delivery in 2020/21
Equality Impact Assessment screening form
Milestone Option Report

5.2 Location

List of Road Safety schemes for delivery in 2020/21 – Appendix A
Equality Impact Assessment screening form – Appendix B
Milestone Option Report – Summary: Appendix C: Full document available on request

PROPOSED ROAD SAFETY SCHEMES 2020/21

	Parish/Town	Street	Location	Works	Budget 2020/21	Budget 2021/22
EAST						
A1303	Swaffham Bulbeck	Crossroads	A1303/Swaffham Heath Rd	Junction improvements to stagger the crossroads – works to be completed across 2020/21 and 2021/22 financial year	£500,000	£200,000
HUNTS						
B1040	Woodhurst	Crossroads	Somersham Road/Wheatsheaf Road	Signals or stagger - TBC	TBC	
COUNTY WIDE						
	County wide	Minor Improvements	Various	Cluster sites, fatals and non-injury potential for high severity	£50,000	
	County wide	Advanced design	Various	AIP, design for future years	£44,000	
				TOTAL	£594,000	

APPENDIX B

Equality Impact Assessment screening form for Road Safety Schemes

Equality Impact Assessment – Screening Form For employees and/or communities

Section 1: Proposal details

Directorate / Service Area:		Person undertaking the assessment:	
Highways, Highway Projects and Road Safety		Name:	Matt Staton
Proposal being assessed:		Job Title:	
Road Safety Schemes 2020/21		Contact details:	Matt.staton@cambridgeshire.gov.uk
Business Plan Proposal Number: (if relevant)		Date commenced:	
		Date completed:	
Key service delivery objectives:			
<p>Each year the road collision and casualty data for the preceding 5-year period is collated and analysed, including the latest collision cluster site list for the county. The cluster site list comprises sites where there have been at least 6 reported collisions involving personal injury or at least 3 involving a fatality or serious injury within 100m in the preceding 3 full calendar years.</p> <p>These sites are then subject to investigation by the road safety team and interventions identified to address the causes of collisions at these sites.</p> <p>Identified schemes are put forward to Highways and Infrastructure committee for approval within the £594k budget identified for road safety capital schemes.</p> <p>This includes an element of funding for design of schemes for future years and to address any issues identified in-year as a result of fatal collision investigations.</p>			
Key service outcomes:			
Reduction in road casualties			
What is the proposal?			
The proposal is to introduce schemes at the identified locations to reduce the risk of personal injury collision, in particular collisions resulting in serious injury or death.			
What information did you use to assess who would be affected by this proposal?			
Road casualty and collision data, including demographic profiles of those involve			
Are there any gaps in the information you used to assess who would be affected by this proposal?			

Information is limited to those meeting the definition outlined in the [Department for Transport's STATS 20 guidance](#):

All road accidents involving human death or personal injury occurring on the Highway ('road' in Scotland) and notified to the police within 30 days of occurrence, and in which one or more vehicles are involved, are to be reported. This is a wider definition of road accidents than that used in Road Traffic Acts.

Information on collisions not resulting in serious injury is unreliable in its consistency, and while anecdotal reports of incidents can prove useful once a site is identified for investigation these are not used in the identification of sites to enable a more consistent approach to be applied. It is however recognised that collisions resulting in slight injury are also significantly underreported, particularly those involving cyclists.

Who will be affected by this proposal?

The proposal will affect all road users at these specific locations, but will have a disproportionate impact on those residents in the local area or those that use the routes for regular journeys.

It is expected that the changes made will improve the situation for these road users with reduced risk of being involved in a road traffic collision at these locations.

Section 2: Identifying impacts on specific minority/disadvantaged groups

Consider each characteristic / group of people and check the box to indicate there is a foreseeable risk of them being negatively impacted by implementation of the proposal, including during the change management process.

You do not need to be certain that a negative impact will happen – at this stage it just needs to be foreseeable that it could, unless steps are taken to manage this.

Scope of this Equality Impact Assessment					
<i>Check box if group could foreseeably be at risk of negative impact from this proposal</i>					
Note *= protected characteristic under the Equality Act 2010					
*	Age	<input type="checkbox"/>	*	Disability	<input type="checkbox"/>
*	Gender reassignment	<input type="checkbox"/>	*	Marriage and civil partnership	<input type="checkbox"/>
*	Pregnancy and maternity	<input type="checkbox"/>	*	Race	<input type="checkbox"/>
*	Religion or belief (including no belief)	<input type="checkbox"/>	*	Sex	<input type="checkbox"/>
*	Sexual orientation	<input type="checkbox"/>			
	Rural isolation	<input type="checkbox"/>		Poverty	<input type="checkbox"/>

Next steps:

If you have checked one or more boxes above, you should complete a full Equality Impact Assessment form.

If you have not checked any boxes, please continue to complete this screening form.

Section 3: Explanation of ‘no foreseeable risk’ EIA screening

Explain why this proposal will not have a foreseeable risk of negative impact for each group. Provide supporting evidence where appropriate. Where the same explanation applies to more than one group, state it in the ‘Reasons’ column for the first relevant group and put ‘as per [first group name] above’ to reduce duplication.

For example: *‘This proposed process combines two previous processes which both had robust EIAs prior to implementation. This process does not introduce any new content. So, no foreseeable risk of negative impact has been identified.’*

		Characteristic / group of people	Explanation of why this proposal will not have a foreseeable risk of negative impact
1	*	Age	While younger and older road users are more at risk of injury as a result of a road traffic collision, the proposals are expected to improve safety at these locations and therefore have a positive impact on this group.
2	*	Disability	While road users with disability are more at risk of injury as a result of a road traffic collision, the proposals are expected to improve safety at these locations and therefore have a positive impact on this group
3	*	Gender reassignment	The proposals are expected to improve safety at the identified locations so no foreseeable risk of negative impact has been identified.
4	*	Marriage and civil partnership	The proposals are expected to improve safety at the identified locations so no foreseeable risk of negative impact has been identified.
5	*	Pregnancy and maternity	The proposals are expected to improve safety at the identified locations so no foreseeable risk of negative impact has been identified.
6	*	Race	The proposals are expected to improve safety at the identified locations so no foreseeable risk of negative impact has been identified.
7	*	Religion or belief (including no belief)	The proposals are expected to improve safety at the identified locations so no foreseeable risk of negative impact has been identified.
8	*	Sex	While male road users are more at risk of involvement in a road traffic collision, the proposals are expected to improve safety at these locations and therefore have a positive impact on this group.

9	*	Sexual orientation	The proposals are expected to improve safety at the identified locations so no foreseeable risk of negative impact has been identified.
10		Rural isolation	While rural residency has been associated with risk of injury as a result of a road traffic collision, the proposals are expected to improve safety at these locations and therefore have a positive impact on this group.
11		Poverty	While poverty has been associated with risk of injury as a result of a road traffic collision, the proposals are expected to improve safety at these locations and therefore have a positive impact on this group.

Section 4: Approval

Note: if there is no information available to assess impact, this means either information should be sought so this screening tool can be completed, or information should be gathered during a full EIA.

I confirm that I have assessed that a full Equality Impact Assessment is not required.

Name of person who completed this EIA:	Matt Staton
Signature:	Signature removed for publication
Job title:	Highway Projects & Road Safety Manager
Date:	06/08/2021

I have reviewed this Equality Impact Assessment – Screening Form, and I agree that a full Equality Impact Assessment is not required.

Name:	David Allatt
Signature:	Signature removed for publication
Job title: <i>Must be Head of Service (or equivalent) or higher, and at least one level higher than officer completing EIA.</i>	Interim Assistant Director: Transport Strategy & Network Management
Date:	27/08/2021

9. Summary

9.1 Introduction

9.1.1 CAPITA Real Estate and Infrastructure (CAPITA) has been appointed by SKANSKA on behalf of Cambridgeshire County Council (CCC), to undertake transport planning analysis work at the B1040 Bluntisham junction. The junction has been identified as having a high accident rate and this study aims to look at feasible improvements.

9.1.2 There are three proposed layouts for the junction including:

- Staggered crossroads
- Signalised crossroads
- Roundabout.

9.1.3 The study aims to model the three proposed schemes in terms of delays and accidents and provide a benefit cost ratio (BCR) for each scheme.

9.2 Approach

9.2.1 An economic assessment has been undertaken to compare the operational and accident benefits of each option to the scheme cost, generating a scheme BCR.

9.2.2 The change in delay at the junction from the capacity models was used to quantify the values of time and vehicle operating costs which informed the scheme BCR.

9.2.3 Accident benefits have also been quantified using CoBALT and inform the scheme BCR.

9.2.4 To calculate the BCR, the scheme costs are compared to the change in cost of delays and accidents, showing if the scheme offers value for money (i.e., the monetised delay and accident benefits outweigh the scheme cost).

9.3 Data Collection

9.3.1 Due to COVID and the resulting change in traffic flows, recent surveys undertaken in 2020 were utilised alongside available historical data from 2019. Data collected includes Manual Traffic Counts (MCC - 08/09/20), Automatic Count Data (ATC - 08/09/2020-14/09/20 and 15/07/19,18/07/19 and 19/07/19) and 5 year accident data (2015-2019).

9.4 Traffic Flows

9.4.1 The traffic flow profiles for the AM, PM and Inter Peak periods were calculated using the MCC data. The AM Peak is 07:30 – 08:30, the PM Peak is 16:30 – 17:30 and the Inter Peak is 14:00 – 15:00.

9.4.2 The ATC traffic data for each site was compared to the survey day MCC traffic flows for the AM, PM and Inter peak periods, to ensure that the survey day was representative of typical

traffic. Historical ATC data was provided by CCC in order to compare traffic volumes before and after Covid-19 restrictions at the Bluntisham junction. The ATC data was for the B1040 north on Monday 15th, Thursday 18th and Friday 19th July 2019. There was a significant difference between the 2019 and 2020 data. In order to accurately model the traffic flows, the 2020 traffic was factored to establish new 2020 flows at the junction.

9.4.3 The following future year flows have been modelled:

- 2021 – Scheme opening
- 2026 – 5 years after Scheme opening
- 2031 – 10 years after scheme opening.

9.4.4 To develop the future year flows, the 2020 flows have been utilised and a growth factor applied by using a TEMPro (Trip End Model Presentation Program) growth factor for Huntingdonshire.

9.5 Accident Data

9.5.1 Personal injury accident (PIA) data within the vicinity of the proposed site has been reviewed for the most recent full five-year period, covering 2015 to 2019. In summary, there have been sixteen accidents at the junction, thirteen minor accidents, two serious and one was fatal. There were an additional 13 accidents on the links to the junction. Most of the accidents involved were vehicular, and only one accident involved a pedestrian. The most serious accident was a fatal accident in November 2019 and involved a minibus with 20 casualties. There have been no accidents involving pedal cycle casualties within study area.

9.6 Proposed Scheme

9.6.1 To model the three proposed schemes traffic modelling was undertaken for the AM, Inter and PM Peaks. The following modelling software was utilised:

- Existing crossroad junction – Junctions 12 software
- Proposed staggered junction – Junctions 12 software
- Proposed roundabout - Junctions 12 software
- Signalised crossroads - LinSig v3 software.

9.7 Existing Crossroads

9.7.1 In the AM Peak in all future years the existing layout is expected to operate within capacity. In the PM Peak the east arm, Wheatsheaf Road, is at capacity in 2020 but predicted to be over capacity from 2021 onwards. Overall, in the PM Peak the junction is expected to operate within capacity.

9.8 Proposed Staggered Junction

9.8.1 In all peaks the staggered junction is expected to operate within capacity. However, in the PM peak in 2031 the Wheatsheaf Road approach shows a 'LOS E', indicating that the approach is expected to operate at capacity by then.

9.9 Roundabout

9.9.1 In the AM and PM Peak, the roundabout is expected to operate over capacity, with the B1040 north arm over capacity in the AM Peak and the B1040 south arm over capacity in the PM Peak. This is likely to be due to the heaviest flow on the B1040 having to give way to the side roads. Although the layout has 2-lane flares, the majority of traffic is travelling ahead and is all in one lane.

9.10 Signalised Junction

- 9.10.1 The modelling indicates that the proposed signalised junction option would work with positive 'Practical Reserve Capacity' up to and including 2031. By 2031, the modelling indicates that the AM and Inter peak periods will have very high levels of spare capacity, even with all movements demanded every cycle. The PM Peak 2031 model shows a much lower PRC value of 1.4%, at a cycle time of 120 seconds. This would be the maximum normally permissible, although would still usually be acceptable. However, it is close to what is normally considered the capacity limit for a new junction. Delay is still shown as being relatively low in this option. In all modelled scenarios, the queues for right turns were fully contained within the available right turn lane lengths.
- 9.10.2 There is reason to expect that the site would out-perform the model for the signalised junction. All the flows for the minor movements are relatively low. This implies that in most cycles of the signals, at least one of the stages will not need to be served; often more than one will be skipped. Combined with the use of adaptive control, this should mean that the site would operate well within acceptable capacity up to and including the design year, 2031.

9.11 Accident Analysis

- 9.11.1 As part of the economic assessment, an analysis of accidents and their resultant cost has been undertaken for each junction option using COBA-LT (version 2013.02). The assessment is based on comparing the number of accidents across the network in the Do Minimum and various Do Something forecasts by using link and junction characteristics, relevant accident data and traffic flows.
- 9.11.2 The decrease in the predicted number of casualties by severity type over the 60-year assessment period for the study area was assessed. The largest saving in accidents is the roundabout, followed by the staggered junction. The signalised junction has the smallest reduction in accidents.
- 9.11.3 The monetary value of the overall change in accidents would be a benefit of £7.2m for the staggered junction, £9.8m for the roundabout and £6.4m for the signalised junction.

9.12 Economic Appraisal

- 9.12.1 As part of the assessment an economic appraisal was undertaken to calculate the Benefit Cost Ratio (BCR) as follows:
- 9.12.2 Benefit to Cost Ratio (BCR)= (Present Value of Benefits (PVB))/(Present Value of Costs (PVC))

- 9.12.3 TAG Data Book July 2020, v1.13.1 was used for the analysis. Vehicle occupancy, journey purpose and value of time were taken into account in the analysis.
- 9.12.4 All the schemes provide a positive Value for Money outcome. Overall, it is estimated that proposed Staggered junction is the best performing of the three schemes, with a BCR of 4.06 which falls in to the 'Very High' value for money category.
- 9.12.5 All options are expected to provide accident benefits; however, the Roundabout and Signalised Junction options are expected to create operational disbenefits, resulting in increased delay and journey times.

Appendix D: Stagger Vs Signals Comparison

Pros and cons

Stagger	Signals
Pros	Pros
Removes the need to judge drivers in 3 directions by separating movements and therefore it allows driver decision making and removes an element of hesitation.	Increased opportunity to exit side roads
Reduces likelihood of junction overshoots	Removes the need for drivers to judge other vehicle speeds when exiting side roads
Clarifies junction layout is a priority junction and emphasises need to slow/stop even without signage.	Reduces delay on side roads in busy times
Removes temptation to dash across in an unsuitable gap.	
Removes see through that could contribute to misjudgement by drivers unfamiliar with the route	
Cons	Cons
Does not improve opportunities to exit junction	Potential increase in shunt accidents
Drivers must still rely on own judgement.	Potential for intentional red light running or 'amber gambling'(especially for crossing manoeuvres) which could lead to collisions, possibly at high speed and increased severity.
Drivers must make 2 turns to cross the junction.	High speed approaches. If green, drivers will not slow the way they do for a priority junction – if the signals change potential sudden braking and overshoots, shunts or unintentional red light running.
	Risk of drivers racing to the lights before they change – risks as above.
	In quiet times side roads will be on red until a vehicle approaches and then change to green. Drivers may become used to this and not react in time to a change in signal
	Speeds outside peak hours are higher and drivers will require more stopping distance – this may result in overshoots/red or amber light running, sudden braking and shunts. This will be affected by how the signals are set up and the distance at which they detect oncoming traffic.

	Intervisibility between all stop lines cannot be achieved
	Increases delay on main road during busy times
	May increase delay on side roads during quiet times.
	Will need to be lit – carbon targets and environmental issues

The Milestone Report indicates that in this location a Staggered Crossroads would deliver greater collision-reduction benefits than a traffic light scheme.

In terms of historic collisions, key contributing factors were understood to include ‘failed to look properly’, ‘failed to judge other persons path or speed’, ‘poor turn/manoeuvre’ and ‘junction restart’ Below is an excerpt from the European evidence synthesis ‘Safety Cube’¹ which explains how a staggered arrangement can improve safety, including reducing the risk of the above by making the junction simpler, thus reducing the cognitive demand on drivers.

“1.4.2 How does convert 4-Leg-junction to Staggered Junction affect road safety? Staggered junctions aim to reduce the number of conflict points at junctions. This is because in general 4-leg junctions have higher accident rates than 3-leg junctions, since they have more conflict points between the streams of traffic (Yannis et al. 2012). Junctions with four approaches make higher demands on road user alertness and behaviour than junctions with three approaches (Elvik et al. 2009). Converting 4-leg junctions to staggered junctions eliminates crossing manoeuvres and reduces the number of potential conflicts (Bared & Kaisar 2001). They make the task of crossing the junction simpler for road users (Elvik et al. 2009).”

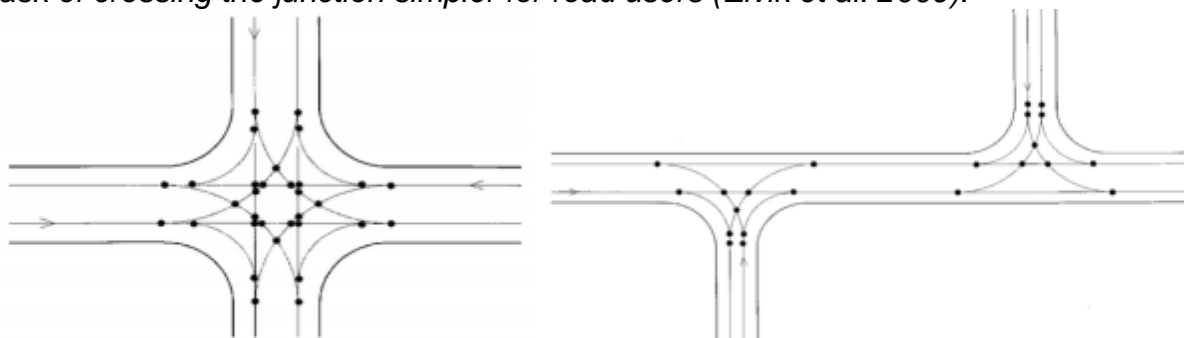


Figure 2. Potential conflict locations at a 4-leg junction (left) and a staggered junction (right) for 2x2-lane junction (Bared & Kaisar 2001)

¹ Soteropoulos, A., Stadlbauer, S. (2017), Convert 4-LegJunction to Staggered Junction, European Road Safety Decision Support System, developed by the H2020 project SafetyCube. Retrieved from www.roadsafety-dss.eu on 25/08/2021

Costs

The Milestone Report includes costs of £3-5m for the options, accounting for operational costs, risks, and optimism bias of 44%. The Report also includes a cost benefit analysis, set out below...

	Staggered Junction	Signalised Junction
Cost	1,870,038	2,771,519
Benefit	363,179	-594,945
Accident Benefit	7,225,000	6,442,500
NPV	5,718,141	3,076,036
BCR	4.06	2.11
Value for Money Category	Very High	High

Note: All entries are present values discounted to 2010, in 2010 prices (£)

Estimated build costs will not be fully understood until detailed design work has concluded. As the detail of the design progresses, it is reasonable to assume that optimism bias can reduce.