

## 6. TRAFFIC SAFETY

*For the applicant; WBerksC; WokBC; RBC; RBWM; BFC; BCC; SBDC; SBC; LBHill; LBHouns; GLA; RAC; AA.*

**TS6.1 The Road Safety Audit (RSA) APP-096 is based on the terms of reference of the DMRB document HD/03. That document has now been replaced by HD/15. To what extent does the RSA require updating to meet the terms of reference of the latest advice? Can such an update be provided?**

1. Following the introduction of HD19/15 on 31 March 2015, all new Road Safety Audit ("RSA") briefs written after 1st April 2015 should be in line with the requirements in HD19/15. The HD19/15 standard states:

*"1.12. This Standard shall be used forthwith for all Road Safety Audits on all Highway Improvement Schemes with the exception of Road Safety Audits for which a Road Safety Audit Brief in accordance with HD 19/03 has been issued before the publication date of HD 19/15. Those Road Safety Audits may be completed in accordance with HD 19/03".*

2. Consequently, audits prepared prior to the introduction of HD19/15 are not required to comply with those standards, but must comply with the standards which were in force at the time of the RSA's publication - being HD19/03. Therefore, the RSA for the Scheme, which was prepared 7 January 2015 when HD19/03 was still in force, does not have to be updated to reflect the new HD19/15.
3. The concept of carrying out the RSA has not been changed by the introduction of HD19/15. However, greater emphasis has been put on the role of the Design Team, who now have to respond formally to the audit via the Road Safety Audit Response document. The principal difference between the two standards is that HD19/15 requires the signatures of all team members in the Statement at the rear of the report.
4. The Road Safety Audit for the Scheme recorded in the Engineering and Design Report (Application Document Reference 7.3) is a Stage 1 RSA carried out on the Scheme's preliminary design and, unless there is a significant delay in proceeding with the detailed design, it is not necessary to redo the Stage 1 RSA. However, the Stage 2 RSA (detailed design) and Stage 3 RSA (construction) will be based on HD 19/15 or any subsequent replacement.

**TS6.2 In Annex E of the EDR APP-113 a status box appears at para 1.2. Is there any update of this Annex?**

1. A Project Safety Control Review Group (“PSCRG”) Meeting was held after Annex E (Hazard Log Report) of the Engineering and Design Report (Application Document Reference 7.4) was prepared. Therefore, a status box was used within the Hazard Log Report to acknowledge that a meeting was due to take place where some hazard scores would be discussed and endorsed. The PSCRG meeting was held on 5<sup>th</sup> February 2015.
2. The Hazard Log Report (Annex E) was issued on the assumption that any hazards to be reviewed at the PSCRG would be endorsed. This subsequently occurred at the meeting on 5<sup>th</sup> February 2015.
3. The minutes (Ref: 514451-MUH-00-ZZ-MI-OS-300408 – Issue A) from the PSCRG meeting on 5<sup>th</sup> February 2015 state the following:

*“4.0 Hazard Review*

*“A review of the high scoring hazards for the M4 J3-J12 smart motorway scheme was undertaken at the last PSCRG meeting on 11 December 2014. All scores at that PSCRG were endorsed with the exception of:*

*H152 – ‘Vehicle recovered from ERA (Emergency Refuge Area)’*

*H154 – ‘Vehicle stopped on hard shoulder (D3M) or verge (ALR)’.*

*AK presented revised hazard scores and justifications of the scores. In addition, H62 – ‘On road resources work unprotected’ has been eliminated from the generic hazard log. JA queried whether there are sensors in the ERAs to alert the RCC (Regional Control Centre) to when a driver has pulled into the ERA. AK commented that no sensors are provided and that this was not required by IAN 161/13.*

*PSCRG endorsed the presented hazard scores.”*

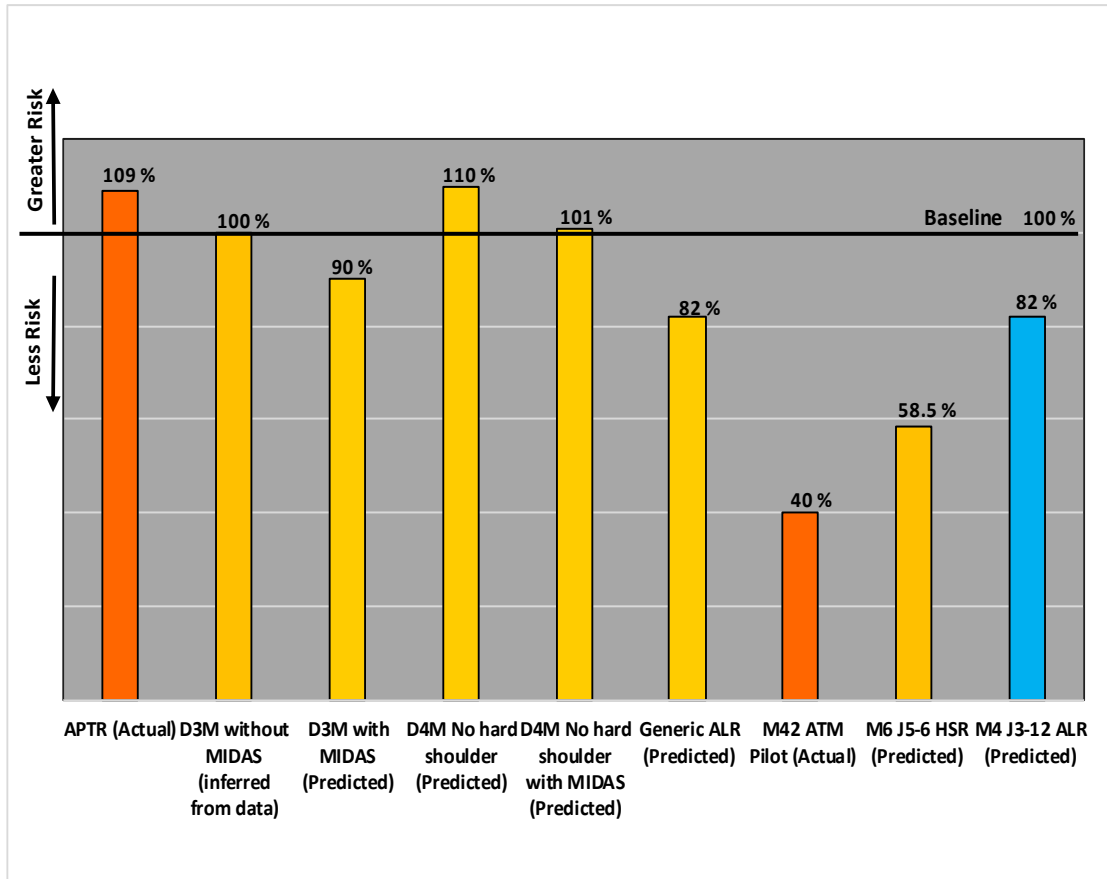
4. Therefore, all hazards contained within the M4 J3-12 Scheme hazard log were endorsed, including the scores for H152 and H154, which had not been endorsed at the previous PSCRG meeting on 11 December 2014. Consequently, the status box can now be removed from Annex E (Hazard Log Report) of the EDR as the text as written is an accurate reflection of the hazard log.

**TS6.3 The baseline comparator is identified in the Hazard Log as "no motorway incident detection or automatic signalling queue protection". Is that the current position for this section of the M4?**

1. The safety baseline for smart motorways is the accident rate on the section of motorway before the installation of motorway incident detection and automatic signalling ("MIDAS") as stated in Section 2.3 of the Hazard Log Report (Annex E to the Engineering and Design Report (Application Document Reference 7.4)). The M4 between J3 and 12 already has MIDAS installed. The assumed MIDAS safety benefit is 10%. Therefore, in order to represent the M4 without MIDAS, to show the safety baseline, the current three year average accident rate is increased by 10% to account for the benefits of MIDAS (as advised in the ALR generic safety report, Ref: 1039092-GSR-016, section 4.1.1 Safety baseline).
2. This is reflected in section 2.3 of the Hazard Log Report (Annex E to the Engineering and Design Report (Application Document Reference 7.4)), which advises that as MIDAS queue protection is installed on the Scheme the safety baseline is:  
  
*"110% of the number (averaged per annum) of Fatal and Weighted Injury (FWI) casualties on the M4 between J3 and 12, and the rate of FWIs per billion vehicle miles per annum, on the M4 between J 3 and 12 averaged for the three years prior to the installation of the scheme."*
3. Section 5.2.78 of the Planning Statement (Application Document Reference 7.1) explains that the calculations from the hazard analysis work show that the total score given in relation to the period after construction of the Scheme represents a reduction of risk of approximately 18% in comparison to the safety baseline (with no MIDAS queue protection). Even when the additional safety benefit of 10% above the baseline with MIDAS is taken into account, the Scheme would still expect to see a reduction in risk of approximately 8%.

**TS6.4 Can the applicant please provide a table to represent a comparison of hazards in the following scenarios: the application project; the current operation of the M4; the M4 as a Managed Motorway (as in M42 MM); and generic ALR?**

1. There is a requirement to confirm that safety will be made 'no worse' than the baseline across all populations by the introduction of the Scheme (see ALR generic safety report, Ref: 1039092-GSR-016, section 4.1.2 Road user safety objective). Prior to operation, this is predicted through the hazard log process. The smart motorways hazard log is a tool used to provide an expected level of safety performance of a scheme comparative to its baseline. The safety baseline and objective is explained within the Hazard Log Report at section 2.3 (Annex E of the Engineering and Design Report (Application Document Reference 7.4)).
2. An assessment has therefore been carried out for the M4 comparing the baseline (M4 J3 – J12 without motorway incident detection and automatic signalling ("MIDAS")), current operation (M4 J3–J12 with MIDAS) and the application of smart motorways all lane running ("ALR"). However, a hazard assessment of the M4 operated under dynamic hard shoulder running ("HSR") has not been undertaken. The ALR operating regime became Highways England Policy in 2012 when Interim Advice Note (IAN) 161/12 was introduced. Therefore, there was no requirement to assess the M4 with an HSR operating regime. The Managed Motorways ALR Generic Safety report Ref: 1039092-GSR-016, August 2013 source: <http://assets.highways.gov.uk/specialist-information/knowledge-compendium/2011-13-knowledge-programme/MM-ALR%20generic%20safety%20report%20final.pdf>) provides background information to explain why the ALR design became Highways England policy as the preferred operating solution to address congestion issues on the network, as explained below.
3. ALR is expected to provide a risk reduction of 18% when compared to the baseline situation – a Dual, 3-Lane Motorway ("D3M") without MIDAS. When comparing the predicted reduction in risk with the actual motorway with MIDAS (which provides a 10% safety benefit as explained in the answer to first written question 6.3), the Scheme would still expect to see a reduction in risk of approximately 8%. This is comparable to a generic ALR scheme (reference section 2.4.2 of the Hazard Log Report – Annex E of the Engineering and Design Report (Application Document Reference 7.4)), which is also estimated to achieve a risk reduction of 18% compared to a baseline D3M without MIDAS (Reference 1039092-GSR-016, August 2013, chapter 4.3.1 Achievement of safety objective for all road users).
4. Figure 1 shows a comparison of the level of safety benefit following hazard analysis for each operating regime.



**Figure 1** - Comparison of risk of different operating regimes<sup>1</sup>

5. The graph in Figure 1 shows that a generic ALR scheme is expected to provide a safety benefit of 18% when compared to a generic baseline (a D3M without MIDAS).
6. Figure 1 shows that the M4 J3-12 Scheme is expected to provide a similar safety benefit of 18% to that experienced with a generic ALR scheme compared to a generic baseline. It also shows that the Scheme is expected to provide an 8% reduction in risk when compared to the existing M4 motorway (D3M with MIDAS between J3 to 4 and 5 to 12 and D4M with MIDAS from J4 to 5).
7. Although this level of benefit is not as significant as that seen on, or expected for, HSR schemes, it meets the Scheme safety objective (as set out in section 2.3 ‘Safety baseline and objectives’ of the Scheme Hazard Log Report (Annex E of the Engineering and Design Report (Application Document Reference 7.4)) and provides substantial cost savings when compared to constructing and operating HSR. Permanently converting the hard shoulder maximises the use of the space available, reduces the risks introduced by the part time use of the hard shoulder and reduces the amount of information the road user has to assimilate from the overhead signs and signals. It will also remove the need for the complex and resource intensive operating systems to “open” and “close” the hard shoulder.

<sup>1</sup> APTR: All Purpose Trunk Road, D3M: Dual 3-lane motorway, MIDAS: Motorway Incident Detection Automatic Signalling, D4M: Dual 4-lane motorway, ALR: All lane running, ATM: Active Traffic Management, HSR: Hard shoulder running

8. The Managed Motorways ALR Generic Safety report (Ref: 1039092-GSR-016, August 2013) explains why ALR is the preferred solution. The report states:

*“Managed motorways all lane running (MM-ALR) has been developed by the Highways Agency to enable a reduction in the amount of infrastructure necessary for a managed motorway scheme, resulting in significant cost savings without a reduction in safety.*

*Permanent conversion of the hard shoulder to a running lane along with the ability to dynamically control mandatory speed limits is a key aspect of MM-ALR. This removes the complex operating regime of opening and closing a dynamic hard shoulder.”*

**TS6.5 The safety baseline for the scheme is set out at para 2.3 Annex E APP-113• Can the applicant please explain the derivation of the safety baseline, in particular why the rate of FWIs is set at 110%?**

1. The safety baseline for the M4 J3- 12 smart motorways is the accident rate on the section of motorway before the installation of motorway incident detection and automatic signalling (“MIDAS”) as described in section 2.3 of the Hazard Log Report (Annex E to the Engineering and Design Report (Application Document Reference 7.4)). This is the same baseline as that of a generic ALR scheme (Reference Managed Motorways ALR Generic Safety report Ref: 1039092-GSR-016, section 4.1.1 Safety baseline). The M4 between J3 and 12 already has MIDAS installed. The assumed MIDAS safety benefit is 10%. Therefore, in order to represent the M4 without MIDAS, to show the safety baseline, the current three year average accident rate is increased by 10% to account for the benefits of MIDAS (as advised in the ALR generic safety report, Ref: 1039092-GSR-016, section 4.1.1 Safety baseline).

2. This is reflected in section 2.3 of the Hazard Log Report (Annex E to the Engineering and Design Report (Application Document Reference 7.4)), which advises that as MIDAS queue protection is installed on the Scheme the safety baseline is:

*“110% of the number (averaged per annum) of Fatal and Weighted Injury (FWI) casualties on the M4 between J3 and 12, and the rate of FWIs per billion vehicle miles per annum, on the M4 between J 3 and 12 averaged for the three years prior to the installation of the scheme.”*

3. As the assumed MIDAS safety benefit is 10%, the 110% figure takes into account the benefits that MIDAS provides.

4. This is in accordance with the Managed Motorway – All Lane Running, Demonstration of Meeting Safety Objective Report (Ref: 1039092-DMS-017) (Reference 10 of the Hazard Log Report (Annex E of the Engineering and Design Report (Application Document Reference 7.4)). The report explains the derivation of the safety baseline and outlines that the baseline needs to be based on the accident rate before the installation of MIDAS. The same text is used in the published Managed Motorways All Lane Running Generic Safety report (Ref: 1039092-GSR-016, August 2013. Source: <http://assets.highways.gov.uk/specialist-information/knowledge-compendium/2011-13-knowledge-programme/MM-ALR%20generic%20safety%20report%20final.pdf>):

*“If more than 50% of the main line carriageway by length has motorway incident detection and automatic signalling (MIDAS) installed, the road user safety baseline must be based on the recorded accident rate before installation of MIDAS. If this information is not available or older than 5 years, the current three year average rate must be increased by 10% to account for MIDAS. It is generally accepted that MIDAS reduces accident rates by between 9% and 13%, therefore an addition of 10% should be used for this purpose”.*

**TS6.6 The highest scoring hazards identified in the Hazard Log are: i) a vehicle stops in running lane off peak; ii) a vehicle drifts off carriageway. There is currently ALR on parts of the M1 and M25. Is there any evidence of an event which illustrates hazards i) or ii)? If there is, please provide details and outcome.**

1. The hazards referenced in the question, are not actually the two highest scoring hazards in the Hazard Log. The M4 J3-12 hazard log contains 17 highest scoring existing motorway hazards (i.e. those with a risk score of E08/S08 and above). Thirteen of these are expected to reduce in risk with the implementation of all lane running (“ALR”), two are expected to remain the same and two are expected to increase in risk. The hazards referenced in the question are the two hazards expected to increase in risk with the implementation of ALR:
  - 1.1 H135 Vehicle stops in running lane - Off peak, which is estimated to increase in risk from an E07.50 to an E08.00, and
  - 1.2 H149 Vehicle drifts off carriageway (i.e. leaving the carriageway as a result of the road environment), which is estimated to increase in risk from an E08.00 to an E08.10.
2. The two highest scoring hazards both before and after implementation of the ALR Scheme are:
  - 2.1 ‘Individual vehicle is driven too fast’, and
  - 2.2 ‘Driver fatigued - unable to perceive hazards effectively’.
3. These are referenced in Hazard Log Report Table 3-1 (Annex E of the Engineering and Design Report (Application Document Reference 7.4)).
4. ALR is currently in operation on the following motorway links:
  - 4.1 M25 J23-25 opened 14 April 2014;
  - 4.2 M25 J5-7 opened 30 April 2014; and
  - 4.3 M25 J25-27 opened 7 November 2014.
5. In relation to the evidence to illustrate these hazards, operation and performance monitoring is currently underway on the first ALR scheme on the M25 J23-27 to measure actual safety performance and compare it with the safety levels before the introduction of ALR. This will give an indication of the actual safety level that can be achieved with ALR. The hazard log assessment and hazard assumptions for ALR schemes will be reviewed, and if necessary revised, in line with the monitoring results. The one year monitoring report will be published by the end of 2015. Until the one year report is available there is no formally published available evidence that illustrates the hazards referred to in the question. During initial scheme operations, performance can be highly variable which is why a 12 month reporting period is an appropriate benchmark to provide analysed data of performance including that of key hazards.
6. With regard to the references to M1 ALR, the hazard log report for the Scheme takes account of work from other ALR schemes, including the M1 J28–31, M1 J32–35a and M25 J23–27. The M1 schemes listed are currently in the construction stage and have yet



to be opened to traffic. Therefore no monitoring data is available to provide any evidence of the events listed.

7. It is noted that there is a smart motorway scheme which is operational on M1 J10-13. However this scheme is a hard shoulder running (“HSR”) scheme, with a small section of ALR, which was introduced due to the mid-link location of a Motorway Service Area. It is considered that this scheme is not an appropriate comparison to the M4 J3-12 scheme design as the M1 section was not designed to the ALR design standard (IAN 161/13) and therefore the technology and infrastructure provision is different to the proposed M4 Scheme.

**TS6.7 Evidence is used from the M42 pilot to assess safety issues. However the hard shoulder is only used during peak traffic times and together with the variable mandatory speed limit on the M42. Can any evidence be produced from experience of the M42 in respect of hazard ii)?**

1. Hazard (ii) - 'Vehicle drifts off carriageway' is a typical single vehicle collision. Monitoring of the M42 hard shoulder running ("HSR") scheme showed that single vehicle collisions reduced significantly with the introduction of 4 lane variable mandatory speed limits ("4L VMSL") (see Annex F of the Hazard Log Report, Annex E of the Engineering and Design Report (Application Document Reference 7.4)). Hazard log scoring for the hazard 'Vehicle drifts off carriageway' for HSR schemes such as Birmingham Box Phase 3, which covers the M6 J5 – J8 section, therefore assign a high risk reduction score of -0.4, which equates to a 70% reduction, for this hazard (Source: Hazard Log Report (M6 J5 to J6 Bromford and Gravelly Hill Viaducts Section – June 2014)).
2. The generic all lane running ("ALR") safety report (section 6.2.3 of the Managed Motorways All Lane Running Generic Safety report Ref: 1039092-GSR-016, August 2013 source: <http://assets.highways.gov.uk/specialist-information/knowledge-compendium/2011-13-knowledge-programme/MM-ALR%20generic%20safety%20report%20final.pdf>) states that for the hazard 'Vehicle drifts off carriageway (i.e. leaving the carriageway as a result of road environment)' no change in risk is expected from the introduction of ALR compared to a baseline D3M without motorway incident detection and automatic signalling ("MIDAS"). This is because, although traffic is travelling closer to the edge of the carriageway, most of this traffic will be during the peak periods, when traffic will be subject to a controlled environment<sup>2</sup>.
3. The M4 J3–12 Project Safety Control Review Group ("PSCRG") argued that there could be a slight increase in the risk of vehicles drifting off the carriageway, as some traffic is travelling nearer the edge of the carriageway and is likely to be driving at the national speed limit during off peak times. The increase in risk (of 25%) for this hazard (compared to 'no change' in the generic ALR case) was endorsed at the 12<sup>th</sup> September 2013 PSCRG. The PSCRG proposed that the same change to the risk score (of 25%) should be considered for the generic ALR hazard log.

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<sup>2</sup> A Controlled Environment is one where driver information is provided through the effective operation of appropriate infrastructure and technology. A controlled environment provides the road user with the right (i.e. relevant, timely and accurate) information, at the right location at the right time; thereby promoting appropriate and intuitive driver behaviour (through situational awareness). Road users will travel through a scheme in an environment where information is highly visible and where they will perceive that their behaviour is being monitored via the use of Closed Circuit Television Cameras (reference: Managed motorways all lane running Demonstration of meeting safety objective report, 1039092-DMS-017, August 2013, Appendix D: Controlled environment).

**TS6.8 To what extent can the experience of ALR on the M1 and M25 help inform the assessment for off peak times when the national speed limit is in force?**

1. Once sufficient data is available from the operation of such schemes, the experience of all lane running (“ALR”) on the M25 and other operational smart motorway schemes will help to inform the operational assessment for off peak times when the national speed limit is in force as well as during periods of congestion when variable speed limits are in operation. The results of the initial monitoring of the M25 ALR scheme will provide the M4 J3-12 Scheme with a better indication of how drivers behave and react within an ALR environment. The experience from other schemes will also inform incident management processes and procedures on the M4 J3-12 Scheme, for example once the M25 ALR one year monitoring report is available (which is expected to be published by the end of 2015) the data collected (e.g. breakdown rates and casualty rates) and any operational feedback will be reviewed by the M4 J3-12 Scheme and this may result in changes to, for example, operating procedures for accessing incidents on the motorway.
2. Operation and performance monitoring is currently underway on the first ALR scheme on the M25 J23-27 to measure actual safety performance and compare it with the safety levels before the introduction of ALR. This will give an indication of the actual safety level that can be achieved with ALR. The hazard log assessment and hazard assumptions for ALR schemes will be reviewed, and if necessary revised, in line with the monitoring results. The one year monitoring report will be published by the end of 2015. However, it should be noted that one-year of reporting remains a very short timeframe upon which to assess the efficacy of the schemes, and on-going monitoring will be required and undertaken.
3. With regard to the experience of M1 ALR, the hazard log report (Annex E of the Engineering and Design Report (Application Document Reference 7.4)) says that it takes account of work from other ALR schemes, e.g. M1 J28–31, M1 J32–35a and M25 J23–27. This means that Highways England reviews, and where appropriate, uses the data and learning from the design process of those schemes. The M1 schemes listed are currently in the construction stage and have yet to be opened to traffic. Consequently, no monitoring data is currently available. However, these schemes are expected to be operational before the M4 J3-12 Scheme, and therefore the experience and learning from these schemes will feed into the operational assessments for the M4 scheme. The results of data collected and analysed (e.g. breakdown rates and casualty rates) on other schemes will be reviewed by the M4 J3-12 Scheme and it will be considered whether there is any impact from the review that may affect any hazards for the M4 J3-12 Scheme. Once the M25 ALR monitoring report is available, the review and analysis undertaken for the M4 J3-12 Scheme is likely to be presented to the M4 J3-12 Project Safety Control Review Group for consideration and endorsement where required should, for example, there be any amendments to hazard scores or proposed changes to operating procedures.

There is a smart motorway scheme which is operational on M1 J10-13. However, this scheme is a hard shoulder running (“HSR”) scheme, with only a small section of ALR, which was introduced due to the mid-link location of a Motorway Service Area. It is considered that this scheme is not an appropriate comparison to the M4 J3-12 Scheme design as the M1 section was not designed to the ALR design standard (IAN 161/13) and therefore the technology and infrastructure provision is different to the Scheme. However any learning and experience from the M1 HSR scheme will be taken into account where appropriate, for example operational feedback and any available published monitoring data (once made available) on driver behaviour on a smart motorway will be considered

through a review of M4 J3-12 Scheme relevant hazards and the output is likely to be presented to the Project Safety Control Review Group.

**TS6.9 Is there any evidence available from the operation of ALR on the M1 or M25 in relation to road safety issues?**

1. There is currently no published evidence from all lane running (“ALR”) on the M25 or M1 in relation to road safety issues. Operation and performance monitoring is currently underway on the first ALR scheme on the M25 J23-27 to measure actual safety performance and compare it with the safety levels before the introduction of ALR. This will give an indication of the actual safety level that can be achieved with ALR. The hazard log assessment and hazard assumptions for ALR schemes will be reviewed, and if necessary revised, in line with the monitoring results. The one year monitoring report will be published by the end of 2015. However, as noted in the response to the previous written question, one-year of reporting remains a very short timeframe upon which to assess the efficacy of the schemes, and on-going monitoring will be required and undertaken.
2. The M1 ALR schemes, e.g. M1 J28–31, M1 J32–35a and M25 J23–27 are currently in the construction stage and have yet to be opened to traffic. Consequently, no monitoring data is currently available. However, these schemes are expected to be operational before M4 J3-12 and therefore the experience and learning from these schemes will feed into the operational assessments for the M4 Scheme. The results of data collected and analysed (e.g. breakdown rates and casualty rates) on other schemes will be reviewed by the M4 J3-12 Scheme and it will be considered whether there is any impact from the review that may affect any hazards for the M4 J3-12 Scheme. Once the M25 ALR monitoring report is available, the review and analysis undertaken for the M4 J3-12 Scheme is likely to be presented to the M4 J3-12 Project Safety Control Review Group for consideration and endorsement where required should, for example, there be any amendments to hazard scores or proposed changes to operating procedures.
3. As explained in the answer to question 6.8, whilst there is a Smart Motorway scheme which is operational on M1 J10-13, the scheme is principally a hard shoulder running (“HSR”) scheme, with only a small section of ALR. As such, it is considered that this scheme is not an appropriate comparison to the M4 J3-12 scheme design as the M1 section was not designed to the ALR design standard (IAN 161/13) and therefore the technology and infrastructure provision is different to the proposed M4 Scheme.
4. Where there are any indications of any safety issues (e.g. through initial data or traffic officer feedback/observations), the Scheme has taken them into account within the hazard analysis. The Hazard Log Report (Annex E of the Engineering and Design Report (Application Document Reference 7.4)) says that the M4 J3–12 hazard log is based on the generic IAN 161/13 hazard log. It also takes account of work during the design process from other ALR schemes, e.g. M1 J28–31, M1 J32–35a and M25 J23–27. Section 3.2 of the Hazard Log Report (Annex E of the Engineering and Design Report (Application Document Reference 7.4)) explains some of the changes to hazard scores and notes some of the initial learning taken from the M25 ALR scheme. It says:

*“The change score for H11 ‘Driver ignores closed lane(s) signals that are protecting an incident’ has been changed from a ‘-0.2’ to a ‘0’ since the publication of the SGAR 2 version of this hazard log report in line with changes to the generic ALR hazard log. The change in score reflects results from monitoring of the M25 ALR sections, which show that at times significant number of drivers ignore Red X lane closure signals. The score change was endorsed by the PSCRG on 11 December 2014”.*

**TS6.10** The change score for Hazard H11 has altered as a result of monitoring of the M25 ALR sections, and the risk is considered no different from the baseline risk or that in the generic ALR. However, has the failure of drivers to follow the lane closed X marking been the cause of any accidents and are there any modifications which could be made to reduce the risk?

1. The Hazard Log Report (Annex E of the Engineering and Design Report (Application Document Reference 7.4)) states:

*“The change score for H11 ‘Driver ignores closed lane(s) signals that are protecting an incident’ has been changed from a ‘-0.2’ to a ‘0’ since the publication of the SGAR 2<sup>3</sup> version of this hazard log report in line with changes to the generic ALR hazard log. The change in score reflects results from monitoring of the M25 ALR sections, which show that at times significant number of drivers ignore Red X lane closure signals. The score changes was endorsed by the PSCRG on 11 December 2014”.*

2. The issue of drivers ignoring a Red X signal was recognised during the initial operation of the M25 all lane running (“ALR”) scheme and therefore changes were made to the generic ALR hazard log, as it was felt that the score was expecting better compliance than what was being observed. Therefore, the score was changed to be no worse than the before situation. These changes were incorporated into the hazard log for the M4 J3-12 Scheme and the score for this hazard was increased accordingly.
3. Highways England is not aware of any accidents that are related to Red X non-compliance on the M25 ALR section. However, non-compliance with the Red X signal has been recognised as an issue in relation to which Highways England has undertaken significant work to improve compliance across the network, as detailed below.
4. It is already an offence not to comply with the Red X signal (prosecution takes place under Section 36 of the Road Traffic Act 1988, pursuant to the Traffic Signs Regulations and General Directions (2002)). However, Highways England is working to provide enhanced enforcement for non-compliance with the Red X signal. Highways England is currently working with the Department for Transport and the Home Office to make a number of legislative changes so that an automated system can be used to enforce the Red X signal. Automated enforcement is expected to be available by summer 2016 and is therefore is likely to be in place by the time the Scheme commences operation in 2022. A number of police forces across the country have already undertaken on-road enforcement of the offence related to non-compliance of the Red X signal. In the interim period before an automated system is available a traditional police enforcement process will be adopted
5. Highways England is also currently working on a Red X compliance programme, to increase understanding of the levels of non-compliance. This includes development work on a monitoring tool which can monitor compliance with the Red X signal across the network. The programme also introduces measures to enhance positive driver behaviour, such as consideration of improvements to the Highway Code and a driver theory text review. Furthermore, education campaigns have been undertaken to improve driver understanding, including media and press coverage, as well as using the message signs on the network to increase awareness of the Red X signal.

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<sup>3</sup> A Stage gate assessment review (“SGAR”) provides basic assurance that a stage within the project lifecycle is complete and that the project control framework (“PCF”) has been followed. It also reviews whether the project is ready to proceed to the next PCF stage, subject to investment authorisation. SGAR 2 is the option selection stage.

**TS6.11 With the application project in place, would CCTV monitoring operate at the same level during normal motorway operation (off-peak) as it would when variable speed limits apply?**

1. That is correct - CCTV monitoring will operate at the same level during normal motorway operation as it would when variable speed limits apply. The CCTV introduced through smart motorways is available to operators in the Regional Control Centre ("RCC") 24 hours per day. It is not continuously monitored by operators within the RCC. However, full CCTV coverage will increase the likelihood of incidents being detected and located more quickly as CCTV images will be shown on monitors within Highways England's RCC.
2. Therefore, the level of CCTV monitoring will be the same during the off peak periods and during congested periods when the variable speed limits are in force.
3. The monitoring of CCTV is outlined within the published Managed Motorways Concept of Operations v2.0 which accompanies the IAN 161 ALR design standard (source: [http://www.standardsforhighways.co.uk/ha/standards/tech\\_info/files/MM-ALR\\_Concept\\_of\\_Operations\\_v2\\_0.pdf](http://www.standardsforhighways.co.uk/ha/standards/tech_info/files/MM-ALR_Concept_of_Operations_v2_0.pdf)). At section 2.3 paragraph 21 it states:  
  
*"Control room operators will have access to images from PTZ CCTV cameras, positioned to provide full coverage of the managed motorway sections of the network. Operators will be able to use the CCTV images to remotely confirm incidents\*, as well as conduct general observation of conditions on the network.*  
  
*\* The MM ALR design does not require RCC resource to conduct close monitoring of CCTV images solely for the purposes of incident detection".*
4. At Section 3 paragraph 38 it states:  
  
*"RCC Operators will be able to remotely monitor network conditions, confirm incidents and (where they are visible) verify signal settings by utilising the PTZ CCTV coverage provided throughout the scheme. The MM ALR design and operation does not of itself require additional close monitoring for schemes, although given that MM ALR schemes tend to be on the busiest parts of the network, TMD may consider them higher priority in terms of supervision and monitoring".*

**TS6.12 How long does it take for a vehicle which breaks down in a live running lane to be detected on the M4 as currently operating, and with the application project in place?**

1. The time taken to detect a vehicle is very difficult to measure. Highways England or the emergency services will respond to an incident as soon as they are made aware of the incident. Whilst the time of detection is recorded, along with all subsequent actions, the time from a vehicle stopping in a live lane to the time the Regional Control Centre (“RCC”) is made aware of its presence varies and is difficult to determine as it is rare that the actual time of the vehicle stopping is known.
2. The M4 in its current situation has limited CCTV coverage and although there is motorway incident detection and automatic signalling (“MIDAS”) there are significantly fewer signals to detect incidents. In contrast, as outlined at section 9.4.5 of the Engineering and Design Report (Application Document Reference 7.3), upon operation of the Scheme, when vehicles come to a stop in a live running lane, the extra controls provided through smart motorway features will mitigate this risk, by being able to support the identification of vehicles through the queue protection system, use of full CCTV coverage to verify a vehicle's location and the ability to set lane closures to protect vehicles. Consequently, whilst it is hard to determine what the exact detection time difference will be between the current M4, and the M4 with the Scheme in operation, a significant improvement is expected as a result of the Scheme, when compared to the current situation.
3. Further, the full CCTV coverage to be installed as part of the Scheme will support the potential efficiencies achieved through the introduction of smart motorways. Incident verification will be much quicker and more accurate so that appropriate resources can be dispatched to the scene where required.



**TS6.13 Is there any new evidence which has emerged since April 2014 which could impact on the hazard scores in the hazard log?**

1. Since April 2014 there has not been any published data on the initial M25 all lane running (“ALR”) scheme operation that has resulted in any further changes to the hazard log scores. Operation and performance monitoring is currently underway on the first ALR scheme on the M25 J23-27 to measure actual safety performance and compare it with the safety levels before the introduction of ALR. The one year monitoring report will be published by the end of 2015.
2. The one year report will give an indication of the actual safety level that can be achieved with ALR and will enable the M4 J3-12 hazard log to be reviewed in line with any evidence from the initial operation of the M25 ALR scheme. Data, including for example, the rate of non-compliance with the red X signal and also the rate of breakdowns, will enable the M4 J3-12 hazard log assumptions to be checked and reviewed and if necessary changed. This may result in specific hazards increasing or decreasing in the level of safety risk.
3. Section 4 of the Hazard Log Report (Annex E of the Engineering and Design Report (Application Document Reference 7.4)) provides an explanation of when the hazard log will be updated. It says:

*“The hazard log will be updated as and when required during the scheme design process. In particular it will be updated if either of the following occurs:*

- *New hazards that are identified as the design develops will be added to the hazard log and their risk will be assessed. Additional mitigation measures will be identified where necessary;*
- *Risk assessments of existing hazards will be reviewed and updated as the design develops;*
- *Future design changes, for example if mitigations identified to protect maintainers change;*
- *If significant new evidence emerges which could impact on the hazard scores, for example monitoring results from other similar Sm schemes or recommendations from an investigation into a road worker incident (either on the scheme or another ALR scheme).”*

**TS6.14 What feedback has been received from operators of motorway rescue services such as the AA or RAC and the emergency services on the implications of having no hard shoulder?**

1. The emergency services and the recovery industry (including the AA and RAC) are key partners for Highways England and have been involved from the outset with the all lane running (“ALR”) concept.
2. In 2013, Highways England established an “Operating Smart Motorways” steering group, and a number of subsidiary working groups, with the emergency services, Driver and Vehicle Standards Agency (“DVSA”) and the recovery industry. The AA and RAC attended on behalf of the recovery industry. The key objective of these groups was to agree how they would operate on smart motorways in order to carry out their normal activities, including emergency response to incidents. These groups have now concluded, and operating agreements are in place for smart motorways with the various groups described.
3. The AA and RAC also meet with Highways England on a regular basis in a number of forums, but the one most relevant is the national Survive working group. They have been briefed on the smart motorway proposals across the network through this forum, and the Survive Best Practice Guide is being re-issued to all recovery agents to enable them to operate safely on smart motorways. The recovery industry has well established protocols to assist motorists in areas where there is no hard shoulder on motorways. There are already many areas of discontinuous hard shoulder on the strategic road network, and there are occasions now where breakdowns occur in running lanes even where there is a hard shoulder. In addition, the industry deals safely with many breakdowns on high speed trunk roads where there is no hard shoulder. The existing protocol where the recovery industry only attends a “live lane” breakdown on a motorway with the support of the Traffic Officer Service or Police (to provide protection) will continue to apply.
4. It is recognised that the recovery industry has concerns about significant lengths of motorway operating without a hard shoulder. The views of the recovery industry have been listened to carefully by Highways England and a significant amount of work has been done to ensure that this service can continue to operate safely and effectively.
5. There has been a lot of detailed engagement with the recovery industry, as detailed above.
6. The RAC responded in February 2015 to a consultation about variable mandatory speed limits as part of the M4 J3-12 smart motorway scheme and they summarised their response as follows:

*“The RAC supports the wider introduction of Managed (Smart) motorways on the M4 between Junction 3 and 12. We recognise that this is a heavily congested section of the motorway and as such there is a strong case for increasing capacity to reduce congestion and improve safety.*

*Variable Speed Limits are an essential part of managed motorways and we are supportive of these. They have a proven record of assisting in helping to control traffic flow at congested times or during variable road and weather conditions. We do have some concerns about the use of speed cameras in certain cases of enforcement.*

*RAC continues to have concerns regarding the “all lanes running” configuration on safety grounds and urges the Highways Agency to use the configuration where the Hard Shoulder is opened up during busy periods”.*

7. The RAC also responded to the M4 J3-12 DCO as follows (Relevant Representation No. 198):

*“With more than eight million members, the RAC is the oldest and one of the UK's most progressive motoring organisations, providing services for both private and business motorists. As such, it is committed to making driving easier, safer, more affordable and more enjoyable for all road users.*

*The RAC, which employs more than 1,500 patrols, provides roadside assistance across the entire UK road network and as a result has significant insight into how the country's road networks are managed and maintained. The RAC's position as a breakdown service provider means we are well placed to report on safety findings from our vehicles across the UK Motorway Network.*

*The RAC continues to have concerns regarding the 'all lanes running' configuration of Smart Motorways. Highways England's own impact assessment views this configuration as less safe than the 'dynamic hard shoulder' configuration. Anecdotally, our patrols are telling us that they feel that breakdowns automatically become more dangerous under the 'all lanes running' configuration”.*

8. The AA responded in 2013 to a consultation about variable mandatory speed limits as part of the M1 J28-31 smart motorway scheme as follows:

*“[...] The AA welcomes the significant improvement to journey times/congestion reduction the MM scheme will bring to the M1 between J28 to J31. However, there are some issues which leave us uneasy [...] We have particular concerns over the distance between emergency refuge areas, the risk created by vehicle breakdowns in lane one (especially in the dark/quiet) and drivers' ability to see the nearside only variable message signs particularly in relation to the operation of the speed limit. The proposals for the above M1 MM will lead to a managed motorway which will be less safe than the M42 MM scheme and also less resilient in the event of major incidents. The AA has had a number of useful meetings with your managed motorway team and this has resulted in a fuller understanding of our respective positions and constructive dialogue aimed at resolving or minimising the areas of concern.”*

9. With regard to the emergency services, Highways England are working closely with the emergency service providers to ensure that any initial concerns that they have are addressed accordingly. At a strategic level, a large amount of work was done through the Operating Smart Motorways groups described above. As a consequence of the work done by this group, Highways England have increased the level of CCTV coverage from around 95% to 100%, and are developing automated enforcement of the mandatory “Red X” stop signal that is displayed on overhead and cantilever signs, as explained in answer to written question 6.10. At a Scheme specific level, on-going detailed engagement will continue with the intention of implementing a Regional Operating Agreement (“ROA”) before the Scheme goes live. This will set out the ways in which emergency services can respond to incidents on the smart motorway, and the types of assistance that Highways England can provide.

10. Lessons learned from the M25 ALR schemes are being shared with the M4 J3-12 scheme and it is intended that any best practice will be integrated into the ROA which is being developed with the emergency services on the M4. This agreement has been introduced to cover the management of the partnership between Emergency Services and Highways England, and specifically, partnership working in relation to incident detection, incident verification, incident access and initial incident response. Furthermore, Highways England also attended a multi-agency live exercise held on 16th May 2015 to test response and incident management of a major road traffic collision on an unlit section of ALR motorway – on the M25 between junctions 26 and 27.