

A47 North Tuddenham to Easton Dualling

Scheme Number: TR010038

Volume 9 **9.17 Stage 1 Road Safety Audit** **Designer's Response**

The Infrastructure Planning (Examination Procedure) Rules 2010
Rule 8(1)(c)

Planning Act 2008

November 2021

Infrastructure Planning

Planning Act 2008

**The Infrastructure Planning
(Examination Procedure) Rules 2010**

The A47 North Tuddenham to Easton
Development Consent Order 202[x]

STAGE 1 ROAD SAFETY AUDIT DESIGNER'S RESPONSE

Rule Number:	8(1)(c)
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Author:	A47 North Tuddenham to Easton Dualling Project Team, Highways England

Version	Date	Status of Version
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1. Project Details

1.1. Project Details

Report Title	STAGE 1 ROAD SAFETY AUDIT RESPONSE REPORT
Date	25/02/21
Document Reference and Revision	HE551489-GTY-HOS-000-RP-ZS-30002 C02
Prepared by	Jamie McConachie
On behalf of	Highways England

1.2. Authorisation Sheet

Project	A47 North Tuddenham to Easton Dualling
Report Title	STAGE 1 ROAD SAFETY AUDIT RESPONSE REPORT
Prepared by	
Name:	Jamie McConachie
Position:	Highways Design Team Lead
Signed:	
Organisation:	Sweco
Date:	16/11/2020
Approved by	
Name:	Barrie Arthur
Position:	Project Manager
Signed:	
Organisation:	Sweco
Date:	16/11/2020

2. Introduction

2.1. Road Safety Audit Report

This report is in response to the Stage 1 road safety audit report. The Stage 1 road safety audit was carried out on the Scheme proposed by Galliford Try and designed by Sweco UK Ltd at the request of James Powis, the Highway Authority Project Manager. The road safety audit was carried out between June and September 2020.

Due to the current Covid-19 pandemic the road safety audit was commenced in accordance with Highways England's advice, dated 04 June 2020 (shown in Appendix A). No site visit was undertaken, and the audit was carried out as a desktop study only using site photos, videos and Google Streetview. A Road Safety Audit report was issued under these terms. Subsequently, new advice was published by Highways England on 26 June 2020 (shown in Appendix A). As a result of this new guidance a site visit was conducted in September 2020, carried out by a different audit team. This updated report is a result of this subsequent audit.

2.2. Road safety audit team

The road safety audit team membership, approved by Hannah Sanderson, from the Overseeing Organisation was as follows:

Initial audit:

Team Leader	Martin Magyar MSoRSA Certificate of Competency
Team Member	Alaster Barlow FSoRSA Certificate of Competency

Subsequent audit arising from site visit:

Team Leader	Martin Magyar MSoRSA Certificate of Competency
Team Member	Adrian Clothier BEng (Hons), MSoRSA, Certificate of Competency

2.3. Road safety audit Brief

The road safety audit team was provided with a road safety audit stage 1 brief, with document reference HE551489-GTY-HGN-000-RP-CH-30005, dated April 2020. This road safety audit brief was accepted by the road safety audit team.

2.4. Road safety audit

The road safety audit comprised an examination of the documents provided, and these are listed in Appendix B.

2.5. Terms of reference

The terms of reference of the road safety audit are as described in GG119 Revision 2. The Road Safety Audit Team has examined and reported only on the road safety implications of the scheme as presented and has not examined or verified the compliance of the designs to any other criteria.

All comments and recommendations are referenced to the detailed design drawings and the locations have been indicated on the plan supplied with the road safety audit Brief in Appendix C.

2.6. Scheme description

The proposed scheme is described in the road safety audit brief as:

- 9km of new dual carriageway, running to the south of the existing A47 at Hockering and to the north of the existing A47 at Honingham
- two new two-tier junctions where the A47 passes over the local roads at the intersections of Berry's Lane with Wood Lane (Wood Lane junction) and Blind Lane with Taverham Road (Norwich Road junction)
- removal of the existing roundabout at Easton to create a free-flowing dual carriageway
- three bridges carrying the A47 over the River Tud and the proposed Wood Lane and Norwich Road junctions
- closing the existing Church Lane / Sandy Lane connection to the A47 with new side roads providing access to Wood Lane junction
- retaining sections of the existing A47 for local road connections and new routes for walkers, cyclists and horse riders where possible, with abandoned sections to be landscaped
- constructing a new underpass for walkers and cyclists to the west of the proposed Norwich Road junction keeping north – south connectivity
- a new route for walkers and cyclists linking Honingham with St Andrews Church
- a new WCHR connection to maintain the north – south route from Honingham towards Weston Green, as the proposed Wood Lane junction cuts across an existing restricted byway

- new drainage systems, including pollution control devices. These are illustrated in the Preliminary Environmental Information Report (PEIR).
- diversion of some utilities infrastructure such as gas mains if needed
- two new laybys on the A47 between Fox Lane and the proposed Wood Lane junctions
- a site compound, storage areas and temporary vehicle parking located within the scheme boundary when construction is taking place

2.7. Site visit

The site was visited by the Road Safety team as follows:

Day/Date	Time from	Time to	Light Conditions	Weather	Surface	Traffic
Wednesday, 02 September 2020	12:00	13:20	Daylight	Fine	Dry	Moderate

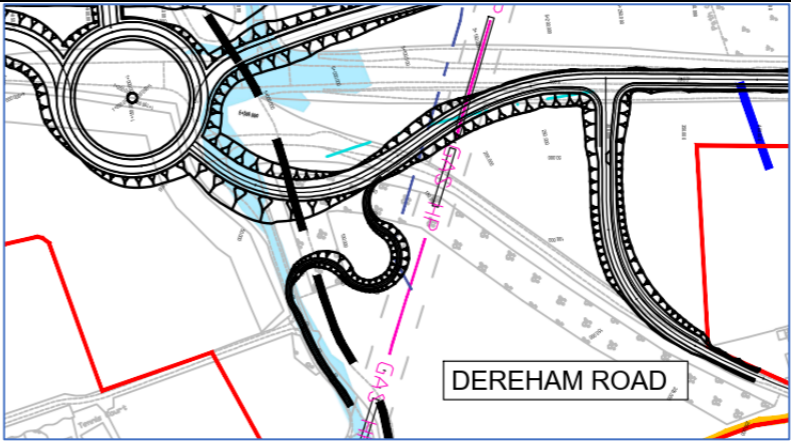
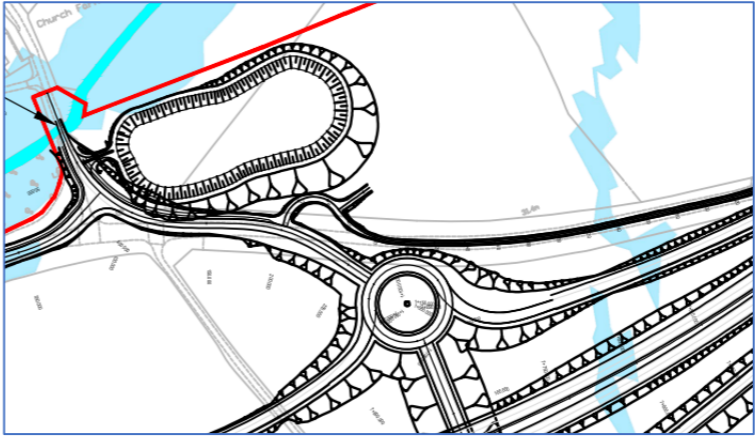
3. Key personnel

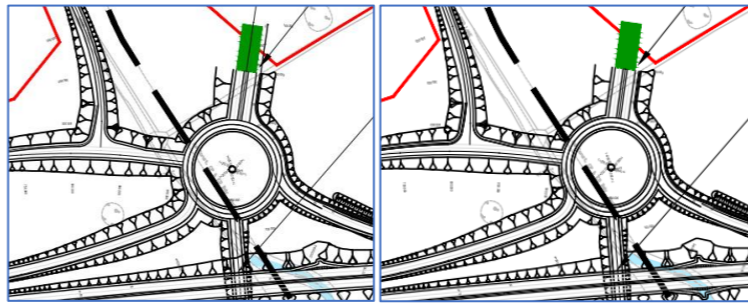
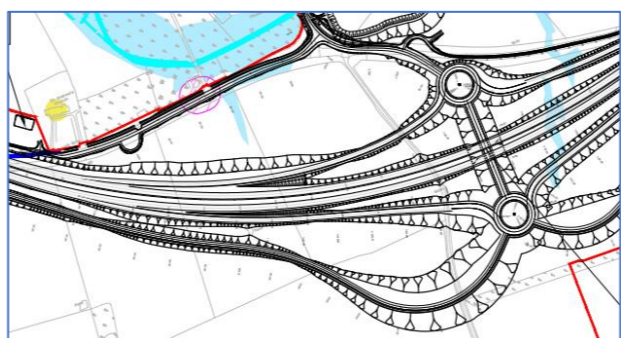
Client	Overseeing Organisation
James Powis Highways England Woodlands Manton Lane Manton Industrial Estate Bedford MK41 7LW	Hannah Sanderson Highways England Woodlands Manton Lane Manton Industrial Estate Bedford MK41 7LW
Designer	Road Safety Audit Team
Jamie McConachie Sweco Quay 2, 139 Fountainbridge Edinburgh EH3 9QG Tel. No.: [REDACTED] Email: [REDACTED]	Team Leader – Martin Magyar, Sweco Team Member – Alaster Barlow, Sweco Sweco Grove House Mansion Gate Drive Chapel Allerton Leeds LS7 4DN Tel. No.: [REDACTED] Team Member – Adrian Clothier, Highways England Woodlands Bedford MK41 7LW

4. Road safety audit decision log

No.	RSA problem	RSA recommendation	Design organisation response	Overseeing Organisation response	Agreed RSA action
1	<p>Location: Drainage basins (approx. chainage 1+200, 2+250, 3+150, 4+000, 5+550, 6+250, 6+420)</p> <p>Summary: Errant vehicles leave access track.</p> <p>Description: Various drainage basins along the scheme have proposed access tracks running around their perimeters which are raised up on embankments. It is unclear if any form of vehicle restraint is to be provided. If the access track is used by vehicles, they may lose control and leave the track.</p>	Provide a suitable vehicle restraint system in the vicinity of embankments.	<p>The Designer disagrees with this RSA problem and recommendation.</p> <p>In Sweco's design teams experience, it would be very unusual to provide a road restraint system for the maintenance track into, and around, a drainage basin.</p> <p>The access tracks will be 3m wide and shall have a 250mm verge on either side. The access tracks shall have an unbound finish and will have a design speed of 10mph.</p> <p>The slope into the basin itself is 1 in 4 which we do not consider to be a steep slope which would warrant further safety measures such as a road restraint system. Any operatives within the drainage basin area should be suitably trained. Typically, basin maintenance will involve grass cutting and sediment removal and access would typically involve appropriate off-road type vehicles.</p> <p>The design of the detention basins will include perimeter fencing and an access gate to mitigate unauthorised access to untrained personnel and public. It is not proposed to have perimeter fencing around two basins that are proposed as wetland basins. These will have a reduced depth of water and shallower side slopes.</p> <p>Refer to HE551489-GTY-HOS-000-RP-ZS-30001 for the Safety Risk Assessment in accordance with GG 104.</p>	I am content with the assessment and response provided and the current design proposals. This should be reconsidered at the RSA 2 to review design standards or best practice provided by other scheme designs.	Further review of design standards and current best practice to be undertaken at Stage 5 and the approach reviewed at Stage 2 RSA.
2	<p>Location: Proposed laybys on mainline (drawing HE551489-GTY-HML-000-DR-CH-30004-P03)</p> <p>Summary: Pedestrians crossing from one lay-by to another are struck by a vehicle.</p> <p>Description: Parking lay-bys are provided in both the west and eastbound directions, almost directly opposite each other. With this layout there is a risk that pedestrians will be tempted to cross from one lay-by to the other, when parked up, especially if a mobile café is present in one of the laybys.</p>	Stagger the laybys along the mainline	<p>The Designer agrees with the RSA problem and recommendation.</p> <p>The location of the eastbound lay-by has been amended and has been moved to the east by approximately 85m. This has created an approximate 100m stagger between the two lay-bys.</p> <p>Whilst a stagger has been provided between the two lay-bys the Designer would still propose that a TRO is put forward restricting the length of stay for vehicles in order to discourage mobile trading facilities from operating. This will both mitigate the potential for pedestrians crossing from one lay-by to another but also avoid the limited stopping provision from being occupied by a mobile trading facility.</p> <p>To further mitigate the potential for pedestrians crossing from one lay-by to another at Stage 5 the Designer will look at the potential to install a mesh fence on the central reserve barrier.</p>	Positive remedial measures provided however, is there an opportunity to consider fencing to further reduce the potential for people to cross the central reserve.	Review to be undertaken at Stage 5 to identify the need and/or merit for further mitigation in central reserve.
3	<p>Location: Link to Norwich Road (Honingham), western tie-in (drawing HE551489-GTY-HSR-000-DR-CH-30016-P03)</p> <p>Summary: A large splitter island is proposed where the new link to Norwich Road ties into a roundabout. This results in the westbound lane of the link road entering the roundabout with little deflection provided. Poor deflection on entries to roundabouts can result in vehicles entering at inappropriate speeds, leading to overshoot or loss-of-control collisions.</p> <p>Description: Poor deflection on entry to the roundabout leads to overshoot and loss-of-control collisions.</p>	Design the entries to the roundabout such that adequate deflection is achieved that safely reduces vehicle speeds on entry.	<p>The Designer disagrees with this RSA problem and recommendation.</p> <p>It is proposed to tie-in the new link in advance of the existing roundabout and therefore match the existing cross-section of the splitter island at the entry. The back of the splitter island will be realigned slightly which will provide more deflection on approach than with the current layout.</p> <p>The proposed carriageway width of the new link is 5.5m compared to approximately 9m on the current roundabout approach. The resultant narrower lanes will encourage lower speeds generally and reduce the likelihood of faster approach speeds.</p> <p>There are no works proposed on the roundabout itself and vehicles will require to slow down in advance of the roundabout to negotiate the roundabout.</p>	I note the response looks at the reduced speeds as a mechanism to reduce overshoot however, what is not clear is any assessment on the benefits or dis-benefits of improving the deflection on the entry.	Review to be undertaken at Stage 5 to identify the need for increased deflection at entry point on the westbound approach.

No.	RSA problem	RSA recommendation	Design organisation response	Overseeing Organisation response	Agreed RSA action																				
			<p>Existing distance markers in advance of the roundabout will be retained providing warning to drivers of the upcoming roundabout enabling them to adjust their speed accordingly.</p> <p>The table below outlines the flows on the WB entry to the roundabout based on no change in existing layout and based on the proposed scheme at both year opening and the design forecast year. As can be seen there is a near 90% drop in the traffic at the WB entry to the roundabout</p> <table border="1" data-bbox="1531 573 2270 821"> <thead> <tr> <th>Scenario</th> <th>AM</th> <th>IP</th> <th>PM</th> </tr> </thead> <tbody> <tr> <td>Do Minimum 2025 (Opening year)</td> <td>912</td> <td>942</td> <td>1039</td> </tr> <tr> <td>Proposed Scheme 2025 (Opening year)</td> <td>116</td> <td>171</td> <td>203</td> </tr> <tr> <td>Do Minimum 2040 (Forecast year)</td> <td>942</td> <td>1046</td> <td>1084</td> </tr> <tr> <td>Proposed Scheme 2040(Forecast year)</td> <td>138</td> <td>221</td> <td>246</td> </tr> </tbody> </table> <p>Refer to HE551489-GTY-HOS-000-RP-ZS-30003 for the Safety Risk Assessment in accordance with GG 104.</p>	Scenario	AM	IP	PM	Do Minimum 2025 (Opening year)	912	942	1039	Proposed Scheme 2025 (Opening year)	116	171	203	Do Minimum 2040 (Forecast year)	942	1046	1084	Proposed Scheme 2040(Forecast year)	138	221	246		
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4	<p>Location: Wood Lane Junction, north and south roundabouts (drawing HE551489-GTY-HML-000-DR-CH-30007-P03)</p> <p>Summary: Multiple conflict points in close proximity and lack of weaving lengths at roundabouts</p> <p>Description: The north and south roundabouts at Wood Lane junction do not appear to have yet been designed with adequate entry and exit flaring and deflection on the arms. When designed fully, the resulting design will likely have very little, if any, weaving lengths between arms. This coupled with the proposed number of arms (5 at each roundabout) will mean there will be five conflict points within close proximity to one another. Drivers entering the roundabout will potentially be in conflict with vehicles leaving the roundabout at the next arm, leading to side-swipe collisions.</p>	<p>Enlarge the inscribed circle diameters of the roundabouts in order to increase the distance between arms and therefore the circulatory weaving lengths. Increased roundabout diameters allow better positioning of traffic signs, which will aid driver safety. It may also be beneficial to re-site the roundabouts further away from the mainline to allow better alignment of the arms into the roundabout</p>	<p>The Designer disagrees with this RSA problem and recommendation.</p> <p>The roundabouts are indicative for Stage 3 and will be fully developed at Stage 5. While the entry and exit flaring has not been fully detailed on the roundabout layouts an allowance has been made for the entry and exit flaring, in the positioning of the arms on the roundabout such that there won't be a conflict with vehicles entering as other vehicles manoeuvre to exit the roundabout.</p> <p>ARCADY assessments have been run for each roundabout layout and all confirm that the RFC value and queuing are all within the necessary thresholds. Refer to the Junction Operational Assessment Technical Note (HE551489-GTY-VTR-000-RP-TR-30004) for details of the assessments.</p> <p>The number of arms at the southern roundabout has been reduced following the removal of the link to Church Lane (south west arm on the roundabout) from the Works. As a result, the exit onto the westbound merge will be moved anti-clockwise providing additional space between the connector road.</p> <p>Further to this the link to Dereham Road and the link to the existing A47 have been realigned. The south east arm of the roundabout will as a result be moved clockwise providing additional space between this arm and the diverge slip. The screenshot below demonstrates the change in layout.</p>	<p>I am content with the level of assessment at present however, will need to be revisited in the RSA stage 2. It is important that assessments at this stage are robust enough such that the level of change at a later date does not significantly modify the junction arrangements as it will impact the DCO submission and may warrant a material change. As per initial comments I would expect future assessments to consider roundabout forms such as number of lanes and / or type (e.g. spiral).</p>	<p>Roundabout entry and exit flaring, and associated road markings, to be fully developed at Stage 5. This issue shall then be reviewed again during the Stage 2 RSA.</p>																				

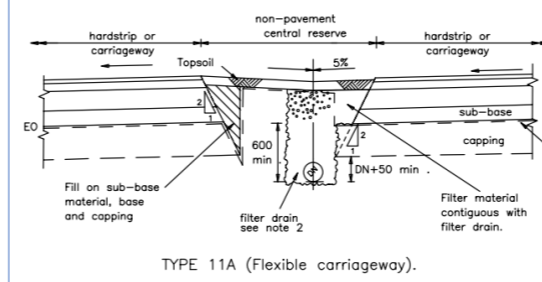
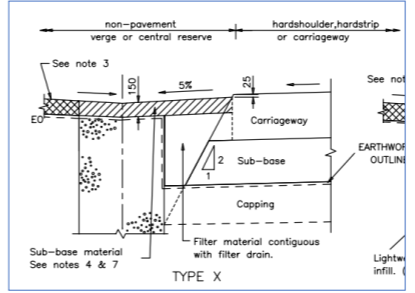
No.	RSA problem	RSA recommendation	Design organisation response	Overseeing Organisation response	Agreed RSA action
			 <p>DEREHAM ROAD</p> <p>Refer to HE551489-GTY-HOS-000-RP-ZS-30004 for the Safety Risk Assessment in accordance with GG 104.</p>		
5	<p>Location: Norwich Road Junction, north and south roundabouts (drawing HE551489-GTY-HML-000-DR-CH-30010-P03)</p> <p>Summary: Multiple conflict points in close proximity and lack of weaving lengths at roundabouts.</p> <p>Description: As with the Wood Lane junction, the north and south roundabouts at the Norwich Road junction do not appear to have yet been designed with adequate entry and exit flaring and deflection on the arms. When designed fully, the resulting design will likely have very little, if any, weaving length between arms. This coupled with the proposed number of arms (5 at each roundabout) will mean there will be five conflict points within close proximity to one another. Drivers entering the roundabout will potentially be in conflict with vehicles leaving the roundabout at the next arm, leading to side-swipe collisions.</p>	<p>Enlarge the inscribed circle diameters of the roundabouts in order to increase the distance between arms and therefore the circulatory weaving lengths. Increased roundabout diameters allow better positioning of traffic signs, which will aid driver safety. It may also be beneficial to re-site the roundabouts further away from the mainline to allow better alignment of the arms into the roundabout</p>	<p>The Designer disagrees with this RSA problem and recommendation. Whilst the entry and exit flaring has not been fully detailed on the roundabout layouts, an allowance has been made for them in the positioning of the arms on the roundabout such that there won't be a conflict with vehicles entering as other vehicles manoeuvre to exit the roundabout.</p> <p>ARCADY assessments have been run for each roundabout layout and all confirm that the RFC value and queuing are all within the necessary thresholds.</p> <p>The number of arms at the northern roundabout has been reduced following the removal of the link to Church Lane (Easton) (north east arm on the roundabout) from the Works. The screenshot below demonstrates the change in layout.</p>  <p>Refer to HE551489-GTY-HOS-000-RP-ZS-30005 for the Safety Risk Assessment in accordance with GG 104.</p>	<p>I am content with the level of assessment at present however, will need to be revisited in the RSA stage 2. It is important that assessments at this stage are robust enough such that the level of change at a later date does not significantly modify the junction arrangements as it will impact the DCO submission and may warrant a material change. I do note the reduction in arms following the link removal which may reduce the severity of this RSA problem. As per initial comments I would expect future assessments to consider roundabout forms such as number of lanes and / or type (e.g. spiral).</p>	<p>Roundabout entry and exit flaring, and associated road markings, to be fully developed at Stage 5. This issue shall then be reviewed again during the Stage 2 RSA.</p>

No.	RSA problem	RSA recommendation	Design organisation response	Overseeing Organisation response	Agreed RSA action
6	<p>Location: Link to existing A47 (Hockering), western tie-in. (drawing HE551489-GTY-HSR-000-DR-CH-30004-P03).</p> <p>Summary: New road alignment exacerbates safety problems at existing crossroads.</p> <p>Description: West of the proposed Wood Lane junction, the existing A47 is to be realigned and formed into a local road. This will tie into the existing Sandy Lane / Church Lane crossroads, priority junction. Priority-controlled crossroads junctions are inherently unsafe, especially where there is a significant movement of traffic between the two side arms. With lower traffic flows on the former A47, and little friction, higher vehicle speeds could result. This has the potential to exacerbate the inherent problems at the crossroads junction.</p>	Design the western tie-in of the new 'link to the existing A47' such that vehicle speeds are reduced on the approach to the crossroads	<p>The Designer agrees with the RSA problem and recommendation.</p> <p>This junction has been redesigned and will no longer be a crossroads as Church Lane to the south will be stopped up.</p> <p>In consultation with Norfolk County Council it has been agreed that the speed limit on de-trunked A47 either side of Hockering will be reduced to 50mph to deter road users from using the local road for 'rat running' purposes.</p> <p>Reduced vehicle speeds as a result of the speed limit change will further improve the safety at this priority junction.</p>	I am content with the assessment and response provided.	No further action
7	<p>Location: Link to existing A47 (Hockering), eastern tie-in with Wood Lane junction. (drawing HE551489-GTY-HSR-000-DR-CH-30005-P03).</p> <p>Summary: Two junctions in close proximity leads to shunt-type collisions.</p> <p>Description: A priority junction is proposed immediately to the west of the Wood Lane Junction north roundabout. (The priority junction will likely be located even closer to the roundabout when the roundabout is fully designed with flared entries). This leaves drivers exiting the roundabout with little time before they reach the decision point of continuing straight on along the new link road or entering the right-turn ghost island. Any queues of vehicles within the ghost island will further limit the time available to drivers to brake and join the back of the queue. This could lead to late braking and shunt-type collisions.</p>	Relocate the priority junction away from the Wood Lane junction, north roundabout.	<p>The Designer agrees with the RSA problem and recommendation.</p> <p>The junction of Wood Lane with the link to the existing A47 east of Hockering has been moved west and therefore further away from the proposed roundabout. This will provide road users with more time on exiting the roundabout to assess the road ahead and take appropriate action to make the right-hand turn into Wood Lane. The screenshots below demonstrate the change in layout with the new alignment shown on the right-hand side.</p> 	I welcome the change presented however, would welcome a safety assessment to determine how the change improves the RSA problem and reduces the eventuality of shunt type collisions. What is not detailed is the extent of the change how much additional time / space has been provided as a result of the change.	Designer to undertake safety assessment at Stage 5 following development of roundabout entry and exit flaring. This issue shall then be reviewed again during the Stage 2 RSA.
8	<p>Location: Link to Norwich Road (Honingham) (drawing HE551489-GTY-HSR-000-DR-CH-30017-P03).</p> <p>Summary: Priority junction layout not visible to drivers, leading to shunt-type collisions.</p> <p>Description: A ghost island priority junction is proposed on the new link to Norwich Road (Honingham). The priority junction will be located immediately to the east of a crest in the link road long profile. This may result in the junction layout not being visible to drivers approaching from the west, along the link road. This in turn could lead to drivers seeking to turn into the side road braking at the last minute, resulting in shunt-type collisions.</p>	Improve the visibility of the priority junction layout for drivers approaching from the west.	<p>The Designer agrees with the RSA problem but the junction in question has been removed from the proposed scheme.</p> <p>The link to Blind Lane however has now been descoped from the Works and the ghost island layout for the priority junction has therefore been removed. The screenshot below demonstrates the change in layout.</p> 	I am content with the assessment and response provided.	No further action

No.	RSA problem	RSA recommendation	Design organisation response	Overseeing Organisation response	Agreed RSA action
9	<p>Location: Mainline, eastern tie-in (drawing HE551489-GTY-GEN-000-DR-ZZ-30002-P01)</p> <p>Summary: Uncontrolled pedestrian crossing on high speed road leads to vehicle / pedestrian collisions.</p> <p>Description: An existing WCHAR provision currently crosses the A47 at an uncontrolled, staggered crossing, approximately 150 metres east of the scheme mainline tie-in. Currently, the crossing lies east of a roundabout, at a point where vehicles are accelerating or decelerating and probably not travelling at full speed. With the new scheme removing the existing roundabout and creating a through dual carriageway, vehicle speeds through the uncontrolled crossing are likely to be significantly higher. This could lead to increased risk of vehicle/pedestrian collisions.</p>	Upgrade or relocate the WCHAR crossing.	<p>The Designer agrees with the RSA problem and recommendation.</p> <p>This uncontrolled crossing will be replaced by a new grade separated crossing located further east at the site of the existing roundabout. The existing uncontrolled crossing will be removed and the gap in the central reserve closed to remove the potential pedestrians to attempt to cross the dual carriageway at this location.</p>	I am content with the assessment and response provided.	No further action
10	<p>Location: Mainline, western-tie in. (Drawing HE551489-GTY-HMK-000-DR-CH-30001)</p> <p>Summary: Warning line road markings stop prior to hazard.</p> <p>Description: Warning line road markings, to TSRGD diagram 1004.1, are proposed on the westbound carriageway at its western tie-in, presumably to warn of the approaching Fox Lane junction. However, the existing westbound carriageway on the approach to Fox Lane junction appears to have lane line markings (rather than warning lines). Drivers may think the hazard has passed as they approach the junction if the warning lines cease before the hazard, leading to drivers taking less care through the Fox Lane junction.</p>	Continue the warning lines through Fox Lane junction.	<p>The Designer agrees with the RSA problem and recommendation.</p> <p>Warning line markings have been extended through to the existing Fox Lane junction.</p>	I am content with the assessment and response provided.	No further action
11	<p>Location: Wood Lane junction, westbound merge slip road. (drawing HE551489-GTY-HMK-000-DR-CH-30006-P03)</p> <p>Summary: Incorrect hatching leads to driver confusion</p> <p>Description: The hatching, to TSRGD diagram number 1012.3, has been drawn incorrectly, with the hatching in the wrong direction, at the Wood Lane junction westbound merge slip road. This could lead to driver confusion, with some drivers believing they are travelling the wrong way down the slip road, resulting in sudden braking and shunt-type collisions.</p>	Mark out the hatching correctly.	<p>The Designer agrees with the RSA problem and recommendation.</p> <p>Road markings have been amended to show hatching in right direction as per TSRGD.</p>	I am content with the assessment and response provided.	No further action
12	<p>Location: Norwich Road junction, westbound merge slip road (drawing HE551489-GTY-HMK-000-DR-CH-30011-P03)</p> <p>Summary: Incorrect hatching leads to driver confusion.</p> <p>Description: The hatching, to TSRGD diagram number 1012.3, has been drawn incorrectly, with the hatching in the wrong direction, at the Norwich Road junction westbound merge slip road. This could lead to driver confusion, with some drivers believing they are travelling the wrong way down the slip road, resulting in sudden braking and shunt-type collisions</p>	Mark out the hatching correctly.	<p>The Designer agrees with the RSA problem and recommendation.</p> <p>Road markings have been amended to show hatching in right direction as per TSRGD.</p>	I am content with the assessment and response provided.	No further action
13	<p>Location: Mainline, western-tie in (drawing: HE551489-GTY-HSN-000-DR-CH-30001-P03)</p>	Provide adequate advance direction signing for Fox Lane junction.	<p>The Designer agrees with the RSA problem and recommendation.</p> <p>Existing countdown marker signs to Diagrams 823, 824 and 825 are currently shown to be removed. Proposed carriageway widening in advance</p>	I am content with the assessment and response provided.	No further action

No.	RSA problem	RSA recommendation	Design organisation response	Overseeing Organisation response	Agreed RSA action
	<p>Summary: Lack of advance signing leads to sudden braking.</p> <p>Description: At the western tie-in of the scheme, there is an existing 1/3 advance direction sign on the westbound approach to Fox Lane junction, which does not appear to have been replaced within the scheme. If drivers do not have adequate warning of the approaching junction this could result in sudden braking and shunt-type collisions.</p>		<p>of these signs should mean that the existing signs do not need to be removed subject to a check of appropriate visibility and setback. The Site Clearance package shall be amended to show these signs to be retained.</p> <p>A new ½ mile advanced direction sign shall also be provided with signing to N. Tuddenham as per the direction sign at the junction.</p>		
14	<p>Location: Link to existing A47 (Hockering), eastern tie-in with Wood Lane junction (drawing HE551489-GTY-HSN-000-DR-CH-30007-P03)</p> <p>Summary: Poorly positioned traffic signs lead to collisions between different vehicle movements.</p> <p>Description: The short link length between the proposed priority junction and the Wood Lane Junction north roundabout has resulted in advance direction signs being poorly placed in both directions, very close to the junctions they forewarn about.</p> <p>The eastbound advance direction sign (sign reference A47TUD/047/30101/ADS-10) is positioned close to the north roundabout and will be read by drivers at a point when they are negotiating the upstream priority junction. This could pose an unsafe distraction to drivers, leading to collisions between opposing vehicle movements at the priority junctions.</p> <p>The westbound advance direction sign (sign reference A47TUD/048/30101/ADS-11) is positioned immediately after the exit of the roundabout. When the roundabout arms are properly flared this sign will actually be located on the exit flare and there will be no time for drivers to digest the information on the sign before they are past it. This could lead to sudden braking and shunts, or loss of control collisions as drivers try to read the sign.</p>	See problem 7. Appropriate spacing of the junctions will allow a safe traffic sign design to be provided.	<p>The Designer agrees with the RSA problem and recommendation.</p> <p>The junction of Wood Lane with the link to the existing A47 east of Hockering has been moved west and therefore further away from the proposed roundabout. This will provide road users with more time on exiting the roundabout to assess the road ahead and take appropriate action to make the right-hand turn into Wood Lane.</p> <p>The advance direction sign for road users heading westbound after exiting the roundabout has been moved to suit the new geometry and priority junction location. The new sign location will have the advanced direction sign 60m from the sideroad centre line and is a compromise of being far enough from the junction to provide adequate warning whilst being out with the immediate roundabout exit.</p>	I am content with the assessment and response provided.	No further action
15	<p>Location: Link to Church Lane (Easton), eastern tie-in with Church Lane. (Drawing HE551489-GTY-HRS-000-DR-CH-30021-P03)</p> <p>Summary: High vehicle speeds on approach to existing junction lead to overshoot collisions.</p> <p>Description: The new link to Church Lane ties in just west of a local junction formed by Church Lane, Ringland Road and Dog Lane. The junction is not conspicuous. The new link road will have a much straighter alignment than the existing section of Church Lane in this vicinity and will likely increase the general speed of vehicles approaching the junction. This may lead to overshoot type collisions.</p>	Provide advance measures along the new link road to reduce vehicle speeds on the approach to the Church Lane/Ringland Road junction.	<p>The Designer agrees with the RSA problem but the sideroad in question has been removed from the proposed scheme.</p> <p>Whilst the Designer agrees with this comment the vehicular link to Church Lane has been removed from the proposed design. The existing Church Lane carriageway will be re-used as shared farm access and walking & cycling route. It is proposed that removable bollards will be placed at the Ringland Road and Dog Lane junction to prevent unauthorised vehicular access along the link.</p>	I am content with the assessment and response provided.	No further action
16	<p>Location: Link to Dereham Road (Easton), eastern tie in with Dereham Road (drawing HE551489-GTY-HRS-000-DR-CH-30025-P03)</p> <p>Summary: Poor lane discipline leads to collisions with vehicles exiting side road.</p> <p>Description: The new link to Dereham Road will produce an s-bend alignment where it ties into the existing Dereham Road. An existing side road priority junction (with the road to Colton) will be within the s-bend. Site observations indicated that the side road is used by large heavy goods vehicles. The s-bend could lead to poor lane discipline by vehicles as they pass through the junction, which could bring them into conflict with large vehicles exiting the side road.</p>	Provide double-white centre lines on Dereham Road, through the s-bend and carry out swept path analysis to ensure all expected vehicle types can manoeuvre in and out of the junction within the respective lanes.	<p>The Designer agrees with the RSA problem and recommendation.</p> <p>The Road Markings design has been amended to show double-white centre lines on Dereham Road, through the s-bend as per TSRGD.</p> <p>Swept Path analysis shows that minor changes to the left turn from Colton will be required to the junction. These minor junction amendments have been incorporated into the proposed design.</p>	I am content with the assessment and response provided.	No further action
17	<p>Location: Mainline, western-tie in (drawing: HE551489-GTY-HSN-000-DR-CH-30001-P03)</p>	Provide measures to ensure vehicles can safely reduce speed	The Designer disagrees with this RSA problem and recommendation.	I am content with the level of assessment at present however, will	This issue shall be reviewed

No.	RSA problem	RSA recommendation	Design organisation response	Overseeing Organisation response	Agreed RSA action
	<p>Summary: Higher vehicle speeds results in shunt-type collisions.</p> <p>Description: At the western tie-in of the scheme the new A47 carriageway will tie into the existing carriageway as a dual, rather than the existing single, carriageway. This will likely result in generally higher vehicle speeds on the westbound approach to the existing Fox Lane junction than is currently experienced. This could lead to a higher risk of shunt-type collisions as vehicles brake to leave at Fox Lane and loss of control at the junction due to increased entry speeds.</p>	<p>if leaving the mainline exit and enter the Fox Lane junction at an appropriate speed.</p>	<p>Currently the road layout heading west widens from single carriageway to dual carriageway approximately 350m in advance of the Fox Lane junction westbound diverge. The Designer considers that with the current layout there is more risk of vehicles accelerating and then moving across lanes to exit at the junction than with the proposed continuous dual carriageway.</p> <p>The proposed design will follow the layout and signing convention for grade separated layouts as is common across the current A47 dual carriageway sections. Whilst vehicle speeds will likely be higher when there is a continuous dual carriageway, speeds will generally be more consistent. Drivers will have appropriate prior warning to the upcoming junction through advanced direction signs and count down markers.</p> <p>The existing slip road is similar to a Type A Option 2 Single Lane Auxiliary Diverge from Figure 3.30b of CD 122. The existing slip road, which will be unchanged, is made up of a 55m taper and 145m of auxiliary lane. The designer feels the taper length is sufficient to allow a driver exiting the mainline carriageway to diverge into the slip road without impeding mainline drivers and thereby increasing the risk of shunt accidents.</p> <p>The existing junction on the eastbound approach to Fox Lane junction is similar to the proposed in layout and signing, and is preceded by 6km of dual carriageway. There have been no reported injury collisions at this junction over the ten year period 2010 to 2019 (data from Crashmap®).</p> <p>Refer to HE551489-GTY-HOS-000-RP-ZS-30017 for the Safety Risk Assessment in accordance with GG 104.</p>	<p>need to be revisited in the RSA stage 2. The designer should monitor any scheme design changes that may increase on the use and associated traffic flow using this junction which may impact on the RSA problem identified.</p>	<p>again during the Stage 2 RSA. During Stage 5 the Designer shall take cognisance of any design change that may have a bearing on the operation of this junction and shall assess the need for any mitigation accordingly.</p>
18	<p>Location: Realigned A47 west of Hockering and existing A47 past Hockering (drawing HE551489-GTY-HSR-000-DR-CH-30002)</p> <p>Summary: De-trunked road encourages higher traffic speeds and more severe collisions.</p> <p>Description: A section of the existing A47 carriageway, in the vicinity of Hockering, will be de-trunked and retained and tied into a realigned section of new carriageway. The realigned carriageway and reduced traffic load could encourage higher vehicular speeds, resulting in continued collisions at priority junctions, but of higher severity.</p>	<p>Provide measures to promote a low-speed, village environment.</p>	<p>The Designer agrees with this RSA problem and recommendation.</p> <p>This section of the existing A47 the proposed speed limit will be reduced from 60 to 50mph with appropriate signage.</p>	<p>I am content with the assessment and response provided, it would also be prudent to consider road widths in the assessment which may encourage reduced speeds.</p>	<p>Further discussion to be held with Local Authority at Stage 5 to identify additional mitigation measures that could be implemented to further promote reduced speeds.</p>
19	<p>Location: Various locations</p> <p>Summary: Headlight glare dazzles drivers, leading to loss of control.</p> <p>Description: Local roads will run parallel to the new mainline in several places within the scheme. There is a risk that headlight glare from traffic on the mainline could dazzle, or confuse, drivers on the local parallel roads, and vice versa.</p>	<p>Provide a form of physical barrier between the mainline and the local roads to prevent headlight see-through.</p>	<p>The Designer agrees with this RSA problem and recommendation.</p> <p>In a number of locations, sideroad carriageways adjacent to the mainline may result in headlight glare between opposing directions of traffic. The designer has amended the design to incorporate measures to prevent headlight glare. This will be achieved, where possible, through the use of hedgerow planting. Where space does not permit planting, the Designer will look to include close boarded fencing or a safety barrier mounted system.</p>	<p>I am content with the assessment and response provided.</p>	<p>No further action</p>
20	<p>Location: Proposed laybys on mainline (drawing HE551489-GTY-HML-000-DR-CH-30004-P03)</p> <p>Summary: Insufficient parking opportunities leads to driver fatigue.</p> <p>Description: One parking layby is proposed in both directions for the entire new scheme. This replaces three laybys in the eastbound direction and two laybys in the westbound direction on the existing A47 that the scheme replaces. The proposed laybys also appear limited in length, especially if used by multiple large vehicles. The proposed provision may</p>	<p>Ensure sufficient parking facilities are provided throughout the scheme.</p>	<p>The Designer agrees with this RSA problem but cannot implement the recommendation.</p> <p>However, the Designer notes that to avoid the introduction of a Departure from Standard the length of the lay-bys cannot be extended. Adding additional length to either proposed lay-by would result in the two lay-bys overlapping and clause 3.13 of CD 169 not being met.</p> <p>It is the Designer's intention to promote a TRO to prevent mobile food vans from operating in either lay-by. The Designer believes that any increase in length of these lay-bys would increase the likelihood of mobile food vans</p>	<p>I am content with the assessment and response provided.</p>	<p>No further action</p>

No.	RSA problem	RSA recommendation	Design organisation response	Overseeing Organisation response	Agreed RSA action
	<p>be insufficient to allow drivers to take sufficient breaks through their journey and oversubscription to the proposed provision may result in verge damage and vehicles blocking access to the facility, resulting in risk of shunt and sudden lane change collisions.</p>		<p>operating and increase the likelihood of road users attempting to cross the central reserve between lay-bys.</p> <p>The proposed design would result in the distance between lay-bys in the eastbound direction being 2 miles upstream of the proposed lay-by and 8 miles downstream. There are however services located at the Longwater Business park which is 5 miles east of the proposed lay-by. The proposed design would result in the distance between lay-bys in the westbound direction being 8.5 miles upstream of the proposed lay-by and 2.5 miles downstream.</p> <p>The Designer proposes to improve signage in advance of the proposed lay-bys to provide road users with a distance to the next available lay-by.</p>		
21	<p>Location: Mainline, past Hockering and through Norwich Road junction.</p> <p>Summary: Overgrown grass leads to lack of forward visibility.</p> <p>Description: A wide central reserve is proposed along two sections of the new mainline, on the section past Hockering, and on the section through the Norwich Road junction. If these central reserves are grassed this could lead to forward visibility issues, which in turn could result in shunt or side-swipe collisions.</p>	<p>Provide paved central reserves to ensure forward visibility can be easily maintained through the life of the scheme.</p>	<p>The Designer disagrees with this RSA problem and recommendation.</p> <p>Following a review of the standards and the associated risks and opportunities associated with a paved or unpaved central reserve construction the Designer considers an unpaved central reserve construction to offer a better solution.</p> <p>An unpaved central reserve offers improved environmental mitigation as well as advantages with respect to surface runoff and downstream attenuation. It also has a significantly better carbon impact compared to a hardened alternative.</p> <p>The Designer proposes to have an unpaved central reserve in line with Highway Construction Detail B5 (see figure below) with measures taken to limit vegetation growth. Another option would be to provide a detail in line with Highway Construction Detail B15 (see second figure below) which would further serve to reduce the vegetation growth in the central reserve and prevent an obstruction to forward visibility.</p>  <p>TYPE 11A (Flexible carriageway).</p> <p>Highway Construction Detail B5, Type 11A (Flexible carriageway)</p>  <p>TYPE X</p> <p>Highway Construction Detail B15, Type X</p> <p>Refer to HE551489-GTY-HOS-000-RP-ZS-30021 for the Safety Risk Assessment in accordance with GG 104.</p>	<p>I am content with the assessment and response provided and encourage the designer to incorporate the most appropriate solution into the design to reduce the potential of the identified issue.</p>	<p>Designer to confirm at Stage 5 what treatment in the central reserve is best to reduce the potential for forward visibility issues whilst still satisfying other functions and requirements of the central reserve.</p>

5. Design organisation and Overseeing Organisation statements

On behalf of the design organisation I certify that: 1) the RSA actions identified in response to the road safety audit problems in this road safety audit have been discussed and agreed with the Overseeing Organisation.	
Name:	Jamie McConachie
Signed:	
Position:	Highways Design Team Lead
Organisation:	Sweco
Date:	16/11/2020

On behalf of the Overseeing Organisation I certify that: 1) the RSA actions identified in response to the road safety audit problems in this road safety audit have been discussed and agreed with the design organisation; and 2) the agreed RSA actions will be progressed.	
Name:	James Powis
Signed:	
Position:	Project Manager
Organisation:	Highways England
Date:	16/11/2020