# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>INTRODUCTION</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>SITE DESCRIPTION</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>MATTERS ARISING FROM THIS STAGE 1 ROAD SAFETY AUDIT</td>
<td>4</td>
</tr>
<tr>
<td>A</td>
<td>GENERAL</td>
<td>4</td>
</tr>
<tr>
<td>B</td>
<td>LOCAL ALIGNMENT</td>
<td>10</td>
</tr>
<tr>
<td>C</td>
<td>JUNCTIONS</td>
<td>11</td>
</tr>
<tr>
<td>D</td>
<td>NON MOTORISED USER PROVISION</td>
<td>17</td>
</tr>
<tr>
<td>E</td>
<td>ROAD SIGNS, ROAD MARKINGS AND LIGHTING</td>
<td>18</td>
</tr>
<tr>
<td>4</td>
<td>AUDIT TEAM STATEMENT</td>
<td>22</td>
</tr>
<tr>
<td>APPENDIX A</td>
<td>LIST OF DRAWINGS, DOCUMENTS AND DEPARTURES FROM STANDARDS</td>
<td>23</td>
</tr>
<tr>
<td>APPENDIX B</td>
<td>PROBLEM LOCATION PLANS</td>
<td>25</td>
</tr>
</tbody>
</table>
1 INTRODUCTION

1.1 This report results from a stage 1 road safety audit carried out on the M4 Smart Motorway All Lane Running (MM-ALR) Junction 3 – Junction 12 scheme at the request of the Project Sponsor, Lynne Stinson (Highways Agency, Birmingham).

1.2 The Audit Team consisted of the following members:

1. Stuart Dungworth
   IEng FIHE MCIHT RegRSA (IHE)
   Audit Team Leader
   URS Infrastructure & Environment UK Limited

2. Colin Bancroft
   BSc (Hons), PCHTE, MCIHT, MSoRSA
   Audit Team Member
   URS Infrastructure & Environment UK Limited

3. Pete Denton
   BSc (Hons), DipASM, MCIHT, MSoRSA
   Audit Team Member
   URS Infrastructure & Environment UK Limited

4. Jamie Stone
   BEng (Hons) TMICE MSoRSA
   Audit Team Member
   URS Infrastructure & Environment UK Limited

1.3 The audit was undertaken in accordance with the Stage 1 Road Safety Audit Brief (514451-MUH-00-ZZ-IS-HS-300197 dated May 2014). The audit comprised of an examination of the documents provided by the design team, which are listed in Appendix A and an examination of the site during the hours of daylight. The road safety audit team have been provided with the following design elements for use in preparing this stage 1 road safety audit report:

- M4 Junction 3 to 12 Mainline General Arrangement;
- Bridge Structure General Arrangement;
- Environmental;
- Side Road Alignments; and
- Proposed Street Lighting Layout.

1.4 The audit site visit took place during the hours of daylight on 8th October 2014. The weather conditions during the site visit were cloudy, bright and dry. The road surface was dry. The site visit was carried out during the off-peak period between the hours of 11:00pm and 3:30pm when traffic was flowing freely. There was a section of temporary traffic management with a reduced speed limit (50mph) where maintenance works were being carried out on the westbound carriageway in the vicinity of junction 12.

1.5 The terms of reference of the audit are as described in the Highways Agency’s Design Manual for Roads and Bridges (DMRB) document HD 19/03 ‘Road Safety Audit’. The advice issued in the DMRB applies to trunk road and motorway highway improvement schemes.

1.6 The audit team have been advised by the project sponsor that no previous stage 1 road safety audits have been carried out as part of the M4 MM-ALR scheme between junction 3 and junction 12.
1.7 The scheme has been examined, and this report compiled, only with regard to the safety implications to road users of the scheme as presented. It has not been examined or verified for compliance with any other standards or criteria. However, to clearly explain a safety problem or the recommendation to resolve a problem, the Audit Team may, on occasion, have referred to a design standard without touching on technical audit.

1.8 An absence of any comment relating to specific road users / modes in Section 3 of this report does not imply that they have not been considered; instead the audit team feel that they are not adversely affected by the proposed changes.

1.9 Nothing in this Audit should be regarded as a direct instruction to include or remove a measure from within the scheme. Responsibility for designing the scheme lies with the Designer and as such the Audit Team accepts no design responsibility for any changes made to the scheme as a result of this Audit.

1.10 Unless general to the scheme, each problem has been identified with reference to scheme chainage points. The locations of the problems are marked on the drawings located in Appendix B.
2 SITE DESCRIPTION

2.1 The Highways Agency is proposing to improve the M4 by making it a "smart motorway" (previously known as managed motorways) between junctions 3 and 12. Smart motorways help relieve congestion by using technology to vary speed limits. This allows the hard shoulder to be converted to a permanent running lane, resulting in all lane running (4 lanes) with no hard shoulder facility. They deliver these benefits at a significantly lower cost than conventional motorway widening and with less impact on the environment during construction.

2.2 M4 J3-J12 MM-ALR (Hounslow to Reading) is being developed by the Alliance (URS, Mouchel and Hyder-Halcrow) JV.

2.3 The M4 is a motorway which runs between London and South Wales with major towns and cities located along the route which include Reading, Swindon, Bristol, Cardiff and Swansea.

2.4 The M4 runs close to the A4 from London to Bristol. After crossing the River Severn it follows the A48 through South Wales, using the Brynglas Tunnels at Junction 25a, Newport and terminates just north of Pontarddulais. The area of land along the M4, with its towns and cities, is known as the M4 corridor. European route E30 includes the M4, although the M4 is not signed as such in England or Wales.

2.5 The M4 is currently to motorway standards with a national 70mph speed limit and 60mph east of junction 4 (eastbound carriageway). Land use along the scheme extents varies from rural, agricultural land to industrial and residential areas. All junctions between and including junction 3 and 12 are grade separated junctions.

Scheme Description

2.6 The works include construction of a rigid concrete safety barrier in the central reserve, construction of a paved surface and amendments to the surface and sub-surface drainage network within the central reserve to facilitate all lane running.

2.7 The works include all aspects associated with a Managed Motorway scheme, and the design follows the principals of IAN 161/13, Managed Motorways All Lane Running, Highways Agency, dated August 2013. Works will include the introduction of:

- Emergency Refuge Areas (ERA)
- Signal and sign gantries
- Cantilever MS4 signs
- Alterations/replacement of existing bridge structures
- Alteration to the exiting merge/diverge areas
3 MATTERS ARISING FROM THIS STAGE 1 ROAD SAFETY AUDIT

A GENERAL

A1 DEPARTURES FROM STANDARDS

A list of the Departures from Standards as part of the M4 J3-J12 Smart Motorway All Lane Running scheme was provided to the audit team. At the time of carrying out this road safety audit, there is no indication that these have, or will be approved. However, the majority of the departures relate to the tolerance restrictions applied to the position of the gantries and the visibility of the signs mounted on the gantries.

The audit team have reviewed the Departures from Standards Checklist and can confirm that from the details provided there are no issues that were considered to be detrimental to the safety of road users.

A2 DRAINAGE

Drawings for this design element were not submitted as part of this stage 1 road safety audit. The below issue was noted during the site inspection.

A2.1 PROBLEM

Drawing(s): N/A
Location: Entire scheme.
Summary: Existing surface water ponding leading to loss of control collisions.

It was noted during the site inspection that water was ponding along the hardshoulder, junction 4b westbound. If these, and other lengths, of the carriageway suffer from ponding following the introduction of all lane running there is an increased risk of loss of control type collisions during periods of heavy rain.

RECOMMENDATION

During the detailed design stage ensure that the carriageway drains sufficiently to limit the risk of ponding occurring.

A3 LANDSCAPING

A3.1 PROBLEM

Drawing(s): N/A
Location: Entire scheme.
Summary: Existing vegetation masking signs leading to collisions.

It was noted during the site inspection that areas of verge along the length of the scheme has mature vegetation coverage. If these areas are not affected by the works there is a risk that the vegetation may remain leading to new signage, located in the
verge area, to be masked from approaching traffic. If signs are masked there is an increased risk of collisions occurring due to hesitation or lane manoeuvres.

**RECOMMENDATION**

During the detailed design stage ensure that areas of existing vegetation do not result in proposed signage being masked to approaching drivers or restricted forward visibility (SSD).

**A4 PUBLIC UTILITIES/SERVICE APPARATUS**

Drawings for this design element were not submitted as part of this stage 1 road safety audit.

**A5 LAY-BYS**

**A5.1 PROBLEM**

**Drawing(s): N/A**

**Location: Entire scheme.**

**Summary:** Retention of Maintenance Access Areas (MAA) may increase the likelihood of collisions occurring.

IAN 161/13 advocates the removal of MAAs unless justification for their presence can be promoted. There are concerns that if the existing MAAs remain on the M4 mainline, collisions with other road users in lane 1 may occur as maintenance vehicles attempt to enter or leave the mainline.

**RECOMMENDATION**

It is recommended that the existing MAAs along the route are removed from the MM-ALR scheme unless justification can be agreed. In the case where a MAA is justified a procedure for entering and leaving the MAAs in a forward gear should be incorporated into the relevant Safety Operational Manual.

**A5.2 PROBLEM**

**Drawing(s): N/A**

**Location: Entire scheme.**

**Summary:** Existing police observation platforms remaining along the M4 may increase the likelihood of collisions occurring.

Vehicles using the existing police observation platforms will be required to slow down in advance of the platforms and possibly attempt to reverse from lane 1 in front of following traffic. This may lead to heavy braking, loss of control and shunt type collisions involving following traffic.

**RECOMMENDATION**
Subject to agreement with the Police, remove existing observation platforms. If facilities are to be retained that there is sufficient hardened space available on the verge for police vehicles to leave and enter the mainline in a forward gear, rather than reversing into the refuge from lane 1.

A5.3 PROBLEM

Drawing(s): N/A
Location: Various ERAs.
Summary: Embankment slope leading to pedestrian falls and injury.

During the site inspection it was noted that a number of ERA will be located where the M4 is on embankment. If passengers of stationary vehicles seek refuge on the verge behind these ERAs there is a risk of falls and injuries occurring due to no protection of the embankments.

RECOMMENDATION

Provide post and wire fencing to protect embankment slopes behind ERA facilities.

A5.4 PROBLEM

Drawing(s): 514451-MUH-ML-ZZ-DR-GA-300329-1D.
Location: Junction 11 diverges.
Summary: Spacing of ERA leading to shunt type collisions.

The drawings provided appear to indicate that the existing hardshoulders located on both the eastbound and westbound diverge slip roads will be removed as part of the proposed scheme. However, the spacing of the mainline ERAs appears to have used the junction diverge slip roads as ERA. IAN 161/13 states that an exit slip with a hardshoulder can be used as a refuge area. If the hardshoulders on the slip roads are removed it could result in spacing between ERAs becoming excessive. This would increase the risk of vehicles stopping in live running lanes leading to shunt type collisions.

RECOMMENDATION

Ensure that spacing between ERAs complies with IAN 161/13 by either providing hardshoulders on the diverge slip roads or increasing the number of ERAs on the mainline.

A5.5 PROBLEM

Drawing(s): 514451-MUH-ML-ZZ-DR-GA-300340-1D & 300341-1D.
Location: Junction 8/9 diverges.
Summary: Spacing of ERA leading to shunt type collisions.

The drawings provided appear to indicate that the existing hardshoulders located on both the eastbound and westbound diverge slip roads will be removed as part of the proposed scheme. However, the spacing of the mainline ERAs appears to have used
the junction diverge slip roads as ERA. IAN 161/13 states that an exit slip with a hardshoulder can be used as a refuge area. If the hardshoulders on the slip roads are removed it could result in spacing between ERAs becoming excessive. This would increase the risk of vehicles stopping in live running lanes leading to shunt type collisions.

RECOMMENDATION

Ensure that spacing between ERAs complies with IAN 161/13 by either providing hardshoulders on the diverge slip roads or increasing the number of ERAs on the mainline.

A5.6 PROBLEM

Drawing(s): 514451-MUH-ML-ZZ-DR-GA-300342-1D.
Location: ERA E6-A1.
Summary: Vertical drop leading to personal injuries.

ERA E6-A1 appears to be located at a point where there is limited space and potential level differences. This may result in vertical drops to the back of the ERA leading to falls and personal injury.

RECOMMENDATION

Ensure that any vertical drop to the rear of the ERA is adequately protected or relocate the ERA.

A5.7 PROBLEM

Drawing(s): 514451-MUH-ML-ZZ-DR-GA-300345-1D.
Location: Junction 6 westbound diverge.
Summary: Spacing of ERAs leading to shunt type collisions.

The drawings provided appear to indicate that the existing hardshoulders located on the westbound diverge slip road will be removed as part of the proposed scheme. However, the spacing of the mainline ERAs appears to have used the junction diverge slip road as ERA. IAN 161/13 states that an exit slip with a hardshoulder can be used as a refuge area. If the hardshoulders on the slip roads are removed it could result in spacing between ERAs becoming excessive. This would increase the risk of vehicles stopping in live running lanes leading to shunt type collisions.

RECOMMENDATION

Ensure that spacing between ERAs complies with IAN 161/13 by either providing a hardshoulder on the diverge slip road or increasing the number of ERAs on the mainline.

A5.8 PROBLEM

Drawing(s): 514451-MUH-ML-ZZ-DR-GA-300347-1D.
Location: ERA E4-B1 & E4-A1.
Summary: Reduced visibility leading to shunt type collisions.

ERA E4-B1 is located on the inside of a bend and E4-A1 is located just beyond a MS4 cantilever gantry. For these reasons visibility of, or from, the ERAs could be reduced resulting in an increased risk of collisions either due to sudden braking to enter the ERAs or vehicles exiting into the path of oncoming vehicles.

**RECOMMENDATION**

Ensure that the required visibility distance can be attained at these locations.

A5.9 **PROBLEM**

Drawing(s): 514451-MUH-ML-ZZ-DR-GA-300351-1D.

Location: ERA E2-B1.

Summary: ERA located after the 1/3 mile ADS leading to collisions.

ERA E2-B1 is located after the 1/3 mile ADS sign. IAN 161/13 states this should be avoided due to the risk of drivers mistaking the ERA for the junction exit.

**RECOMMENDATION**

Reposition either the ERA or ADS such that the sign is located downstream of the ADS.

A5.10 **PROBLEM**

Drawing(s): 514451-MUH-ML-ZZ-DR-GA-300353-1D.


Summary: ERA located after the 1/2 mile ADS leading to collisions.

ERA E1-A1 is located after the 1/2 mile ADS sign. IAN 161/13 states this should be avoided due to the risk of drivers mistaking the ERA for the junction exit.

**RECOMMENDATION**

Reposition either the ERA or ADS such that the sign is located downstream of the ADS.

A5.11 **PROBLEM**

Drawing(s): 514451-MUH-ML-ZZ-DR-GA-300353-1D.

Location: ERA E1-B1.

Summary: Spacing of ERAs leading to shunt collisions.
ERA E1-B1 is located 2.7km after the preceeding ERA. IAN 161/13 states the maximum distance between refuge areas should be no greater than 2.5km. Excessive spacing will increase the risk of shunt collisions due to vehicles stopping on the mainline.

RECOMMENDATION

Review the positioning of the ERA to reduce the distance between consecutive ERAs to 2.5km or less.

A6 ACCESS

A6.1 PROBLEM

Drawing(s): 514451-MUH-ML-ZZ-DR-GA-300331-1D.

Location: Existing maintenance building; chainage 52000.

Summary: Accessibility of the existing maintenance building may lead to collisions between maintenance vehicles and other road users.

There is an existing building located at approximate chainage 52000 within the eastbound nearside verge that is currently accessed via the mainline carriageway. If the building and access is required to remain under the proposed SM-ALR, there are concerns that collisions may occur between road users travelling within lane 1 and maintenance vehicles as they enter and leave the carriageway.

RECOMMENDATION

Provide sufficient surfacing for vehicles to enter and leave the mainline in a forward gear and that the procedure for entering and leaving this area in a forward gear is incorporated into the relevant Safety Operational Manual. Alternatively, review the possibility of accessing the building from Lower Earley Way.

A6.2 PROBLEM

Drawing(s): 514451-MUH-ML-ZZ-DR-GA-300327-1D.

Location: Eastbound Motorway Services Area (MSA).

Summary: Late or sudden lane change manoeuvres leading to collisions.

The eastbound MSA is located approximately 2km beyond the start of all lane running (4 lanes). There is a risk that drivers wishing to access the MSA will continue to run in LBS2 and will not appreciate the need to cross an additional lane resulting in potential collisions as a result of sudden or late lane change manoeuvres.

RECOMMENDATION

Ensure that the proposed signage for the MSA takes into consideration the change in road layout.

A6.3 PROBLEM

Drawing(s): M4MM-MUH-ST-S2-DR-BD-300001-1A
Location: Maintenance steps.

Summary: Lack of MAA leading to collisions

No MAA have been detailed within the vicinity of the maintenance steps. If operatives park in a hazardous location there is an increased risk of collisions.

RECOMMENDATION

Ensure safe parking locations are provided on the side roads for operatives accessing the maintenance steps.

A6.4 PROBLEM

Drawing(s): 514451-MUH-ML-ZZ-DR-GA-300599

Location: Maintenance steps.

Summary: Lack of MAA leading to collisions

No MAA has been detailed within the vicinity of the existing maintenance steps. If operatives park in a hazardous location there is an increased risk of collisions.

RECOMMENDATION

Ensure safe parking locations are provided on the side roads for operatives accessing the maintenance steps.

A7 SKID RESISTANCE

Drawings for this design element were not submitted as part of this stage 1 road safety audit.

A8 AGRICULTURE

No issues that were considered to be detrimental to the safety of road users were identified in relation to this subject.

A9 FENCES & ROAD RESTRAINT SYSTEMS

Drawings for this design element were not submitted as part of this stage 1 road safety audit.

A10 BRIDGE PARAPETS

See Section D2

A11 ADJACENT DEVELOPMENTS & ROADS

No issues that were considered to be detrimental to the safety of road users were identified in relation to this subject.

B LOCAL ALIGNMENT

B1 VISIBILITY
No issues that were considered to be detrimental to the safety of road users were identified in relation to this subject.

**B2 NEW/EXISTING ROAD INTERFACE**

No issues that were considered to be detrimental to the safety of road users were identified in relation to this subject.

**C JUNCTIONS**

**C1 LAYOUT**

No issues that were considered to be detrimental to the safety of road users were identified in relation to this subject.

**C2 VISIBILITY**

**C2.1 PROBLEM**

Drawing(s): 514451-MUH-ML-ZZ-DR-GA-300345-1D.

Location: Junction 6 Eastbound Merge.

Summary: Reduced visibility leading to side swipe or shunt type collisions.

The proposed layout results in lane two of the merge slip road approaching the mainline at a sharp angle. This along with the level differences between the slip-road and the mainline may result in visibility on approach and at the merge area being reduced. If there is reduction in available visibility there is an increased risk of collisions involving vehicles entering the mainline into the path of traffic in LBS1 and high speed collisions may occur.

**RECOMMENDATION**

Ensure that adequate visibility can be attained at the merge area.

**C2.2 PROBLEM**

Drawing(s): 514451-MUH-ML-ZZ-DR-GA-300349-1D.

Location: Junction 5 Eastbound Merge.

Summary: Reduced visibility leading to side swipe or shunt type collisions.

The proposed layout results in lane two of the merge slip road approaching the mainline where the level differences between the slip-road and the mainline is heightened. This may result in visibility on the approach and at the merge area being
reduced. If there is reduction in available visibility there is an increased risk of collisions involving vehicles entering the mainline in conflict with passing traffic.

**RECOMMENDATION**

Ensure that adequate visibility can be attained at the merge area.

**C3 SIGNING**

**C3.1 PROBLEM**

Drawing(s): 514451-MUH-ML-ZZ-DR-GA-300325-1D.

Location: Sign G9-19.

Summary: Poor sign positioning leading to collisions.

The proposed sign is positioned at a point where the lane drop diverge flares from one to two lanes which may result in lane arrows not being directly over the relevant running lanes. If the lane arrows are not centralised there is an increased risk of vehicles straying from there running lane leading to shunt or side swipe type collisions.

**RECOMMENDATION**

Ensure the sign is positioned in advance of the flare such that all lane arrows are centralised over their relevant running lanes.

**C3.2 PROBLEM**

Drawing(s): 514451-MUH-ML-ZZ-DR-GA-300325-1D.

Location: Westbound diverge slip road.

Summary: Poor lane choice leading to lane change collisions.

The exit slip flares from two to four lanes on approach to the roundabout control point. The existing approach does not provide sufficient advance information to enable drivers to choose the correct lane on the approach to the roundabout, this could lead to unnecessary and late lane change manoeuvres occurring and increasing the risk of collisions.

**RECOMMENDATION**

Introduce additional signage in advance of the flare point to encourage early lane choice.

**C3.3 PROBLEM**

Drawing(s): 514451-MUH-ML-ZZ-DR-GA-300326-1D & 300327-1D

Location: ERA E9-B3 & ERA E9-A2.

Summary: Sign positioning leading to collisions.
There is an existing MSA signs located in the vicinity of the proposed ERA facilities. There is a risk that the signs will create a barrier to visibility in the vicinity of the ERA leading to potential collisions. Additionally, the signs may create driver confusion if they are located before the ERA with the risk of drivers inadvertently mistaking the ERAs for the exit points for the MSA.

RECOMMENDATION

Ensure the signs do not impede visibility or cause driver confusion.

C3.4 PROBLEM

Drawing(s): 514451-MUH-ML-ZZ-DR-GA-300329-1D & 300330-1D.

Location: Junction 11 diverges.

Summary: Missing signage leading to shunt or lane change type collisions.

Both diverges for junction 11 are double diverges but there is no advance signage detailed to convey this to approaching drivers. Signage has been detailed for junction 8/9 that has a similar diverge. There is a risk that the majority of drivers, being unaware of the second diverge, will exit into lane one. As the slip road flares from two to four lanes at the roundabout there is an increased risk of late and sudden lane change manoeuvres leading to collisions.

RECOMMENDATION

Introduce signage that informs approaching drivers of the double diverge. It would be preferable if this signage, or additional signage, conveyed the destinations reached via the two diverges. This would further reduce the need for drivers to change lanes on the slip road.

C3.5 PROBLEM

Drawing(s): 514451-MUH-ML-ZZ-DR-GA-300343-1D.

Location: Sign G6-02.

Summary: Sign masking leading to shunt or lane change collisions

Gantry sign G6-02 is located after Lake End Road overbridge structure. There is a risk that the higher portion of the sign, the exit sign, will be masked by the bridge structure reducing the forward visibility. If the forward visibility is reduced there is an increased risk of shunt or lane change type collisions on approach to the diverge area.
RECOMMENDATION
Relocate the sign to ensure the appropriate forward visibility of the entire sign face can be attained.

C3.6 PROBLEM
Drawing(s): 514451-MUH-ML-ZZ-DR-GA-300343-1D.
Location: Eastbound and Westbound merge slip roads.
Summary: High entry speeds leading to collisions.

The layout of Huntcombe Spur may result in higher than normal approach speeds to the merge areas. If the M4 is subject to a reduced speed limit there is an increased risk of collisions involving vehicles attempting to merge at a higher speed.

RECOMMENDATION
Introduce AMIs onto the link to reduce vehicle speeds in advance of the merge areas.

C3.7 PROBLEM
Drawing(s): 514451-MUH-ML-ZZ-DR-GA-300344-1D.
Location: Sign G5-08.
Summary: Confusing sign leading to lane change collisions

Gantry sign G5-08, exit sign, is located over lanes 3 and 4, this results in the sign looking unusual compared to all other signs along the route. There is a risk that this sign will result in driver confusion and potential collisions.

RECOMMENDATION
Reposition the sign such that it is over lane 1.

C3.8 PROBLEM
Drawing(s): 514451-MUH-ML-ZZ-DR-GA-300351-1D.
Location: Sign G2-15.
Summary: Sign location leading to lane change type collisions.

Sign G2-15 is located approx. 100m in advance of the hatched median between lane 1 and 2 of the merge slip road. The final sign design may indicate individual destination reached via the two lanes, this may encourage drivers to make sudden lane change manoeuvres in advance of the hatched median. If this occurs the likelihood of lane change type collisions is increased.

RECOMMENDATION
Reposition the sign such that the offset between the sign and the hatched median is maximised.

C3.9  PROBLEM

Drawing(s): 514451-MUH-ML-ZZ-DR-GA-300352-1D.

Location: Sign G2-02.

Summary: Sign location leading to lane change type collisions.

Sign G2-02 is located approx. 50m in advance of the hatched median between lane 1 and 2 of the merge slip road. The final sign design may indicate individual destination reached via the two lanes, this may encourage drivers to make sudden lane change manoeuvres in advance of the hatched median. If this occurs the likelihood of lane change type collisions is increased.

This sign may also result in unnecessary lane changes taking place as both lanes merge into a single lane while the sign does not clearly convey.

RECOMMENDATION

Reposition the sign such that the offset between the sign and the hatched median is maximised and review the sign face design drawing detailed design stage.

C3.10  PROBLEM

Drawing(s): 514451-MUH-ML-ZZ-DR-GA-300354-1D.

Location: Westbound 1 1/3 mile ADS, Junction3.

Summary: Sign position leading to shunt type collisions.

The sign is positioned on an overbridge structure in advance of junction 3 westbound merge area. There is a risk that drivers will not appreciate the sign is 1 1/3 miles in advance of the diverge area. As such, drivers may misinterpret the road layout resulting in driver hesitation, inappropriate manoeuvres or attempting to exit into the merge area. Due to this there will be an increased risk of collisions occurring within the mainline merge area.

In addition to this the audit team are concerned that fixing the proposed sign to the bridge structure will be problematic and may create ongoing maintenance issues.
RECOMMENDATION

Reconsider the requirement/need for providing this ADS considering the design also details a ¼ and ½ mile ADS in advance of the westbound junction 4 diverge slip road.

C4 ROAD MARKINGS

Drawings for this design element were not submitted as part of this stage 1 road safety audit.

C5 TRAFFIC SIGNALS

C5.1 PROBLEM

Drawing(s): N/A

Location: Ramp metering at merge slip roads within the extents of the scheme.

Summary: Existing ramp metering facilities conflict with the proposed road layout.

It is unclear from the details provided at this stage whether or not the ramp metering located at the junction merge slip roads is to remain under the MM-ALR scheme. Due to the change in road layout, there are concerns that if the facility remains, drivers may not be expecting to stop on the merge slip road leading to late braking and shunt type collisions occurring.

RECOMMENDATION

It is recommended that the ramp metering is either removed or the control point is relocated in conjunction with the proposed road layout.

C5.2 PROBLEM

Drawing(s): 514451-MUH-ML-ZZ-DR-GA-300343-1D

Location: MS4 sign G6-07.

Summary: Limited space leading to vehicle strikes.

It was noted during the site inspection that at the point G6-07 is detailed there is limited verge width which may result in inadequate lateral clearance to the sign assembly. If sufficient lateral clearance is not achieved there is an increased risk of any collision severity being increased if an errant vehicle was to leave the carriageway at this location.

RECOMMENDATION

It is recommended that G6-07 is relocated to a point where additional verge width is available.
D  NON MOTORISED USER PROVISION

D1  ADJACENT LAND

No issues that were considered to be detrimental to the safety of road users were identified in relation to this subject.

D2  FOOTWAYS/CYCLETRACKS

D2.1  PROBLEM

Drawing(s): N/A

Location: Various side roads.

Summary: Restricted shared facility width leading to conflicts.

A number of shared facilities are detailed as 2m in width, this is the absolute minimum width permitted over long lengths of facility. There is a concern that only providing the minimum width will increase the risk of NMU conflicts if the routes are to be utilised by cyclists.

RECOMMENDATION

Where the footways are to be designated as shared facilities the potential of increasing the width of the facilities to a minimum of 2.5m needs to be investigated during detailed design.

D2.2  PROBLEM

Drawing(s): 514451-MUH-SR-ZZ-DR-GA-300599.

Location: Ascot Road side road.

Summary: Continuity of cyctrack facility leading to NMU collisions.

The shared facility is detailed as ending at the northern extents of the scheme. At this point no facilities have been detailed to enable users to access and egress the facility.

RECOMMENDATION

At detailed design the shared facility should be furnished with access/egress and crossing points to ensure the facility can be used safely.

D2.3  PROBLEM

Drawing(s): 514451-MUH-SR-ZZ-DR-GA-300601.

Location: Marsh Lane side road.
Summary: Continuity of shared facility leading to NMU collisions.

The drawing details a cycle track on both sides of the carriageway for the extents of the re-alignment works. It was noted during the site inspection that there are only existing facilities on a single side of the carriageway. It is not clear how this short length of shared facility will be accessed from the carriageway, if adequate facilities are not provided there is an increased risk of collisions involving NMUs.

RECOMMENDATION

At detailed design the shared facility should be furnished with access/egress and crossing points to ensure the facility can be used safely.

D2.4 PROBLEM

Drawing(s): 514451-MUH-SR-ZZ-DR-GA-300606 & 300611.

Location: Oldway Lane & Old Slane Lane side road.

Summary: Parapet height resulting in NMU falls.

As this route is not open to traffic there is likely to be higher usage by cyclists and equestrians. If the parapets are of not a sufficient height to protect users there is an increased risk of falls from the structure.

RECOMMENDATION

At detailed design ensure that the parapet heights are of a sufficient height to protect all users from the hazard.

D2.5 PROBLEM

Drawing(s): 514451-MUH-SR-ZZ-DR-GA-300607, 300608, 300609 & 300610.

Location: Wood Lane, Datchet Road, Riding Court Road & Recreation Ground side roads.

Summary: Parapet height resulting in NMU falls.

It is unclear if the proposed footways will be designated as shared facilities. If they are and the parapets are of not a sufficient height to protect users there is an increased risk of falls from the structure.

RECOMMENDATION

At detailed design ensure that the parapet heights are of a sufficient height to protect users from the hazard.

E ROAD SIGNS, ROAD MARKINGS AND LIGHTING

E1 ROAD SIGNS
E1.1  PROBLEM

Drawing(s): 514451-MUH-ML-ZZ-DR-GA-300340-1D & 300341-1D.

Location: Junction 8/9 diverges.

Summary: Lack of speed limit signs leading to collisions.

The existing speed limit does not change as you exit the M4 onto the connecting road network therefore there are no existing speed limit signs on the diverge slip roads. Under the Smart Motorway scheme vehicles leaving the mainline could be doing so under a lower posted speed limit but there will not be any signage to inform them of the speed limit on the local network. This will result in driver confusion with regarding the proposed speed limit and potential conflicts due to variations in vehicle speeds.

RECOMMENDATION

Ensure terminal speed limit signage is provided for the local road network.

E1.2  PROBLEM

Drawing(s): 514451-MUH-ML-ZZ-DR-GA-300345-1D.

Location: Junction 6 diverges.

Summary: Lack of speed limit signs leading to collisions.

The existing speed limit does not change as you exit the M4 onto the connecting road network therefore there are no existing speed limit signs on the diverge slip roads. Under the Smart Motorway scheme vehicles leaving the mainline could be doing so under a lower posted speed limit but there will not be any signage to inform them of the speed limit on the local network. This will result in driver confusion with regarding the proposed speed limit and potential conflicts due to variations in vehicle speeds.

RECOMMENDATION

Ensure terminal speed limit signage is provided for the local road network.

E1.3  PROBLEM

Drawing(s): 514451-MUH-ML-ZZ-DR-GA-300352-1D.

Location: Eastbound permanent 60mph signs.

Summary: Uncertain speed limits leading to collisions.

It is unclear how the permanent 60mph will interact with the variable speed limit associated with the Smart Motorway scheme. If it is unclear what the correct speed limit is there is an increased risk of collisions due to differentials in vehicle speeds.

RECOMMENDATION

Remove the fixed speed limit signage from this length of Smart Motorway.

E2  LIGHTING
E2.1 PROBLEM

Drawing(s): N/A.

Location: All junctions diverge/merge slip roads.

Summary: Reduced visibility increasing the risk of collisions.

No details have been provided regarding changes to be made to ensure a smooth transition between proposed and existing lighting. If a consistent or smooth transition in lighting is not provided there is a risk of dark patches and associated collisions.

RECOMMENDATION

Ensure adequate lighting levels are maintained.

E2.2 PROBLEM

Drawing(s): 514451-MUH-ML-ZZ-DR-GA-300586-1R.

Location: Junction 7 slip roads.

Summary: Lack of street lighting increasing the risk of shunt or side swipe type collisions.

The westbound diverge & merge facilities are detailed as being realigned as part of the scheme. The drawings provided do not indicate any new lighting on the realigned slip road facilities. If lighting is not provided the merge and diverge areas will have reduced illumination increasing the risk of shunt or side swipe type collisions.

RECOMMENDATION

Provide street lighting on all the slip roads associated with junction 7.

E2.3 PROBLEM

Drawing(s): 514451-MUH-ML-ZZ-DR-GA-300594-1R.

Location: Chainage 14,600 to 15,500.

Summary: Lighting columns conflict with ERAs.

The lighting columns are detailed in the verge area between Ch.14,600 – 15,500. Within this section there is an eastbound and westbound ERA (Ch.15,100). If the lighting columns are set back to accommodate the ERAs there is a risk that the mainline may not be sufficiently illuminate leading to potential collisions due to dark patches.

RECOMMENDATION

Ensure the lighting design accommodates the ERAs and the additional off-set from the mainline carriageway.

E3 ROAD MARKINGS
Drawings for this design element were not submitted as part of this stage 1 road safety audit.

**E4 POLES & COLUMNS**

No issues that were considered to be detrimental to the safety of road users were identified in relation to this subject.
4   AUDIT TEAM STATEMENT

4.1 I certify that this audit has been carried out in accordance with Road Safety Audit Standard (HD 19/03).

AUDIT TEAM LEADER

Stuart Dungworth IEng, FIHE, MCIHT, RegRSA (IHE)

URS
Royal Court
Basil Close
Chesterfield
S41 7SL

Signed

Date 7th January 2015

AUDIT TEAM MEMBERS

Colin Bancroft BSc (Hons), PCHTE, MCIHT, MSoRSA

URS
Royal Court
Basil Close
Chesterfield
S41 7SL

Pete Denton BSc (Hons), DipASM, MCIHT, MSoRSA

URS
Royal Court
Basil Close
Chesterfield
S41 7SL

Jamie Stone BEng (Hons), TMICE, MSoRSA

URS
Royal Court
Basil Close
Chesterfield
S41 7SL

AUDIT TEAM OBSERVERS

There were no Audit Team Observers present during the site visit.
The following drawings, documents and departures from standards were submitted as part of the Road Safety Audit:

**Drawings**

<table>
<thead>
<tr>
<th>Document No.</th>
<th>Rev</th>
<th>Description</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>514451-MUH-ML-ZZ-DR-GA-300325-1D to 300354-1D</td>
<td>-</td>
<td>GENERAL ARRANGEMENT SHEETS (30 SHEETS)</td>
<td>24/07/2014</td>
</tr>
<tr>
<td>514451-MUH-ML-ZZ-DR-LE-300568-1R to 300598-1R</td>
<td>-</td>
<td>PROPOSED LIGHTING LAYOUT (31 SHEETS)</td>
<td>22/08/2014</td>
</tr>
<tr>
<td>514451-MUH-SR-ZZ-DR-GA-300599 to 300611</td>
<td>-</td>
<td>SIDE ROAD ALIGNMENT (13 SHEETS)</td>
<td>22/08/2014</td>
</tr>
<tr>
<td>514451-MUH-ST-ZZ-RP-OB-300373-001-0R &amp; 002-0R</td>
<td>-</td>
<td>OLD WAY GENERAL ARRANGEMENT</td>
<td>-</td>
</tr>
<tr>
<td>514451-MUH-ST-ZZ-RP-OB-300372-001-0R &amp; 002-0R</td>
<td>-</td>
<td>WOOD LANE GENERAL ARRANGEMENT</td>
<td>-</td>
</tr>
<tr>
<td>514451-MUH-ST-ZZ-RP-OB-300371-001-0R &amp; 002-0R</td>
<td>-</td>
<td>DATCHET ROAD GENERAL ARRANGEMENT</td>
<td>20/02/2014</td>
</tr>
<tr>
<td>514451-MUH-ST-ZZ-RP-OB-300370-001-0R &amp; 002-0R</td>
<td>-</td>
<td>RECREATION GROUND GENERAL ARRANGEMENT</td>
<td>-</td>
</tr>
<tr>
<td>514451-MUH-ST-ZZ-RP-OB-300369-001-0R &amp; 002-0R</td>
<td>-</td>
<td>RIDING COURT GENERAL ARRANGEMENT</td>
<td>-</td>
</tr>
<tr>
<td>514451-MUH-ST-ZZ-RP-OB-300368-001-0R &amp; 002-0R</td>
<td>-</td>
<td>OLD SLADE LANE GENERAL ARRANGEMENT</td>
<td>14/02/2014</td>
</tr>
<tr>
<td>514451-MUH-ST-78-DR-BD-300001-0D &amp; 300002-0D</td>
<td>-</td>
<td>THAMES BRAY UNDERBRIDGE WIDENING</td>
<td>-</td>
</tr>
<tr>
<td>514451-MUH-ST-66-DR-BD-300001-0D &amp; 300002-0D</td>
<td>-</td>
<td>WINDSOR BRANCH RAILWAY UNDERBRIDGE WIDENING</td>
<td>-</td>
</tr>
<tr>
<td>514451-MUH-ST-S2-DR-BD-300001-1A &amp; 300002-1A</td>
<td>-</td>
<td>LANGLEY INTERCHANGE UNDERBRIDGE WIDENING</td>
<td>28/02/2014</td>
</tr>
<tr>
<td>514451-MUH-ST-39-DR-BD-300500-1R</td>
<td>-</td>
<td>SIMPSON ROAD NORTH SUBWAY WIDENING</td>
<td>29/08/2014</td>
</tr>
<tr>
<td>DRAWING 8.1</td>
<td>-</td>
<td>PRELIMINARY ENVIRONMENTAL INFORMATION REPORT VISUAL EFFECTS DRAWINGS (16 SHEETS)</td>
<td>-</td>
</tr>
<tr>
<td>M4MM-MUH-ST-S2-DR-BD-300001-1A to 300002-1A</td>
<td>-</td>
<td>LANGLEY INTERCHANGE UNDERBRIDGES WIDENING (2 SHEETS)</td>
<td>28-02-2014</td>
</tr>
</tbody>
</table>
### Documents

<table>
<thead>
<tr>
<th>Document No.</th>
<th>Rev</th>
<th>Description</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>537806-MUH-00-ZZ-IS-HS-300197</td>
<td>1R</td>
<td>Road Safety Audit Stage 1 Brief</td>
<td>May 2014</td>
</tr>
<tr>
<td>Interim Advice Note 161/13</td>
<td></td>
<td>Managed Motorways All Lane Running</td>
<td>August 2013</td>
</tr>
</tbody>
</table>

### Departures from Standards

<table>
<thead>
<tr>
<th>Document No.</th>
<th>Rev</th>
<th>Description</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>514451-MUH-00-ZZ-SH-DS-300210 - M4 J3 to 12 DfS_Checklist</td>
<td></td>
<td>Departures from Standards Checklist</td>
<td>-</td>
</tr>
</tbody>
</table>