A1074/A47(T) LONGWATER INTERCHANGE IMPROVEMENT

STAGE 2 SAFETY AUDIT

REPORT REF: A1074/018
March 2023

Report Prepared for: Norfolk County Council and National Highways

Project Details:

Report Title	A1074/A47(T) Longwater Interchange Improvement – Stage 2 RSA
Date	March 2023
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Prepared By	NCC/WSP and NH
On behalf of	Norfolk County Council and National Highways
Report author	

Report Status:

Issue	Status	Purpose	Name/Signature	Date
1	Stage 2 Safety Audit Report	Client Issue	……	19/05/23
Choose an item.	Choose an item.	Choose an item.	…… ……	
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INTRODUCTION

This report contains the results of a Stage 2 Safety Audit carried out on the above scheme. The Audit was carried out at the request of Norfolk County Council Infrastructure Delivery. and also on behalf of National Highways.

The Audit Team is independent of the project design team and has had no involvement with the project. Audit Team membership was as follows:-

EIR Reg 13 - Personal Data	Principal Engineer Highway Safety WSP
(Audit Team Leader)	
EIR Reg 13 - Personal Data	Project Engineer Network Safety + Sustainability Norfolk County Council
(Audit Team Member)	
(Audit Team Member)	Principal Engineer Planning and Development National Highways
(Audit Team Observer)	Project Technician Network Safety Norfolk County Council

The Audit took place via online conferencing on 31 March 2023. The audit comprised an examination of the supplied documentation (see Appendix A) and a site inspection by all members of the Audit Team on 31 March 2023 at 14:20 which lasted around 1.5hrs. During the site visit the weather was cloudy and the road surface dry. Traffic flows were moderately heavy with some fluctuating queuing at roundabout entries.

The terms of reference are as described in GG 119 *Road Safety Audit*. The Auditors have examined and reported only on the road safety implications of the scheme as presented and has not examined or verified the compliance of the design to any other criteria.

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The audited scheme involves conversion of the southern roundabout of the Longwater interchange to a signalised 'teardrop'. In addition, footways and shared-use cycle facilities are proposed along the west side of the interchange including puffin crossing facilities at the trunk road slip roads. The submission did not contain details of any proposed lighting changes.

The auditors have reviewed the latest 3-year accident record for the location (to end Dec 2022). During this time there have been 7 recorded personal injury accidents (1 serious, 6 slight) at the interchange. None involved non-motorised users. Locations are scattered: 2 on the westbound off-slip approach/entry to southern roundabout; 3 on the overbridge; 1 on Dereham Rd entry to northern roundabout; 1 on William Frost Way. The serious accident involved a single vehicle/ failed breath test. There is little commonality with no apparent implications for the proposed scheme.

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ITEMS RAISED AT PREVIOUS AUDIT

A previous stage 1 RSA of the scheme was undertaken in December 2021.

Problem 4.1 in that report regarding parapet height on the overbridge recommended that it should be a minimum of 1.5m. The Designer Response stated that this dimension was an error in CD377 Rev 0 and that the figure should be 1.4m. However, the latest version of CD377 Rev 4 issued Jan 2021 still states the minimum parapet height adjacent to cycleways is 1.5m. The current Audit Team therefore re-iterate the RSA1 recommendation that the parapet should be 1.5m high in accordance with CD377.

Designer Response:

Noted - Notwithstanding the potential error in CD377 the proposals do not provide a cycleway on the overbridge therefore the parapet height is adequate for the purpose intended.

Concerns raised in the RSA1 report (Problems 3.1, 5.1 & 5.2) regarding stopping sight distance of traffic signals remain an issue and are discussed further in 3.1, 3.2 & 5.1 below.

All other problems raised in that report have been resolved.

ITEMS RAISED AT THIS STAGE 2 AUDIT

1.0 General

1.1 No comment

2.0 Alignment

2.1 Problem – collision with opposing traffic or crossing NMUs

Location – proposed refuge location on Dereham Road, Easton

The Audit Team note that there is an existing eastbound bus stop adjacent to the proposed refuge location. This raises concern that some drivers may attempt to overtake a stationary bus by passing the wrong side of the refuge island, with potential for collision with oncoming traffic or crossing NMUs.

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Recommendation - that the stop is moved a little further east to enable following vehicles to overtake a stationary bus without passing the wrong side of the island or encroaching into the opposing traffic lane.

Designers Response:

Agree –
The bus stop can be relocated slightly further to the east away from the refuge island.

2.2 Problem – NMUs struck by turning traffic

Location – Dereham Road, Easton entry to southern roundabout

There is evidence of regular kerb overrun at this location where shared-use foot/cycleway is now proposed. This suggests a risk of NMUs being struck by turning traffic.



Recommendation – that swept path analysis is undertaken and the kerb line adjusted as necessary to reduce this risk.

Designers Response:

Partly agree –
Swept path analysis has been carried out which shows that HGV's can navigate the turn without overrunning the kerb. It is also proposed that the existing splay kerbs are replaced with half battered kerbs at this location to minimise likelihood of overrunning.

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2.3 Problem – collision with NMUs entering the carriageway

Location – William Frost Way at proposed maintenance bay

There is a redundant pedestrian drop crossing point at this location (its counterpart on the median island was removed some years ago). This busy location is not considered safe for crossing; however the proposed bay design appears to replicate the dropped kerbs here, perpetuating the risk of encouraging pedestrian movements.



Recommendation – that the proposed bay layout is modified/relocated to remove dropped kerbs at this point. (Note the proposed bay location immediately behind the feeder cabinet seems likely to result in awkward manoeuvring).

Designers Response:

Agree –
Entry/exit kerbs to maintenance bay to be changed from dropped kerbs to splay kerbs.

2.4 Problem – vehicle failure-to-stop collisions with NMUs

Location – A47 eastbound off-slip approach to proposed puffin crossing

The Auditors are concerned that the proposed length of 65 PSV surfacing on approach to the stop line may be inadequate (it scales around 55m compared with approx. 80m on the westbound off-slip). If so, it would raise the risk of drivers overshooting the crossing resulting in collision with NMUs crossing.

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Recommendation – that the required length is checked and increased as necessary.

Designers Response:

Noted – The minimum required length is 50m. The exact length has been determined based on the site and proposed layout.

3.0 Junctions

3.1 Problem – junction overshoot collisions

Location – A47 westbound off-slip

The Audit Team note that 40mph SSD of the proposed traffic signals is only available to the offside primary signal. On a busy 2-lane approach, drivers' view of this signal could be obscured by high-sided vehicles in the adjacent lane. This raises concern over late awareness of a red signal, leading to failure to comply and collision with circulating traffic. The concern is exacerbated by the short length of proposed 40mph limit on the off-slip, potentially resulting in higher than desirable approach speeds.

Recommendation – that re-shaping of the nearside embankment is undertaken in order to achieve SSD of the nearside primary signal (it appears the extent might be relatively minor and where the embankment height is less than 1.5m). Provision of a signals warning sign is also recommended due to the curving approach. It is also recommended that the proposed 40mph limit is extended down the off-slip to at least 120m from the stop line.

Designers Response:

Noted - A departure has been submitted to National Highways for the substandard SSD. This is an existing junction that is on an uphill approach where speeds are not excessive.
A sign to diag. 543 will be included in the design.

The extents of the 40mph sign has been previously determined in conjunction with NCC and National Highways.

3.2 Problem – junction overshoot collisions

Location – southbound overbridge approach to proposed 'teardrop'

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The Audit Team note that visibility of both primary traffic signals will be intermittently obstructed by ADS7 (which replaces the existing ADS). This raises concern over late awareness of a red signal, leading to failure to comply and collision with circulating traffic.

Recommendation – that ADS7 is relocated outside the signal visibility splay. It appears that the proposed 'teardrop' island offers the opportunity for re-siting on the offside, where sign conspicuity would be good.

Designers Response:

Noted –
Any suitable location outside the signal visibility splay would be too close to the roundabout and be on the offside of the carriageway.
Visibility checks have been carried out which indicate there is no visibility issue.

3.3 Problem – tail-end collisions

Location – southbound overbridge approach to proposed 'teardrop'

Departure DFS-GEO-003 identifies existing sub-standard forward visibility at this location, although this has not resulted in an associated accident record. However, the Audit Team note that proposed forward visibility to object height 1.05m is further reduced from 48m to 41.9m, limited by the bridge parapet. The change of junction control and removal of the need to give way may also lead to higher approach speeds on a green signal. In the event of any stationary/queuing vehicles on the tear-drop circulatory, obstructed visibility of brake lights ahead could result in late braking and potential tail-end collisions.

Recommendation – the Audit Team accepts that changes to the bridge parapet would be disproportionately expensive, as stated in the Departure. Relocation of ADS7 as recommended in 3.2 above, together with removal of adjacent vegetation, will help to maximise available visibility. High friction surfacing is also recommended at this location to further mitigate the risk.

Designers Response:

Noted – However any suitable location of ADS7 outside the signal visibility splay would be too close to the roundabout and be on the offside of the carriageway.
Visibility checks have been carried out which indicate there is no visibility issue with the sign for the signals.
Removal of vegetation can be specified at this location.

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HFS requires extra maintenance and due the low design speed at the overbridge HFS has been deemed not necessary. The surfacing treatment however can be increased to PSV 68 to further mitigate the risk.

3.4 Problem – collisions between turning traffic and NMUs

Location – Premier Inn access junction off Dereham Road, Easton

The existing junction radii are very large (approx. 15m) although the access itself rapidly narrows/tightens into a car park. Large radii increase the speed of turning traffic while increasing the width that NMUs must cross, raising the potential for conflict.

Recommendation – that the junction radii be reduced.

Designers Response:

Noted - however this is outside the scope of this scheme.

4.0 Non-motorised Users

4.1 Problem – collisions with NMUs unexpectedly entering carriageway

Location – proposed footway between westbound on-slip and eastbound off-slip

The Audit Team note that this length of provision is intended as footway only. However, the length of path involved (approx. 200m) and the location of 'cyclist dismount' signs at the signalised crossings (where they will have little apparent relevance), raises concern over potential poor compliance by cyclists. This would pose a risk of conflict between users which could lead to a pedestrian or cyclist unexpectedly entering the carriageway, being struck by a passing vehicle.

Recommendation – that the potential for conflict be reduced by widening the facility to north and south of the overbridge to 3m for shared use. A more marked narrowing at either end of the bridge deck and co-location of the cyclist dismount signs might be more likely to achieve compliance over the remaining shorter section of 2m width. In this event it is also recommended that the proposed puffin crossings on the slip roads are modified to toucans to better cater for cyclist use.

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Designers Response:

Noted –
Cyclists should use the footway as intended by dismounting before using the puffin crossings. The path leading up to the crossings north and south of the overbridge are 3m wide.

4.2 Problem – NMUs falls

Location – proposed footway/cycleway, various

A verge is shown at the back of the footway/cycleway adjacent to the top of an embankment. However its width appears inadequate for any errant NMU to be able to recover before falling down the embankment.

Recommendation – that a 1m wide level verge is provided between the back of foot/cycleway and the top of embankment.

Designers Response:

Noted –
this would disproportionately increase the cost of the scheme due to the increase in embankment size and land required for installation of 1m verge.

4.3 Problem –collisions with NMUs entering carriageway

Location – overbridge, proposed footway

An existing lighting column plinth (see photo) restricts the footway width to less than 1m which may result in NMUs, particularly wheelchair users, entering the carriageway at risk from passing traffic. This risk is exacerbated by the scheme which encourages increased NMU usage of the route.

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Recommendation – that the column is relocated as part of the scheme lighting design in order to remove the pinchpoint.

Designers Response:

Agree. Although designed used existing position, due to no change in the footpath width.
Flange based column on bridge deck. This column can be re-sited on opposite side of the road away from Cycleway footpath, or a new base behind bridge fence. Parapet/bridge work required.

4.4 Problem –collisions with NMUs entering carriageway

Location – proposed footway adjacent to northern roundabout

The proposed footway is obstructed by an existing wide-based column for traffic camera and control kiosk (see photo). When in use, the adjacent maintenance hardstanding will also severely restrict the footway. Either could result in NMUs, particularly wheelchair users, entering the carriageway at risk from passing traffic.

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Recommendation – that the obstructions are relocated or the path widened to the rear of them to ensure free passage.

Designers Response:

Agree – CCTV belongs to National Highways; we shall discuss with NH the possibility of relocation to the back of the footway.

4.5 Problem – NMU trips/falls

Location – proposed refuge on Dereham Road, Easton

Although provision of tactile paving is shown at the proposed refuge, there is currently no surfaced footway on the southern side. It is understood that a linking foot/cycleway is intended under another scheme, however in the meantime there is a risk of NMU trips/falls here.

Recommendation – that a surfaced landing area is provided on the southern side of the refuge surrounding the proposed tactile paved area.

Designers Response:

Noted –

this is outside the scope of this scheme but will be covered in an S278 scheme currently at design stage.

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4.6 Problem – NMU trips/falls

Location – proposed footway edging, general

The key on the kerbing drawings states that footway edging is to have a 50mm upstand. The reason for this is not clear and there is concern that it could pose a tripping hazard in some locations.

Recommendation – that the upstand is omitted wherever there is potential for an NMU to cross the line of edging and perhaps trip/fall.

Designers Response:

Agree –
The key shall be amended to show the edging kerb to be 50mm wide, not having any upstand.

5.0 Signs, Lighting and Markings

5.1 Problem – vehicle failure-to-stop collisions with NMUs

Location – A47 eastbound off-slip approach to proposed puffin crossing

Due to the curving approach, proposed siting of ADS11 on the nearside verge will obstruct SSD visibility of the nearside signal and of any pedestrians waiting to cross. On a busy 2-lane approach drivers' view of the offside primary signal could be obscured by high-sided vehicles in the adjacent lane. This may lead to failure to comply with a red traffic signal resulting in collisions with crossing pedestrians and cyclists.

Recommendation – that ADS11 is relocated outside the signal visibility splay. It appears that siting on the offside might be a practicable alternative.

Designers Response:

Noted –
To be reviewed, sign could go on the offside but exact position to be confirmed.

5.2 Problem – collisions with NMUs unexpectedly entering carriageway

Location – proposed footway/cycleway, various

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The Audit Team noted a number of existing street lighting and other columns that lie within the proposed footway/cycleway. No details have been provided regarding their relocation, raising concern that they will restrict the usable width of the facility. This creates potential for conflict between users which could lead to a pedestrian or cyclist unexpectedly entering the carriageway, being struck by a passing vehicle.

Recommendation – that existing street lighting columns and other sign posts should be relocated to the rear of the proposed footway/cycleway.

Designers Response:

Agree –
Proposed columns to be located at the back of path on the verge behind pin curbs to maximise footpath/cycleway width.

5.3 Problem – vehicle collisions with crossing NMUs in darkness

Location – proposed signalised crossings

Street lighting proposals have not been submitted; however the Audit Team have concerns over safety of the proposed signalised crossings at night. At these locations it is important that drivers can see NMUs crossing or waiting to cross, in order to anticipate and react accordingly. Inadequate crossing illumination could result in late driver awareness, leading to collisions with NMUs.

Recommendation – that the lighting design takes into account the proposed crossing locations to ensure night-time conspicuity of NMUs at/on the crossings.

Designers Response:

Noted –
The street lighting for the signalised crossing has been designed in accordance with BS5489.

5.4 Problem – collision with non-passive street furniture increases accident severity

Location – A47 slip roads

The Audit Team are not clear if use of passive posts is proposed. Impact with non-passive street furniture increases the risk of fatal or serious injury. This is a particular

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concern on the trunk slip roads due to the heavy traffic flows and potential for higher speeds in these locations.

Recommendation - that posts on the trunk slip roads should be passively safe. The appropriate product should be chosen to minimise risk of secondary harm to NMUs by any dislodged post/sign.

Designers Response:

Partly Agree –
Details such as passive posts are set out in the Signage Schedule. Signs along the trunk slip road which require illumination will be reviewed to determine if these can be passively safe.

Passively safe posts have not been specified for proposed lighting columns but can be changed.

5.5 Problem – head-on collision due to mistaken turn

Location – A47 westbound off-slip at proposed signalised junction

The offside lane is shown marked with a right turn arrow (as existing). However the change to signal control could introduce potential for a driver to mistakenly turn right at the signals themselves (rather than negotiate the tear drop), leading to head-on collision with opposing traffic.

Recommendation – the Audit Team consider this risk to be low but recommend that an extra pair of 'confirmation' arrow markings are placed on the circulatory lanes some 15-20m after the stop line to help further mitigate the risk. This would also help clarify correct use of both lanes for turning right.

Designers Response:

Noted –
There are chevron signs on the tear drop directing all traffic to the left. The alignment of the approach would make turning right very difficult. Additional road markings would provide little benefit and would require additional maintenance

5.6 Problem – vehicle collisions with crossing NMUs

Location – A47 westbound on-slip signalised crossing

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There is some concern that the proposed crossing may lack conspicuity in this location. Late driver awareness, exacerbated by the curving approaches, would raise the risk of failure to stop and collision with crossing NMUs.

Recommendation –that an extra pair of zig-zag markings is placed on the approach lane to further enhance crossing conspicuity.

Designers Response:

Noted –
The purpose of zig-zag markings is not to enhance the crossing conspicuity. The current design is standard with 8 2m marks either side,9 marks either side is permitted but an odd number of marks is not normal practice. 10 marks would extend into the roundabout.

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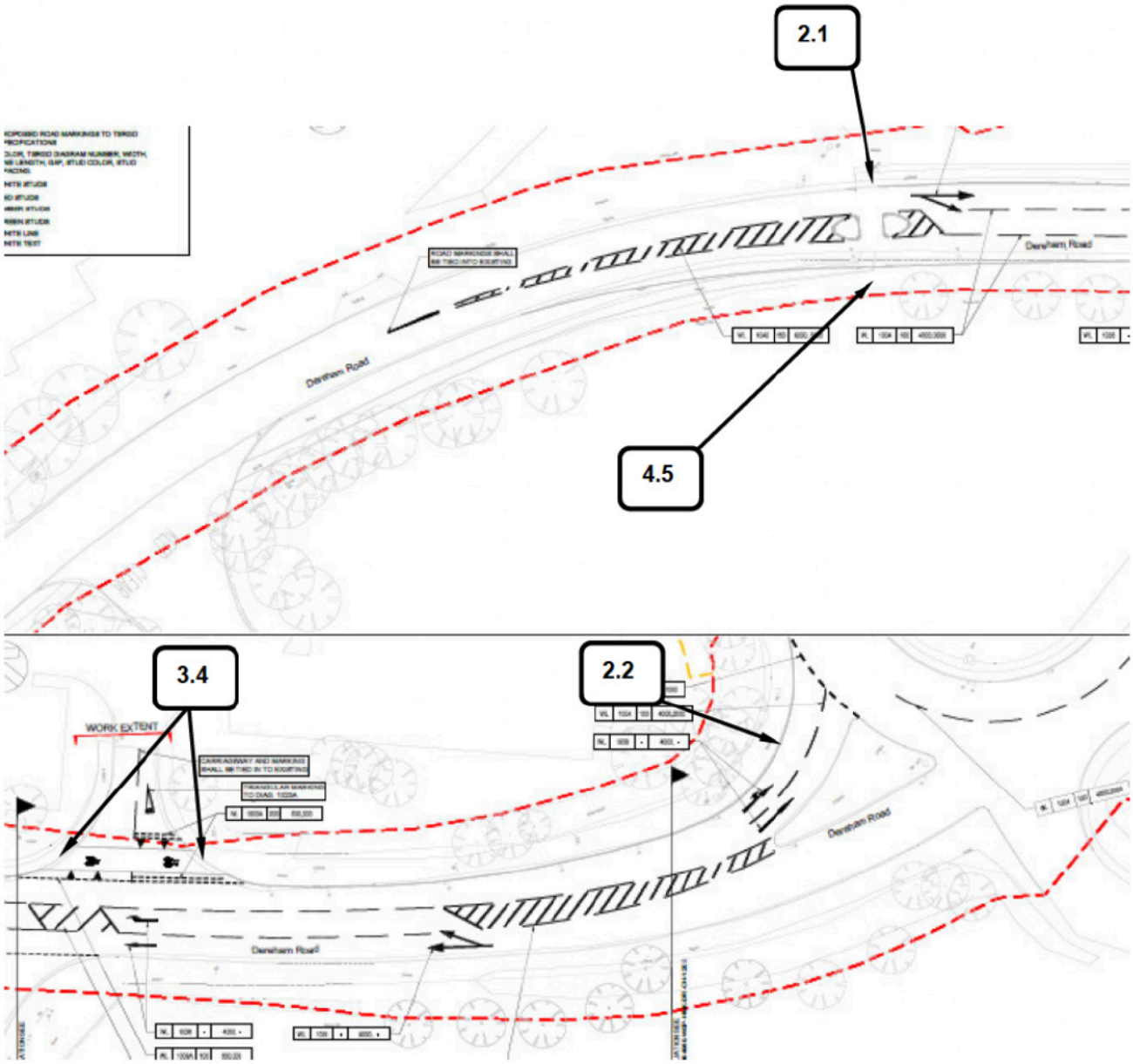
6.0 Problem Location Plans



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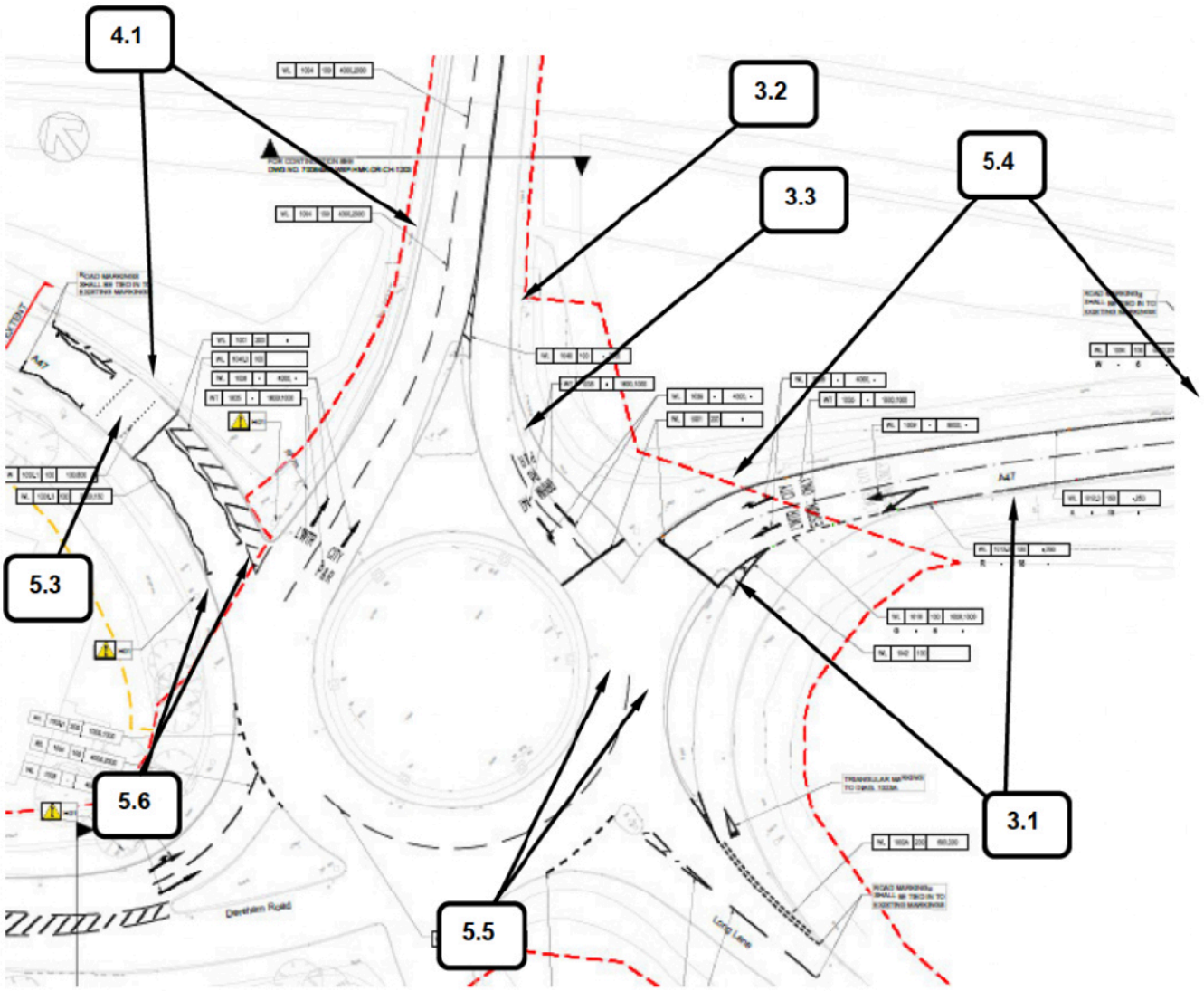

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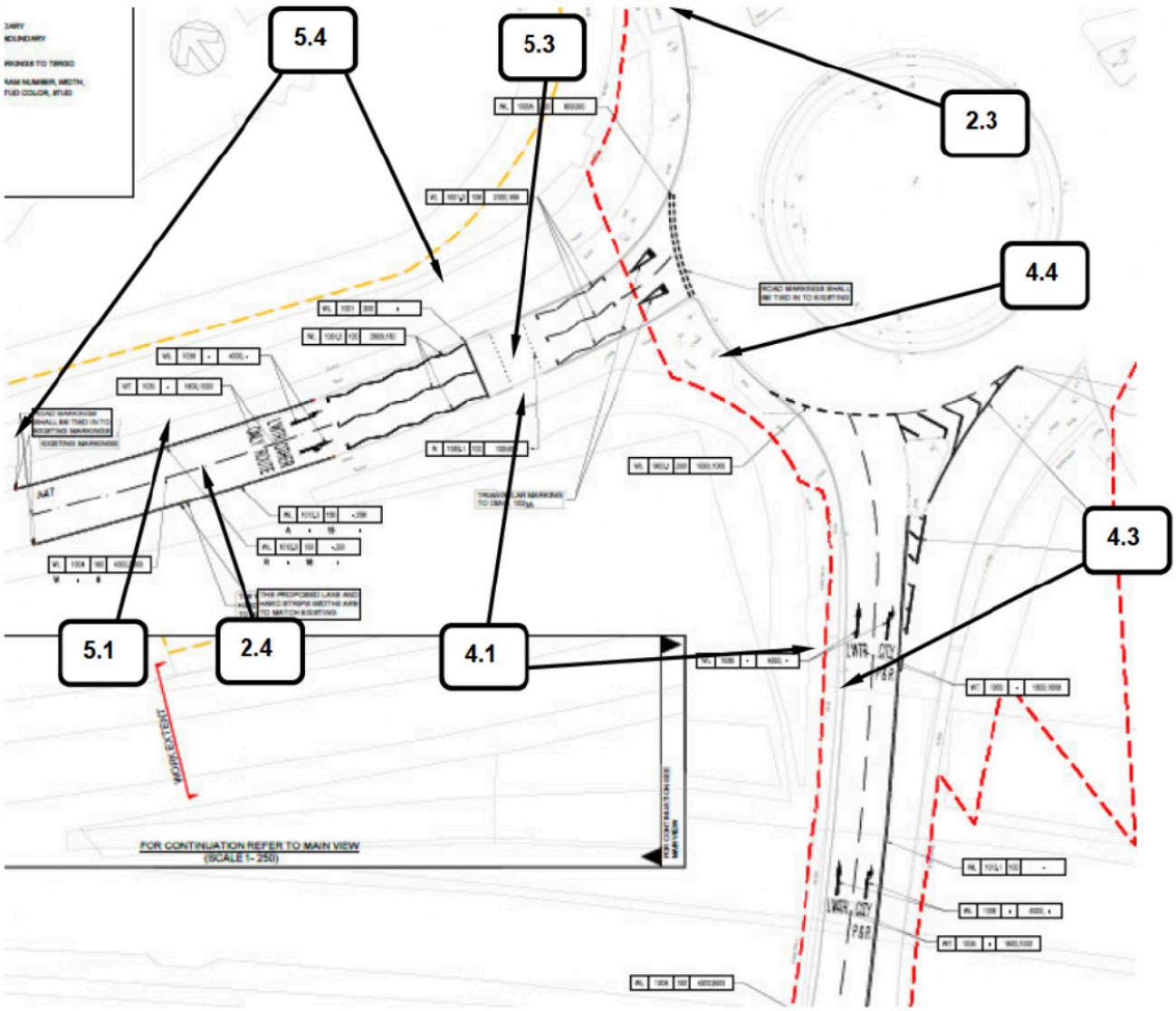

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AUDIT TEAM STATEMENT

We certify that this audit has been carried out in accordance with GG 119 *Road Safety Audit*.

Signed (ATL)
Dated 19 May 2023

Signed .....
Dated 18 May 2023

Signed .....
Dated 19 May 2023

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APPENDIX A: Audit Brief

The following documents were submitted for this Road Safety Audit:

Document Ref.	Scale (if applicable)	Title
A1074/018		RSA1 Report & Designer Response
70084960 – WSP – RSA2 Brief Rev2		Audit Brief
70084960 series		Scheme drgs as listed in the Brief
3 yr road accident details	N/A	Provided by NCC

Departure from standard DFS-GEO-003 was submitted, regarding southbound forward visibility on approach to the tear-drop junction.

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