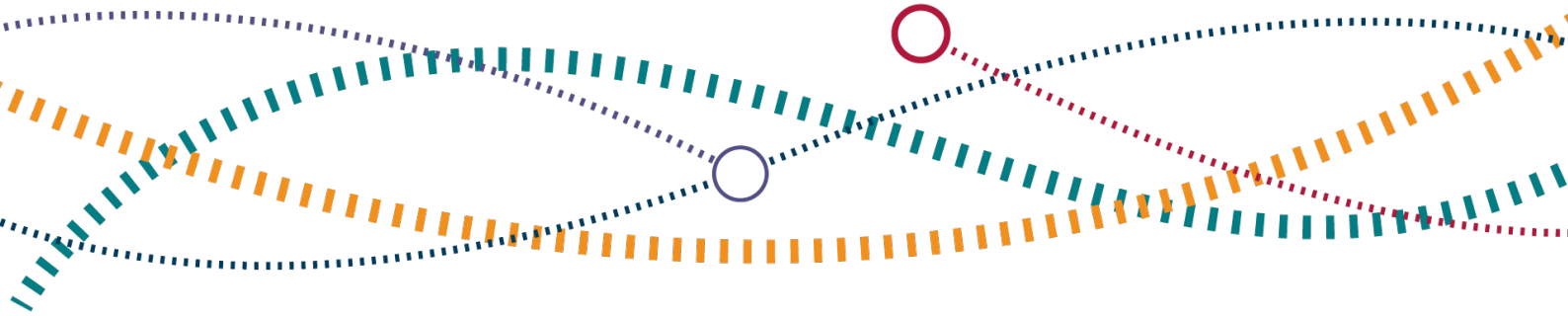
OFFICE OF RAIL AND ROAD

First Annual Assessment of safety performance on the strategic road network

ORR's assessment of safety performance on the strategic road network in 2021 and progress update on Transport Select Committee smart motorways recommendations

15 December 2022



Contents

Executive summary

Introduction

1. This report is the first of what we intend to be annual assessments of National Highways' safety performance on the strategic road network (SRN), including the operation and effectiveness of the end-to-end safety system on smart motorways. This year's assessment for 2022, reports our:

    - assessment of National Highways' 2021 performance against its second road investment strategy (RIS2) key performance indicator (KPI) safety target to halve the number of people killed or seriously injured on the SRN by 2025, compared to a 2005 to 2009 baseline; and

    - early findings in relation to the Transport Select Committee's (TSC) recommendations 4 and 6.

Background

2. National Highways was set up as a government-owned company in 2015, tasked with managing the SRN – the motorways and major A-roads in England. The Office of Rail and Road (ORR) holds National Highways to account for delivering improvements for road users, including improving safety.

3. In RIS2, the government specified a set of outcomes and investments that it requires National Highways to deliver over the second road period (RP2), from April 2020 to March 2025. This includes a target to halve the number of people killed or seriously injured (KSI) on the SRN by 2025 (compared to a 2005 to 2009 baseline).

4. This report covers our assessment of National Highways' 2021 performance against this safety target. In previous years, because of the timing of the release of the official STATS19 casualty data, we have published that safety performance assessment as a standalone update to our annual assessment. We are now taking the opportunity to draw together and report on our road safety activity in our first annual assessment of safety performance on the SRN.

5. Shortly after the Department for Transport (DfT) published RIS2, in March 2020, it released its smart motorways evidence stocktake and action plan (referred to hereafter as 'the stocktake' or 'the action plan'), which included a set of actions to improve the safety of, and public confidence in, smart motorways. We monitor

National Highways' delivery of these actions as well as holding the company to account for its performance against the RIS2 safety KPI target.

6. National Highways has reported annually on its delivery against the action plan and safety statistics for smart motorways. Following recommendations we made in our quality assurance of all lane running (ALR) motorway data in 2021, the company's second year progress report, published in May 2022, included more detailed and consistent splits of safety data by road type for 2016 to 2020 (a period before the implementation of the action plan).

7. From this, National Highways concluded that no one type of motorway, smart or conventional, performs better than the others against all of the safety metrics considered. It found that the rate of KSIs (and fatal and weighted injuries – FWI – a similar metric that applies weights according to casualty severity) were lower on smart motorways than conventional ones. However, the company also concluded that there was a higher risk of a collision in a live lane involving a stopped vehicle on ALR and dynamic hard shoulder (DHS – smart motorways where the hard shoulder is opened to traffic under certain traffic conditions) smart motorways than on motorways with a permanent hard shoulder. Our quality assurance review, and a similar review we carried out for the second progress report, found no errors in the underlying calculations and that National Highways has a suitable process in place to ensure that its evidence is reliable.

8. Our assessment of safety performance on the SRN in 2021 includes analysis by road type (motorways and 'A' roads) but more detailed splits by type of motorway are not available at this time. We expect the company to publish its third year progress report in spring 2023 and this will include more detailed safety analysis (including by road type) with 2021 safety data.

9. Alongside the third progress report in spring 2023, we also expect National Highways to update the before-after analysis (originally published in 2019) in its smart motorway ALR overarching safety report. This analysis compares schemes' performance against a hypothetical 'counterfactual' of what could have happened if they were not converted to smart motorways. This provides an alternative, and in some ways stronger, form of evidence on smart motorway projects' safety performance. We recommended improvements to this analysis in our 2021 quality assurance review of ALR motorway data and will review the company's progress against these recommendations.

10. Both pieces of analysis will add to the evidence base on smart motorway safety. But, as they will use data up to 2021 and the delivery of significant aspects of the action

plan has continued throughout 2022, they are unlikely to be able to demonstrate the effectiveness of the action plan as a whole in improving smart motorway safety.

The Transport Select Committee inquiry into the roll-out and safety of smart motorways

11. In February 2021, due to continuing concerns over the safety of smart motorways the TSC launched an inquiry into the roll-out and safety of smart motorways. It published a report containing nine recommendations aimed at improving the safety of smart motorways in November 2021.

12. In January 2022, the TSC published the government's response to its report. DfT agreed to take forward all of the committee's recommendations. At DfT's request, ORR is leading on two recommendations:

    - assessing the effectiveness of the safety systems in place on smart motorways (recommendation 4); and
    - beginning in September 2022, evaluating the effectiveness of the action plan in reducing the frequency and duration of live lane incidents (recommendation 6).

13. After exploratory work with government and National Highways over 2022, including visits to enhance our understanding of the operation of smart motorways on the network, we received the first performance data in September 2022 and began our analysis in line with the recommendations from the TSC. In its response to the TSC, government envisaged us reporting on this work annually. Our evaluation of smart motorway safety systems and the wider action plan is a long-term programme of work. We expect this to continue at least until the end of the second road period (RP2) in March 2025.

14. As such, this report includes an update on our initial progress with the TSC's recommendations. We have focused on ALR smart motorways at this stage but we expect the format and content of this report to evolve as more data becomes available, covering more areas of performance and possibly to include other types of smart motorway (dynamic hard shoulder and controlled motorway), and as we further develop our assessment.

15. At this stage of our work, it is too early to fully understand how successful the different smart motorway safety systems and other elements of the action plan have been in reducing collision and casualty numbers. We would strongly caution against drawing links between these areas at this time. This is particularly the case for this year as the casualty data relates to 2021 (when traffic on the SRN was returning to

close to pre-COVID-19 pandemic levels) and National Highways continued to deliver significant elements of the action plan in 2022.

16. We have three key messages, set out below.

Safety performance on the SRN in 2021

National Highways' safety performance appears to be on course to achieve its key safety target to halve the number of people killed or seriously injured on the strategic road network by 2025, compared to a 2005 to 2009 baseline. However, traffic across 2021 as a whole was still below pre-pandemic levels and there is a risk that the number of casualties could increase if traffic levels rise further in 2022. The company will need to maintain its strong focus on safety and is developing an action plan aligned to its 2025 target. We expect to see the plan in March 2023. We will scrutinise the plan to assure ourselves that it is robust, deliverable and sets out how the company will achieve its target.

17. National Highways' safety performance appears to be on course to achieve its RP2 target to reduce the number of people killed or seriously injured on the SRN by 50% compared to 2005 to 2009 levels.

18. In 2021 1,857 people were killed or seriously injured on the SRN. This represents a 42.1% reduction against the 2005 to 2009 average baseline of 3,206 people killed or seriously injured per year on the SRN; is 261 (12.3%) fewer than in 2019; but an increase of 424 (29.6%) compared to 2020. We should be cautious about making comparisons with previous years, and 2020 in particular due to significantly reduced traffic levels resulting from the COVID-19 pandemic.

19. While National Highways appears to be on course to meet its RIS2 safety KPI target, overall traffic levels on the SRN in 2021 were 14.0% lower than in 2019. With traffic expected to return to pre-pandemic levels in 2022 and beyond, total casualty numbers may rise. Noting that safety is the company's priority, it will need to maintain its strong focus on safety throughout RP2 to achieve its 2025 target.

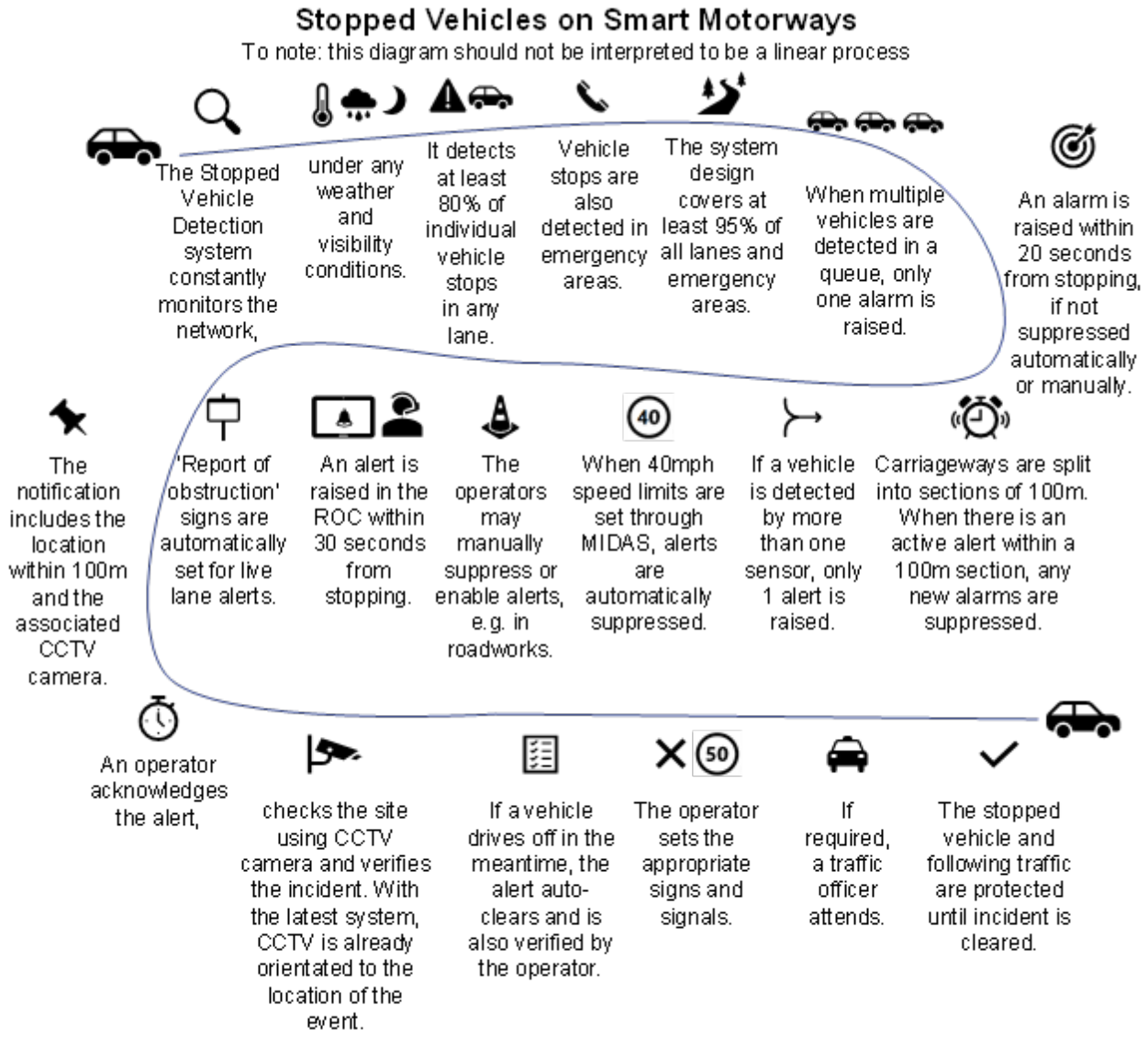
20. National Highways is working to develop and deliver a plan aligned to its 2025 safety target and how it will achieve its longer-term goal of zero harm on the network by 2040. We expect to see this plan by March 2023. We will scrutinise the plan to assure ourselves that it is robust, deliverable and sets out how the company will achieve its 2025 safety target.

Effectiveness and operation of the end-to-end safety systems on smart motorways

National Highways met its action to have radar-based stopped vehicle detection (SVD) technology in place on every existing all lane running (ALR) smart motorway by the end of September 2022, six months ahead of the original March 2023 milestone. The pace of delivery, in response to the action plan target, which aims to reduce the duration of live lane stops, has given the company limited opportunity to apply lessons learnt as it goes. Overall performance is not yet at the level the company set itself and urgent action is needed. National Highways recognises this and is working to make rapid improvements to the SVD technology to achieve the required performance levels by the end of June 2023. There are encouraging signs from one scheme that has been tested with upgraded software but the company has more to do to roll-out improvements across all ALR smart motorways. We are monitoring this closely and, should it not be on track to make the necessary improvements, we will consider taking further action in line with our Holding to Account policy.

21. National Highways has rolled-out SVD and met its September 2022 deadline to have the technology in place on all existing ALR smart motorways in England, six months ahead of the original March 2023 milestone in the action plan. The diagram below describes the operation of the SVD service, based on its specified performance levels.

Figure 1. The concept for the end-to-end system for stopped vehicle detection



Source: National Highways

22. SVD is operating and is helping, as a complement to the systems already in place, to improve control room operator and traffic officer response times to incidents across these schemes. Although it is too early to see the full effects, this should be improving safety and reducing the risks associated with stopped vehicles on live lanes on ALR smart motorways.

23. However, the testing that forms part of National Highways' operational acceptance phase (that is, the handover from the company's major projects team to its operations team), shows that SVD performance is falling short of the performance requirements the company set itself for a number of measures:

    - Across all National Highways' regions with ALR smart motorways, false detection rates are substantially above the required maximum. The company's specification states that false alerts may not constitute more than 15% of all alerts and performance ranged from 63.8% to 83.5% across the regions. This creates extra workload for operators; risks reducing operators' and drivers' confidence in the system (false alerts automatically trigger 'Report of Obstruction' messages on variable message signs ahead of alert locations); and, ultimately, could lead to real alerts being missed.

    - Overall detection rates are below National Highways' minimum requirement of 80%. None of the company's five regions with ALR smart motorways are meeting this requirement, achieving between 59.6% and 79.6%.

    - The required average time to detect stopped vehicles in less than 20 seconds is not being met. Four out of five of National Highways' regions with ALR smart motorways are not meeting this requirement, achieving between 43 and 65 seconds, on average.

    - In addition to the core SVD functionality, National Highways is not achieving the availability performance targets of essential supporting systems. The availability of variable message signs was below the 95% target set out in its performance requirements for the whole April 2022 to August 2022 period, and CCTV availability was also below 95% in August 2022, the most recent month of data available to us.

24. National Highways must take urgent action to achieve the performance levels it has set. The company recognises this and is investigating the issues with SVD through a three phase programme. It started this work in September 2022.

25. National Highways is implementing a software upgrade as one of the early improvements identified in this programme. Testing results for one scheme with this upgrade showed that the requirements for the detection rate and the time to detect stopped vehicles were met. This is encouraging but it is too early to see the effect across all schemes with SVD in place. The company has more to do to roll-out these improvements across all ALR smart motorways and to reduce false detection rates.

26. National Highways plans to complete the first phase and achieve its performance requirements by the end of June 2023. We will closely monitor the company's progress over the coming months. We can require the company to take further action, in line with our Holding to Account policy, if we do not think it is doing everything it reasonably can, and we will do so if necessary.

27. Following the initial stabilising phase, National Highways plans to optimise the operation of the system nationally, and, ultimately, move into a process of enhancing the system through continuous improvement, from October 2023.

28. It is also crucial that National Highways maintains its focus on improving the performance of the supporting safety systems, especially CCTV and variable message signs, through its wider operational technology improvement programme. This will be a focus of ours as we continue our work in this area. The company must urgently produce an action plan specifically tailored to show how it will achieve the necessary performance improvements to a reasonable timescale. We will scrutinise the plan and consider action in line with our Holding to Account policy if sufficient progress is not made.

Evaluating the success of the Smart Motorway Safety Evidence Stocktake and Action Plan

It is too early to fully understand how successful National Highways' delivery of the action plan has been in reducing the frequency and duration of live lane stoppages on smart motorways. Therefore, in the initial stages of our work, we have reviewed the company's evaluation plans and carried out a detailed assessment of how it evaluates its education campaigns. The company's overarching strategy to monitor and evaluate the success of the action plan, and its approach to evaluating its education campaigns, are well aligned to the relevant best practice guidance. The company will begin its overarching evaluation work in 2023. We will monitor its implementation and delivery, along with the evaluation of future waves of education campaigns.

29. The action plan is aligned to three main outcomes: reducing the frequency of live lane stops; reducing the duration of live lane stops; and improving driver perception of safety on smart motorways.

30. Of the 20 actions, National Highways has completed 16, of which four are subject to ongoing audit by the company; it has paused one (following the TSC's

recommendation); and three are ongoing and progressing to plan. Two of the four actions subject to ongoing internal audit of particular note are:

- Action 2a: faster roll-out of SVD – the SVD system, whilst in place on the SRN, is not yet operating to the required standards set by National Highways; and
- Action 3: faster traffic officer response times to incidents – National Highways has achieved substantial improvements in response times. In line with its revised milestone, in September 2022, it achieved a response time of 9 minutes and 49 seconds against the national target of a 10-minute average response time on smart motorways where the existing spacing between safe places to stop in an emergency is more than one mile. The company is committed to maintaining its focus on this area. We will continue to monitor its performance as it will carry on reporting to us until the end of RP2.

31. National Highways' approach for how it will evaluate the success of the action plan is well aligned with government's Magenta Book, which provides best practice guidance on evaluation in government. The company will undertake this evaluation using the three years of safety data that it will collect between 2022 and 2025.

32. In the initial stages of our work, we have focused on National Highways' education campaigns. We appointed consultants, Agilysis, to undertake an independent review (which we will publish on our website in due course) of the company's 'Go Left' education campaign. This covered how:

- the campaign was put together;
- its effectiveness was measured; and
- lessons learnt were captured and applied to future waves of the campaign.

33. Overall we conclude that National Highways' approach to the campaign and its subsequent evaluation were well aligned with the Government Communication Service (GCS) evaluation framework. This is a best practice guide on how to plan and evaluate campaigns for communication professionals across the wider public sector. The application of lessons learnt across the phases of the campaign was a particular strength and in some areas of its planning and evaluation the company had extended beyond the GCS framework.

34. The report also found some gaps, in part at least, arising from the origins of the campaign as a requirement of the action plan. This meant that some of the usual processes in developing the evidence base for the campaign were not followed in

this instance. However, the report concludes that there are opportunities for National Highways to further strengthen any future phases of the campaign, including:

- extending the involvement of behaviour change experts could help to place the behaviours in context, influencing the messages provided and how they are measured;
- collecting snapshots of quantitative data to try to understand the campaign's on-road impact, for example looking at the use of the left-hand lane as an indicator of improved understanding of how to drive on smart motorways; and
- drawing from elements of other best practice frameworks to enhance its application of the GCS framework, to delve more deeply into understanding the problem being addressed by the campaign by posing additional questions that explore the influences on behaviour to inform design and how a campaign is evaluated.

1. Introduction

1.1 National Highways was set up as a government-owned company in 2015, tasked with managing the strategic road network (SRN) – the motorways and major A-roads in England. The Office of Rail and Road (ORR) holds National Highways to account for delivering improvements for road users, including improving safety.

1.2 In its second road investment strategy (RIS2) the government specified a set of outcomes and investments that it requires National Highways to deliver over the second road period (RP2), from April 2020 to March 2025. This includes a target to halve the number of people killed or seriously injured (KSI) on the SRN by 2025 (compared to a 2005 to 2009 baseline).

1.3 This report covers our assessment of National Highways' 2021 performance against this safety target. In previous years, because of the timing of the release of the official STATS19 casualty data, we have published that safety performance assessment as a standalone update to our annual assessment. We are now taking the opportunity to draw together and report on our road safety activity in our first annual assessment of safety performance on the SRN. We expect the format and content of the report to evolve over time as we develop our work on the Transport Select Committee's (TSC) smart motorways-focused recommendations, which are discussed below.

1.4 Shortly after RIS2 was published, in March 2020, government released its smart motorways evidence stocktake and action plan (referred to hereafter as 'the stocktake' or 'the action plan'), which included a set of actions to improve the safety of, and public confidence in, smart motorways. We monitor National Highways' delivery of these actions and hold the company to account for its performance against the RIS2 safety key performance indicator (KPI) target.

1.5 National Highways has been reporting annually on its progress in delivering the action plan and safety statistics for smart motorways. Following recommendations we made in our quality assurance of all lane running (ALR) motorway data in 2021, the company's second year progress report, published in May 2022, included a more detailed and consistent breakdown of safety data by road type for 2016 to 2020 (a period before the implementation of the action plan).

1.6 Our quality assurance review, and a similar review we carried out for the second progress report, found that:

- the underlying calculations are correct;
- National Highways' analytical assurance framework is a strong application of Aqua Book guidance (for producing quality analysis for government) and has followed these processes to ensure its evidence is reliable and the strengths, risks and uncertainties in the analysis are clearly reported;
- the company took steps to increase transparency in how it has communicated new methods and by publishing more detailed collision and casualty data; and
- it addressed the relevant recommendations from our first review in its second progress report.

1.7 From the evidence in its second year progress report, National Highways concluded that no one type of motorway, smart or conventional, performs best against all of the safety metrics considered, and that the rate of KSIs (and fatal and weighted injuries – FWI – a similar metric that applies weights according to casualty severity) were lower on smart motorways than conventional ones. However, the company also concluded that there was a higher risk of a collision in a live lane involving a stopped vehicle on ALR and dynamic hard shoulder smart motorways (DHS – smart motorways where the hard shoulder is opened to traffic under certain traffic conditions) than on motorways with a permanent hard shoulder.

1.8 In this report we present our assessment of National Highways' safety performance on the SRN in 2021. This includes analysis by road type (motorways and 'A' roads) but more detailed splits by type of motorway are not available at this time. We expect National Highways to publish its third year progress report in spring 2023. This will include more detailed safety analysis (including by road type) with 2021 safety data.

1.9 We also expect National Highways to update in spring 2023 the before-after analysis (originally published in 2019) in its smart motorway ALR overarching safety report. This analysis compares schemes' performance against a hypothetical 'counterfactual' of what could have happened if they were not converted to smart motorways. This provides an alternative, and in some ways stronger, form of evidence on smart motorway projects' safety performance. We recommended improvements to this analysis in our 2021 quality assurance review of ALR motorway data and will review the company's progress against these recommendations.

1.10 Both of these pieces of analysis will add to the evidence base on smart motorway safety. But, as they will use data up to 2021 and the delivery of significant aspects of the action plan has continued throughout 2022, they are unlikely to be able to demonstrate the effectiveness of the action plan as a whole in improving smart motorway safety.

The Transport Select Committee inquiry into the roll-out and safety of smart motorways

1.11 Public interest in the safety of smart motorways has continued and, in November 2021, the TSC published the outcome from its inquiry into the roll-out and safety of smart motorways. Within this report, there were three recommendations that specifically referenced ORR:

- Recommendation 1: The Department [for Transport] should make the introduction of changes to the design and operation of the Strategic Road Network depend on a formal health and safety assessment by the Office of Rail and Road;

- Recommendation 4: The Department and National Highways should commission the Office of Rail and Road to conduct an independent evaluation of the effectiveness and operation of stopped vehicle detection technology, including maintenance and monitoring; and

- Recommendation 6: Beginning in September 2022, the Office of Rail and Road should be tasked with evaluating how successful the action plan has been in:

(b) reducing incidences of live lane breakdowns;

(c) reducing the time for which people who breakdown or stop in a live lane are at risk; and

(d) educating drivers on what to do if they breakdown in a live lane.

1.12 The government's response, published in January 2022, endorsed these three recommendations. The response extended, or clarified, the scope of our work in two significant ways:

- Recommendation 4 – The response recognised that SVD operates as part of a wider system of inter-related features that help keep traffic moving and safe on smart motorways. Therefore, the scope of our work covers the whole of that end-to-end safety system, not just SVD technology.

- Recommendation 6 – The response specified that we should assure and report on the successful delivery of each actions and that the desired outcomes are being achieved.

1.13 After exploratory work with government and National Highways over 2022, including visits to see the operation of smart motorways on the network, we received the first performance data in September 2022 and began our analysis in line with the recommendations from the TSC. As was set out in the government's response to the TSC, which envisaged us reporting annually, this report includes an update on our progress in the early stages of our work. We see this as a long-term programme that will continue at least until the end of RP2 in 2025.

1.14 While all the areas covered in this report relate to road safety, it is too early to fully understand how SVD technology, the wider safety system and other parts of the smart motorways action plan have affected overall casualty numbers. We would strongly caution against drawing links between them at this stage. This is particularly the case as the casualty data relate to 2021 (when traffic was returning to more normal levels) and National Highways delivered significant elements of the action plan during 2022.

1.15 As discussed above, we expect National Highways to publish its more detailed analysis of the latest smart motorway safety data and its updated before-after evaluation evidence in spring 2023. Both of these pieces of analysis will add to the evidence base on smart motorway safety but, as they will use data up until 2021, will not be able to assess the success of the more recent measures National Highways has implemented under the action plan.

1.16 The remainder of this report is structured as follows:

(a) section 2 reports our assessment of safety performance on the SRN in 2021;

(b) section 3 presents our progress and findings to date on our assessment of the effectiveness and operation of the end-to-end safety systems on smart motorways; and

(c) section 4 presents our progress and findings to date in evaluating the success of the smart motorway evidence stocktake and action plan.

2. Safety performance on the SRN in 2021

2.1 In RP2, National Highways' safety key performance indicator (KPI) has a target to reduce the number of people killed or seriously injured (KSIs) on the SRN by 50% in 2025, compared to a baseline of the 2005 to 2009 average.

2.2 In our annual assessment of National Highways' performance, published in July 2022, we said we would publish a report on National Highways' safety performance following DfT publishing its safety data in autumn 2022.

2.3 On 29 September 2022, DfT published its road casualty statistics for 2021.

KPI: number of people killed or seriously injured on the SRN

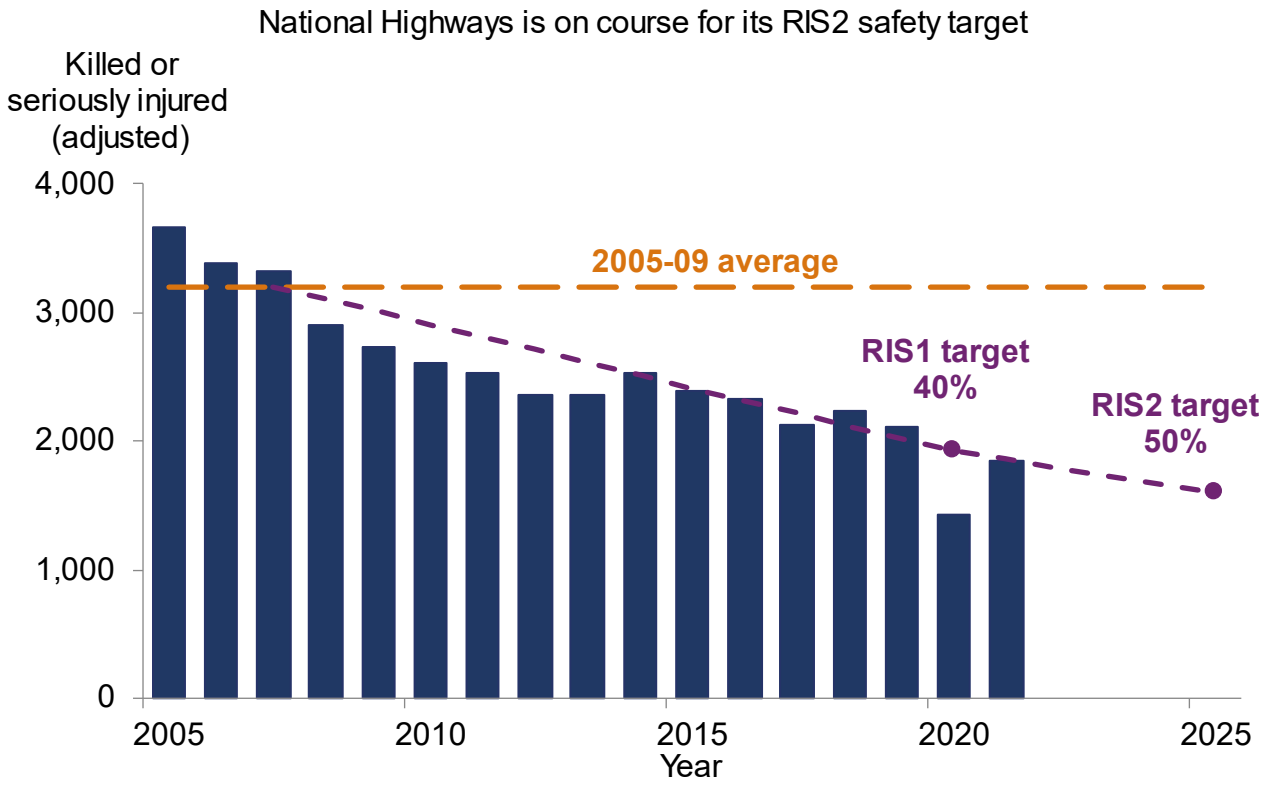
2.4 Figure 2.1 shows that, in 2021, 1,857 people were killed or seriously injured on the SRN. This is 261 (12.3%) fewer than in 2019 and represents a 42.1% reduction from the baseline. In comparison, deaths and serious injuries on all roads in England have fallen by 9% since 2019, and by 32% compared to the same 2005 to 2009 baseline period.

2.5 The number of people killed or seriously injured on the SRN in 2021 compared to 2020 has increased by 424 (29.6%). However, comparisons with 2020 should be approached with caution due to significantly reduced traffic levels in 2020.

2.6 In 2021 there were 222 deaths on the SRN, 12 (5.7%) more than in 2019.

2.7 Table 2.1 shows the trajectory for National Highways to reach a 50% reduction in people killed or seriously injured by 2025. The trajectory is based on the company reducing casualties by an equal amount each year, first from the baseline period to the RIS1 target level in 2020, and then from that point to the RIS2 target for 2025. To be on track in 2021, National Highways needed to reduce the number of people killed or seriously injured to below 1,859. The company's performance is marginally better than this trajectory.

Figure 2.1 Killed or seriously injured (adjusted), strategic road network, 2005 to 2021



Source: DfT road casualty statistics (RAS0303)

Table 2.1 Trajectory for National Highways to meet its 2025 target

Year	Actual KSIs	KSI trajectory	Committed target
2005 to 2009 (baseline)	3,206	-	-
2020	1,433	1,923	1,923 (40% of 3,206) by 2020
2021	1,857	1,859	-
2022	Autumn 2023	1,795	-
2023	Autumn 2024	1,731	-
2024	Autumn 2025	1,667	-
2025	Autumn 2026	1,603	1,603 (50% of 3,206) by 2025

Source: DfT road casualty statistics (RAS0303)

Severity adjustment

Since 2012, a large number of police forces moved to injury-based reporting systems. The system affects the number of serious and slight injuries reported. In previous years, serious injuries may have been classified as slight injuries.

DfT publishes adjusted figures, these are the estimated number of serious and slight injuries if all police forces used injury-based severity reporting. This enables the figures to be compared with historical data.

Table 2.2 Killed or seriously injured (adjusted), strategic road network, 2021, 2019 and 2005 to 2009

Casualty Severity	2021	2019	2005-09 baseline	Percentage change from	
				2019	Baseline
Killed	222	210	357	+5.7%	-37.8%
Seriously injured (adjusted)	1,635	1,908	2,849	-14.3%	-42.6%
Killed or seriously injured	**1,857**	**2,118**	**3,206**	**-12.3%**	**-42.1%**

Source: DfT road casualty statistics (RAS0303)

Casualty Rates

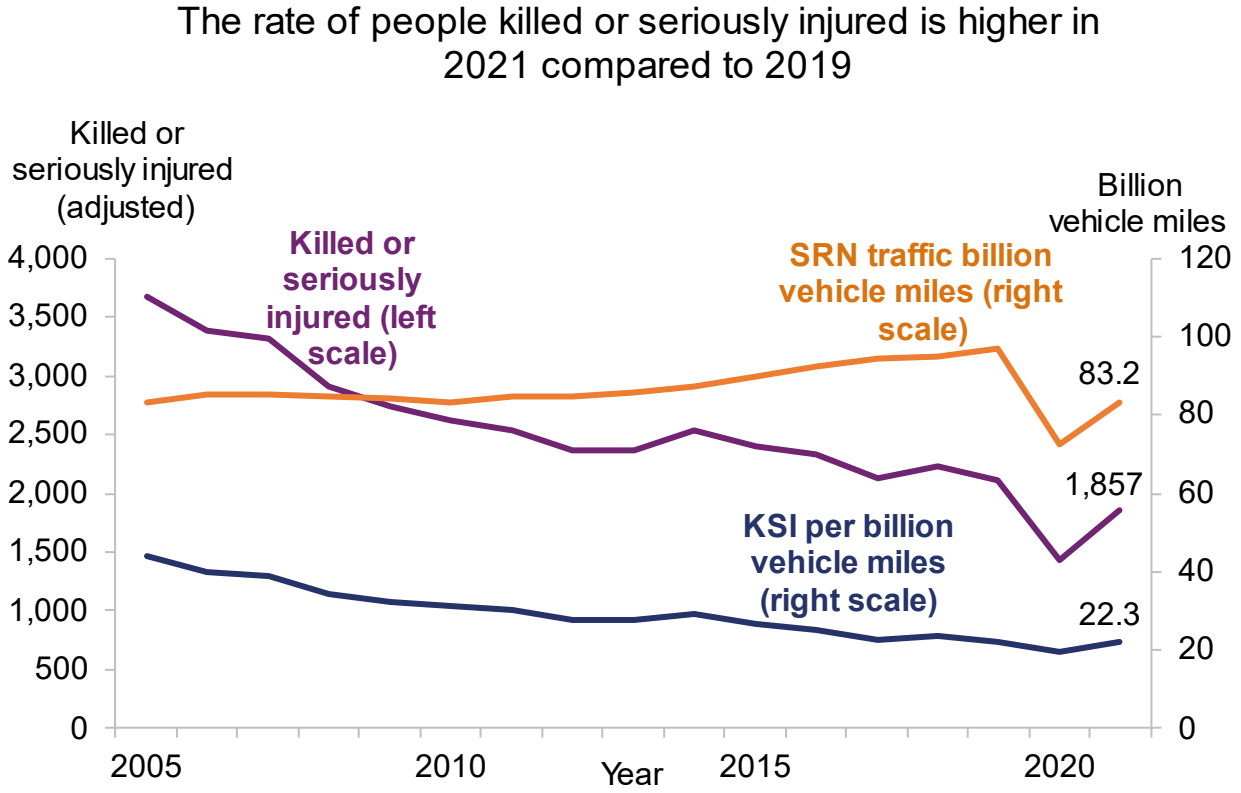
2.8 Traffic levels on the SRN were significantly affected by the COVID-19 pandemic. As can be seen in figure 2.2, traffic on the SRN in 2021 was still below the pre-pandemic levels seen in 2019. To better understand the impact of reduced traffic, it is useful to look at casualty rates, the number of casualties per billion miles travelled.

2.9 DfT reported that for all roads in Great Britain, the rate of people killed or seriously injured per billion vehicle miles travelled increased by 1.5% in 2021 compared to 2020. Figure 2.2 shows that this increase in the casualty rate was also observed on the SRN, where an increase of 13.1% was observed, from 19.7 KSIs per billion vehicle miles in 2020 to 22.3 KSIs per billion vehicle miles in 2021.

2.10 Using the rate of people killed or seriously injured, it is possible to estimate a 'counterfactual' position. Multiplying the total miles travelled in 2019 on the SRN (96.8 billion vehicle miles) by the rate of being killed or seriously injured per mile on the SRN in 2021 (22.3 per billion vehicle miles), we estimate that 2,161 people

could have been killed or seriously injured with pre-pandemic traffic levels. There are many factors affecting road safety beyond just traffic levels but this illustrates the risk that casualties could increase further with further increases in traffic in 2022.

Figure 2.2 Killed or seriously injured (adjusted) per billion vehicle miles, strategic road network, 2005 to 2021



Source: DfT road casualty statistics (RAS0303) and DfT traffic statistics (TRA4101)

Road type

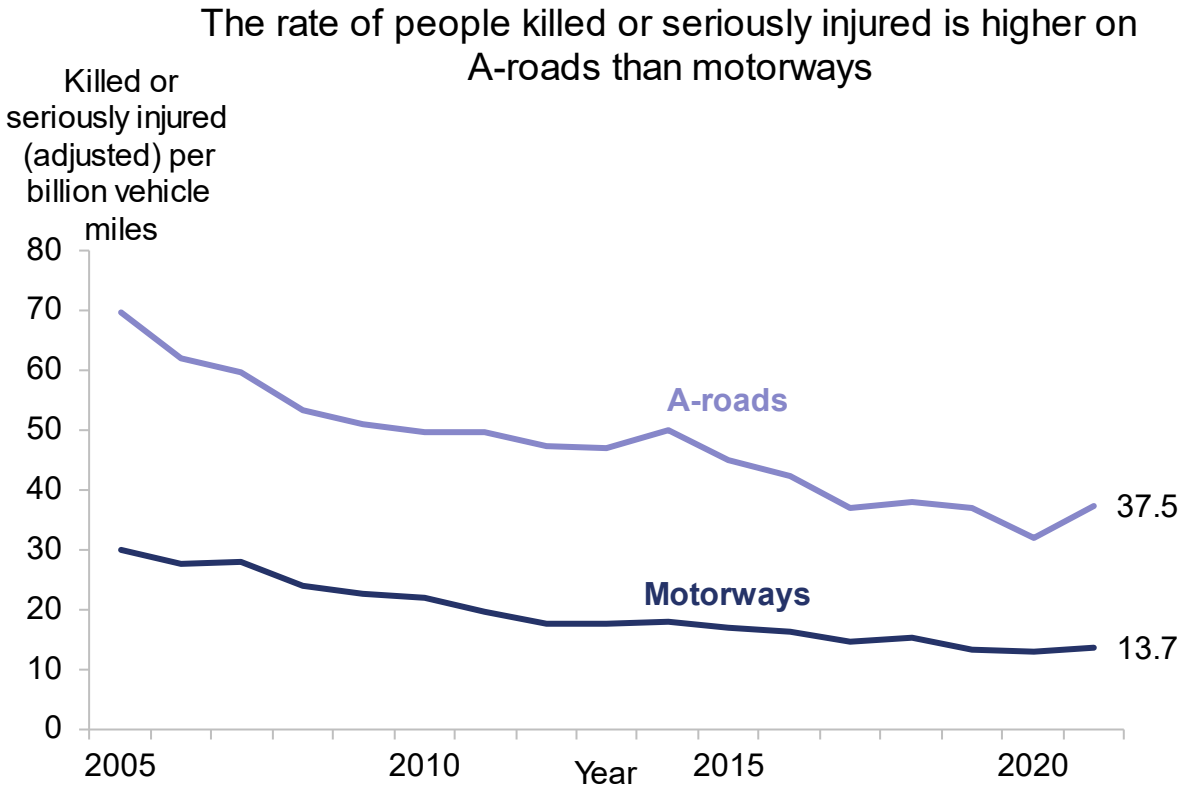
2.11 Casualty data is split between motorways and A-roads and it can be useful to see the differences between road types.

2.12 On National Highways' motorway network, a total of 729 people were killed or seriously injured in 2021. This is an increase of 127 (21.2%) compared to 2020, but 106 (12.7%) lower compared to 2019.

2.13 On National Highways' A-roads, a total of 1,127 people were killed or seriously injured in 2021. This is an increase of 296 (35.6%) compared to 2020, but 155 (12.1%) lower compared to 2019.

2.14 Figure 2.3 shows the rate of people killed or seriously injured on motorways (13.7 per billion miles) is lower compared to A-roads (37.5 per billion miles). At this stage, this data is unable to separate smart motorways from conventional motorways. National Highways' action plan progress reports include analysis of a more disaggregated set of road types, distinguishing between conventional and the different types of smart motorway. We expect the company's third progress report, to be published in spring 2023, to include this analysis of the 2021 safety data.

Figure 2.3 Killed or seriously injured (adjusted) per billion miles, by strategic road type, 2005 to 2021



Source: DfT road casualty statistics (RAS0303) and DfT traffic statistics (TRA4102)

PIs: improving safety for all

2.15 Performance Indicators (PIs) are untargeted metrics. They enable us to scrutinise more aspects of National Highways' network performance beyond the headline KPIs.

Total number of people killed or injured on the SRN

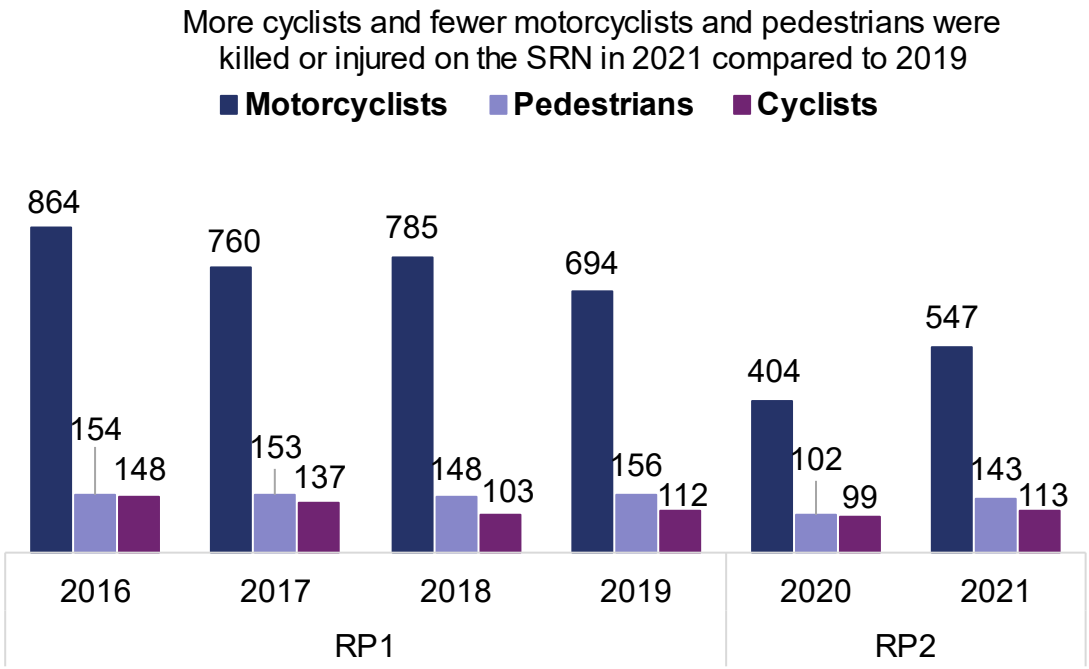
2.16 In 2021, 9,819 people were killed or injured on the SRN. This PI includes the 'slight injury' category that is excluded from the KPI. This is a 24.7% increase compared to 7,873 people killed or injured in 2020.

2.17 The number of people killed or injured in 2021 is 2,528 (20.5%) lower than in 2019, when 12,347 people were killed or injured. With traffic levels in 2021 14.0% lower than in 2019, this shows a decrease in the rate of casualties on the SRN in 2021 compared to pre-pandemic levels.

Number of non-motorised and motorcyclist users killed or injured on the SRN

2.18 In 2021, a total of 803 non-motorised and motorcyclist users were killed or injured on the SRN. This is an increase of 198 (32.7%) compared to 2020, but 159 (37.1%) lower compared to 2019. Figure 2.4 shows a breakdown by user type.

Figure 2.4 Non-motorised and motorcyclist users killed or injured, strategic road network, 2016 to 2021



Source: DfT road safety data tables

Number of injury collisions on the SRN

2.19 In 2021, 6,539 collisions were recorded on the SRN that resulted in at least one injury of any severity. This is 1,272 (24.1%) higher compared to 2020, but 1,366 (17.3%) lower compared to 2019.

Accident frequency rate for National Highways' staff and supply chain

2.20 As reported in our 2021-22 Annual Assessment of National Highways' performance, published in July 2022, there has been an improvement in accident frequency rates since 2015 for both National Highway staff (0.05 incidents per 100,000 hours worked) and its supply chain (0.07 per 100,000 hours worked), although improvements have stalled in RP2.

Percentage of traffic using iRAP 3-star or above roads

2.21 As we also reported in our 2021-22 Annual Assessment of National Highways' performance, National Highways met and exceeded its RIS1 target to ensure that 90% of travel on the SRN was on roads rated three stars or better, using iRAP (international road assessment programme) version 1.

Conclusion

2.22 National Highways' safety performance is on course to achieve its RP2 target to reduce the number of people killed or seriously injured on the SRN by 50% compared to 2005 to 2009 levels.

2.23 The number of people killed or seriously injured on the strategic road network in 2021 was marginally better than the trajectory to reach a 50% reduction. National Highways will need to maintain its strong focus on safety throughout RP2 to achieve its 2025 target, especially as further increases in traffic in 2022 could lead to increases in casualties.

2.24 National Highways is working to develop and deliver an action plan aligned to its 2025 safety target and its longer-term goal of zero harm on the network by 2040. We expect to see this plan by March 2023. We will scrutinise the plan to assure ourselves that it is robust, deliverable and sets out how the company will achieve its 2025 safety target.

3. Effectiveness and operation of the end-to-end safety systems on smart motorways

3.1 Smart motorways use multiple technology systems with interrelated features working together to help enable free-flowing traffic and improve road users' safety. The technology systems include variable speed limits, signs and signals (including Red X signals to close lanes), enforcement cameras, CCTV, and the Motorway Incident Detection and Automatic Signalling (MIDAS) system and, on all lane running (ALR) smart motorways only, these systems are further enhanced with the inclusion of stopped vehicle detection (SVD) technology.

3.2 SVD is an enhancement which complements the other systems that work together to help further reduce the risks associated with live lane stops on ALR smart motorways. SVD does not operate independently from these other systems and it is important to understand how it operates as part of the wider end-to-end safety system. Therefore, DfT commissioned us to go further than only assessing the effectiveness of SVD by assessing the effectiveness and operation of that whole end-to-end safety system.

3.3 This section reports our progress in the initial stages of this work. It is structured in the following way:

(a) understanding the end-to-end safety system and its components;

(b) establishing the system's intended operational outcomes and performance requirements;

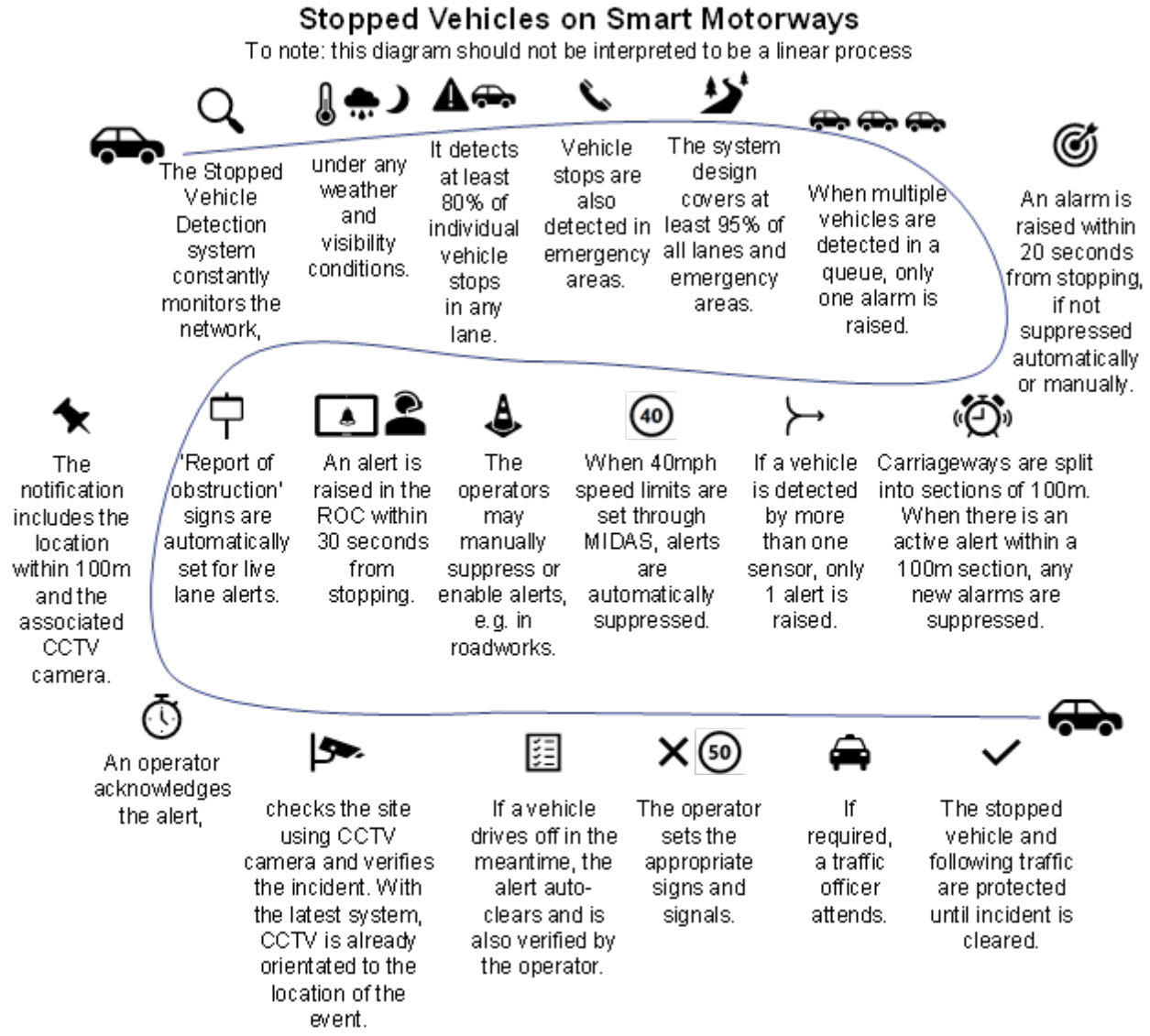
(c) analysing initial operational performance of the end-to-end safety system; and

(d) summarising and setting out the way forward.

The end-to-end safety system and its components

3.4 The end-to-end process for SVD is illustrated in the diagram below, based on the performance requirements that National Highways has set itself.

Figure 3.1 The concept for the end-to-end system for stopped vehicle detection



Source: National Highways

Operational capability of the system

3.5 The operational capability of smart motorway safety systems and how each system interacts with SVD are summarised in the tables below:

Table 3.1 SVD system components from detection to alert

System	Description
SVD system (ALR only)	The SVD system is defined as the system on the roadside that sends alerts of stopped vehicles to the traffic management system. The SVD system raises two categories of alert – SVD (Live) – stopped vehicle detected in a live lane and SVD(EA) – stopped vehicle in an emergency area (EA). Currently, the technology used for the SVD system is radar-based, for which National Highways has a sole supplier nationally. Scanning SVD radar is a technology that tracks moving vehicles through the field of view of the radar and raises the alarm to a Regional Operations Centre (ROC) operator if a vehicle stops in the carriageway or EA. The system is configured locally to understand which zones within its range are live lanes or EAs, and which zones are not relevant for SVD.
Traffic management system	Two traffic management systems are currently implemented in National Highways' regional operations centres (ROCs) and receive stopped vehicle alerts from the roadside SVD systems. These traffic management systems are Control Office Base Station (COBS) & DYNAC. COBS is the National Highways legacy system, while DYNAC is the upgraded advanced traffic management system. DYNAC roll-out across the regions began in 2021. DYNAC has been installed in five ROCs, with the remaining two scheduled to be completed by 2023. The traffic management system receives the alerts from the SVD servers, displays them to the operators for action and automatically sets "Report of obstruction" on upstream motorway signs, whilst operators are taking action.
National Road Tele-communications Service (NRTS)	NRTS operates and maintains the telecommunications services that link over 30,000 roadside assets including SVD, message signs, CCTV cameras and MIDAS to seven ROCs and the National Traffic Operation Centre enabling National Highways to manage and operate the network. NRTS provides the communication link between the roadside SVD radar, the SVD servers, and the traffic management system (DYNAC or COBS) in the ROC.

Table 3.2 SVD service components from alert to resolution

System	Description
Closed-circuit television (CCTV)	CCTV plays an important role in the SVD service. Once an alert is displayed to the ROC operators, the operators use the cameras to verify and classify the alert and then set the signals as appropriate. CCTV allows operators in the ROC to view parts of the highway network with the ability to see 100% of the carriageway on ALR smart motorways.
Message signs and signals	Signals display illuminated speed information and lane closure symbols. Message signs display illuminated text. This information can relate to

System	Description
	signal setting, journey time information, incidents, weather, planned works, or road layout changes. For the SVD service, signs and signals provide information that alerts drivers to hazards ahead and display Red X signals to close lanes to other traffic when a stopped vehicle is identified. When an SVD alert is raised, the SVD system will automatically set message signs within the area to display “report of obstruction”. Once the operator has verified the incident and its location, they can manually close lanes accordingly on the motorway using the signals.
National Highways’ ROC operator actions	The operators play a critical role in providing the SVD service. Their role includes acknowledging the SVD alert, using CCTV to verify the situation, classifying the alert, setting signs and signals, and deploying resources, such as traffic officers.
Traffic officer response times	Traffic officers play a significant role in achieving National Highways' three imperatives of safety, customer service and delivery, by helping to keep the roads moving and road users safe. Traffic officers are deployed by the operators in the ROC when a stopped vehicle is detected and they take the lead role in managing the situation, except where there is an incident involving loss of life, life-changing injuries, or potential criminal activity which are managed by emergency services. There was an average 10-minute response time target set for traffic officers on parts of the ALR network where places to stop in an emergency are greater than 1 mile apart.

Table 3.3 Wider detection systems influencing SVD outcomes

System	Description
Motorway Incident Detection and Automatic Signalling (MIDAS)	MIDAS detectors monitor traffic by collecting data on vehicle speeds, volumes, classification, and occupancy. They identify queuing traffic or congestion by monitoring traffic speed and flow. Detectors can be inductive loops (sensors installed in the road surface) or 'side-fire radar' (radars installed on a pole beside the motorway). In the SVD service, MIDAS enables auto suppression of SVD alerts when the traffic flow is at 40mph or below. Auto suppression prevents multiple alerts from being sent to the ROC operators when cars are moving at low speeds and the risk of a collision (or non-identification of a stoppage) is low. MIDAS is not designed to automatically detect stopped vehicles, but due to its ability to detect slowing traffic and queues in the event of a stopped vehicle in a live lane, it will provide a level of resilience to the SVD system for the operator to identify if there has been an incident. The ROC operators will see the automatic setting of reduced speed signs which will alert them to an incident that can be evaluated using the CCTV cameras to inform their response.

System	Description
Enforcement cameras (HADECS)	Highways Agency Digital Enforcement Camera System (HADECS) v3 is a multi-lane speed enforcement system used to enforce Variable Mandatory Speed Limits (VMSL) and 'Red-X' compliance on smart motorway schemes. This should improve compliance with the speed limit and 'Red-X' signals set by the operators for various reasons including when a stopped vehicle has been identified, which should, in turn, reduce the risk of a collision.

Operational outcomes and performance requirements

SVD performance requirements

3.6 The analysis undertaken by the Highways Agency (the forerunner to Highways England and National Highways) as part of its safety governance process between 2010 and 2012 identified an increase in risk associated with stopped vehicles in running lanes of future ALR smart motorways during off-peak conditions. This resulted in the creation of the M62 and M25 trial sites to conduct testing of a system that would address the increase in the risk identified. Following the trials, National Highways developed the technical requirements for the SVD system and the operational requirements for the SVD service. The company has advised that these requirements were partly driven by what was technically achievable with the technology available at the time, and the trade-offs between different requirements (for example, that a higher detection rate would require a longer time to detect stopped vehicles).

3.7 The complete list of core requirements for the SVD system can be found in Annex A. The key requirements for the SVD service as specified by National Highways in its technical specification are as follows:

(a) The SVD system shall provide at least 95% coverage of the defined ‘coverage area’, per carriageway, per link. The coverage area is defined as all mainline carriageway running lanes (to the outside of carriageway markings) and each of the emergency areas (or, EAs, formerly known as emergency refuge areas).

(b) The detection rate for detecting a stopped vehicle that triggers an SVD alert shall be at least 80%. The detection rate is defined as the true positive rate, which is the proportion of “stopped vehicle events” which are correctly reported within the performance limits.

(c) The false detection rate shall be lower than 15% of all SVD alerts raised. The false detection rate is defined as the proportion of all SVD alerts reported incorrectly, either because an SVD alert does not relate to a true stopped vehicle event or because the SVD alert data is not within the performance limits.

(d) The time to detect shall not exceed 20 seconds. The time to detect is the elapsed time between a stopped vehicle event occurring and an SVD alert message with the status "alert" being generated.

3.8 In February 2022, National Highways carried out a safety risk assessment of the complete SVD service (people, process, infrastructure, and all associated technology), building on earlier risk assessments of individual systems and features of the overall service. This aimed to address the question of the risk profile of ALR with SVD in operation compared to ALR without SVD. The scope of the safety risk assessment was to evaluate the likely impact and effectiveness of the SVD system currently deployed on ALR schemes.

3.9 The assessment concluded that, with SVD performing in line with the key requirements specified above, the overall risk associated with a vehicle stopped in a live lane would reduce by 51.8% compared to the risks without SVD. This provides reassurance that the requirements specified are aligned with reducing the risk.

3.10 However, in this safety risk assessment, National Highways did not explore if a higher risk reduction could be achieved with alternative requirements to those listed above. For example, if the detection rate were set to 90%, how would this affect the other requirements and would it result in a risk reduction greater than the 51.8% found in the company's risk assessment? The company has told us that it considered this during the trials but has not provided evidence of the conclusions. It should consider if there is value in re-visiting this analysis with its greater experience in operating the system across a wider range of sites, as part of its plans to optimise and enhance performance (which are described in more detail later in this section).

System availability

3.11 System availability is a performance metric that determines the percentage of time a system is available for use. National Highways specifies its SVD system availability requirement in its SVD user requirements as "The user must be provided with a system that meets current Highways England roadside technology

availability targets of 98%". For its other technology assets (specifically message signs, signals and CCTV) the company has set itself a 95% availability target.

Maintenance

3.12 Maintenance is essential for ensuring asset availability, safety, and reliability. National Highways set out its maintenance requirements for the SRN under its asset delivery model in GM701 – Asset delivery asset maintenance requirements.

3.13 As specified in these standards, all roadside technology defects that limit the capability of the SVD service must be resolved within 48 hours unless an alternative intelligence-led approach is identified and justified by network characteristics, asset intelligence and customer, safety, and delivery needs.

Operational performance of the end-to-end safety system

3.14 We are at an early stage of our work in this area and this section of the report provides the initial results and findings from our analysis of operational performance to date. This analysis has two main sources:

- 'ground truthing' testing of SVD systems (which is described in more detail below) – which provides a snapshot of a scheme's operational performance; and
- five months of ongoing operational data, which largely relates to system availability on ALR smart motorways, and some aspects of SVD performance, from April 2022 to August 2022.

3.15 It should be noted that from both sources we are working with a limited amount of data. Where this data has raised potential concerns with performance, we are closely monitoring National Highways' progress in making improvements.

SVD performance

Ground truthing testing

3.16 In this sub-section, we analyse the SVD service's operating performance against the minimum requirements described above. This analysis draws mainly from data produced by National Highways' ground truthing testing of SVD technology.

3.17 When SVD is installed, it goes through product and site acceptance testing to ensure it is functioning. National Highways developed ground truthing as an

additional layer of assurance to test if the system is meeting its operational requirements for detection rates, detection time and false alerts.

3.18 The ground truthing process involves monitoring, verifying and timing alerts generated by the SVD technology within the ROC over a 24-hour period. As such, ground truthing results represent a snapshot of performance at the time of the testing, rather than a continuous series of the latest performance across all ALR schemes.

3.19 The detection rate is determined by reviewing recorded footage from each CCTV camera in the test area. This process is not able to verify every event or alert. This leads to a range in the results, depending on how unverified events are treated (whether the detection rate is based on the total number of alerts, or only those that can be verified). The results we report here use the low end of that range as, if this 'worst case' is higher than the minimum level, it would demonstrate that the system is meeting the requirement.

3.20 Ground truthing is carried out during the handover from National Highways' major projects team to its operations team. If performance does not meet the required level, the company will carry out a root cause analysis, implement the required improvements and repeat the ground truthing testing until the performance requirements are met. Furthermore, the ground truthing process will be repeated annually on the anniversary of each scheme's opening.

Ground truthing results

3.21 The table below summarises the results from the initial 'scheme commissioning' ground truthing tests of 17 ALR schemes. We have aggregated the results to regional level (to be consistent with other data which are on a regional basis), for the five of National Highways' operating regions that have ALR smart motorways. The table reports weighted averages for each region, with the rate or average time for each ALR scheme in that region weighted by the total number of alerts recorded during the 24-hour testing period. We explored alternative approaches, using unweighted means and medians. These did not produce substantially different results and the results for the median scheme in each region (and nationally) are included in Annex B.

Table 3.4 Initial ground truthing testing results

Features	Minimum require-ment	East	North West	Midlands	South East	York-shire and North East	National
Detection rate (%)	>80%	78.3%	74.0%	59.6%	73.4%	79.6%	67.5%
False detection (%)	<15%	67.2%	71.1%	83.5%	63.8%	70.2%	74.8%
Alert time (secs)	<20 secs	43.1s	15.7s	56.5s	45.7s	64.8s	47.6s

Source: National Highways ground truthing testing data

The average figures presented here have been calculated from the average ground truthing results of all schemes within each region (and across all schemes for the national figures), weighted by the total number of alerts recorded during the 24-hour testing period. Alternative methods of calculation were found to have a limited effect on the averages and performance against the requirements.

3.22 Table 3.4 shows that:

- Across all National Highways' regions with ALR smart motorways, false detection rates are substantially above the required maximum. The company's specification states that false alerts may not constitute more than 15% of all alerts and performance ranged from 63.8% to 83.5% across the regions. This creates extra workload for operators; risks reducing operators' and drivers' confidence in the system (false alerts automatically trigger 'Report of Obstruction' messages on variable message signs ahead of alert locations); and, ultimately, could lead to real alerts being missed.
- Overall detection rates are below National Highways' minimum requirement of 80%. None of the company's five regions with ALR smart motorways are meeting this requirement, achieving between 59.6% and 79.6%.
- The required average time to detect stopped vehicles in less than 20 seconds is not being met. Four out of five of National Highways' regions with ALR smart motorways are not meeting this requirement, achieving between 43 and 65 seconds.

3.23 National Highways must take urgent action to achieve the performance levels it has set. The company recognises this and is investigating the issues with SVD through its three phase Stabilise and Tune – Optimise – Enhance (STOE) programme. This programme is discussed in more detail later in this section.

3.24 The rest of this sub-section covers different aspects of the operational performance of SVD, from the coverage of the system through to ROC operator response times. The end-to-end process ultimately concludes with a traffic officer attending, where needed, until the incident is cleared. Given the close links with our evaluation of the effectiveness of the action plan in reducing the duration of live lane stoppages, we report on this in section 4.

Coverage

3.25 During the detailed design stage of a scheme's development, National Highways goes through a process to ensure the SVD radars are positioned to meet the detection coverage area requirement of 95% (at all times, including during all weather and lighting conditions). This involves desktop verification with 2D and 3D modelling and site surveys by the contractor and SVD supplier.

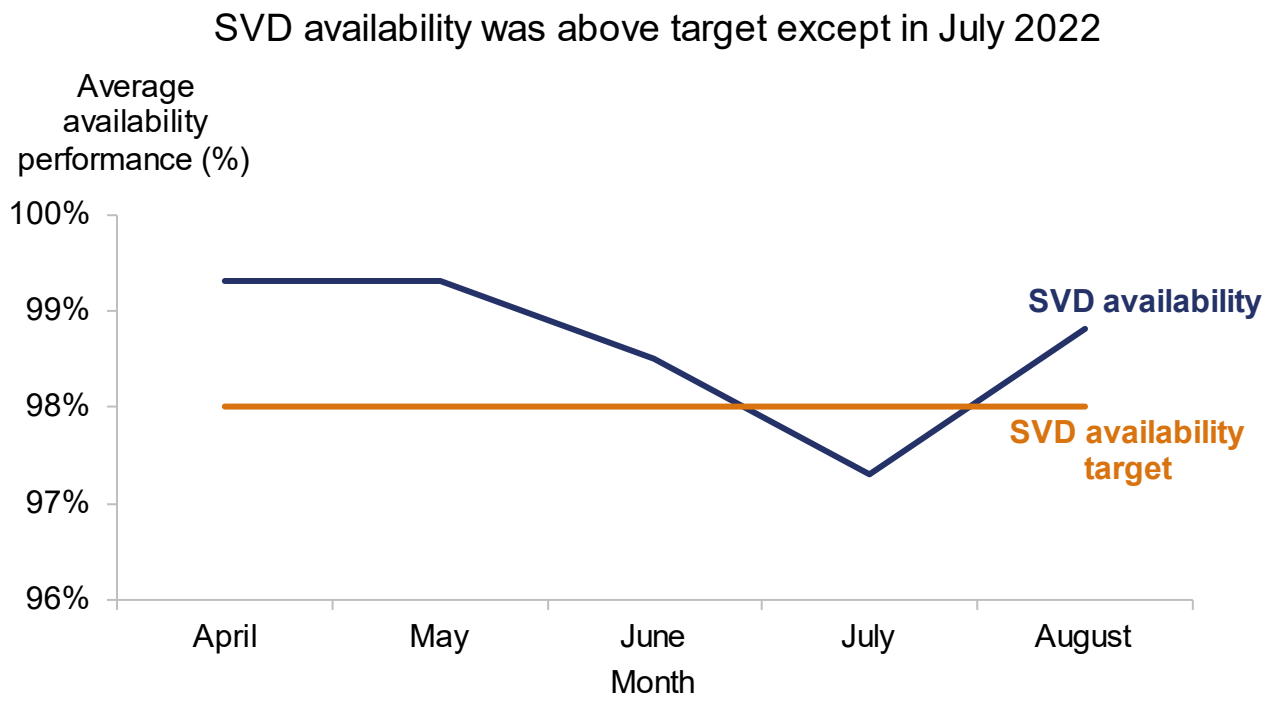
3.26 National Highways is exploring a suitable testing method to demonstrate its compliance with this requirement. We will engage with the company on this as our work develops and will report on its performance when data is available.

Availability

3.27 National Highways captures SVD availability through ongoing monitoring, not the ground truthing process. We have reviewed five months of data from April 2022 to August 2022 and SVD availability performance is shown in the chart below, plotted against the 98% target.

3.28 National performance was above the 98% in four of the five months and exceeded the target on average across that period. The 98% target was also achieved in all of the five regions with ALR schemes in August 2022.

Figure 3.2 National SVD availability performance, April 2022 to August 2022



Source: National Highways ALR monitoring data

Alert suppression

3.29 The SVD system is required to have the functionality to filter out SVD alerts when 40mph variable speed limits are set by MIDAS.

3.30 National Highways has told us that part of the reason for the high false detection rates reported above is that the ground truthing process records as false alerts instances where there is no stopped vehicle and where there is a stopped vehicle but no action is required. The latter would include times when a vehicle stops and then restarts its journey or where a stopped vehicle is detected in queueing traffic. The company has also stated that its operator response times (discussed below) are directly impacted by short duration, high volume incidents known as 'mirroring'. These can generate hundreds of alerts and overwhelm the operators.

3.31 We have seen evidence from ground truthing logs that alerts are being automatically suppressed. But the factors affecting false alert rates and operator response times that National Highways has reported suggest that this part of the system could operate more effectively. We will explore with the company how it can more directly demonstrate meeting this requirement and will report on this when the performance data is available.

Automatic signing

3.32 Based on a review of a sample of COBS raw data logs provided by National Highways and a visit to West Midlands ROC to see SVD in operation, we have observed that automatic signing is operating as required and generating “Report of obstruction” signs. More extensive analysis is required with more data to provide further confidence that the company is meeting the requirement. The performance of automatic signing will be analysed further in our next report.

Operator response time – classifying alerts

3.33 The SVD classification process is carried out by an operator in the ROC when an SVD alert is received. It involves classifying the received alert as a stopped vehicle in a live lane, emergency area or a non-live lane. The requirement is for 95% of alerts to be classified within 90 seconds of notification of the stopped vehicle event.

3.34 National Highways captures its operator response times through ongoing monitoring, not the ground truthing process. We have reviewed five months of data from April 2022 to August 2022. On average across this five month period, fewer than 70% of alerts were classified within 90 seconds. This is less critical than the performance of the SVD technology itself, as it does not directly impact the safety improvements delivered by the SVD service.

3.35 National Highways has implemented changes to reduce the number of false alerts and duplication of alerts enabling the operators to categorise alerts quicker as required. There is some evidence of this in the data, with performance improving from 67.7% in April 2022 to 70.2% in August 2022. We will continue to monitor performance for this requirement.

Stabilise and Tune – Optimise – Enhance

3.36 National Highways accelerated its delivery of SVD to have the system in place on all ALR smart motorways by September 2022, six months ahead of the original action plan milestone of March 2023. The pace of delivery, in response to the action plan target, which aims to reduce the duration of live lane stops, has given the company limited opportunity to apply lessons learnt as it goes.

3.37 The issues revealed in the ground truthing testing may, to some extent, be expected with a new system, but they require urgent action from National Highways to improve SVD performance. The company recognises this and has introduced a three-phase process, beginning in September 2022, to apply those

lessons learnt, establish the governance around future SVD updates, drive system improvements and enhance the effectiveness of the SVD service.

3.38 The three phases in the STOE process are:

(a) Stabilise and tune (running until the end of June 2023) – will ensure the SVD system achieves the minimum requirements, reduce operator workload, upgrade legacy systems to support DYNAC delivery, and establish an SVD physical test environment, including other measures.

(b) Optimise (by October 2023) – will examine legacy retrofit and physical upgrades, explore automating ground truthing, re-engineer regional installations and enhance service monitoring.

(c) Enhance (from October 2023) – will explore the requirements assessment and baseline, design updates, scheme refresh and deployment, and will ultimately evolve into a process of continuous improvement.

3.39 In the stabilise and tune phase, National Highways is conducting root cause analysis to determine the required fixes when schemes fail to achieve the required performance in ground truthing tests. The company will then implement the required fixes and retest schemes. It has committed to continuing this process until the performance requirements are met, which is expected by the end of June 2023.

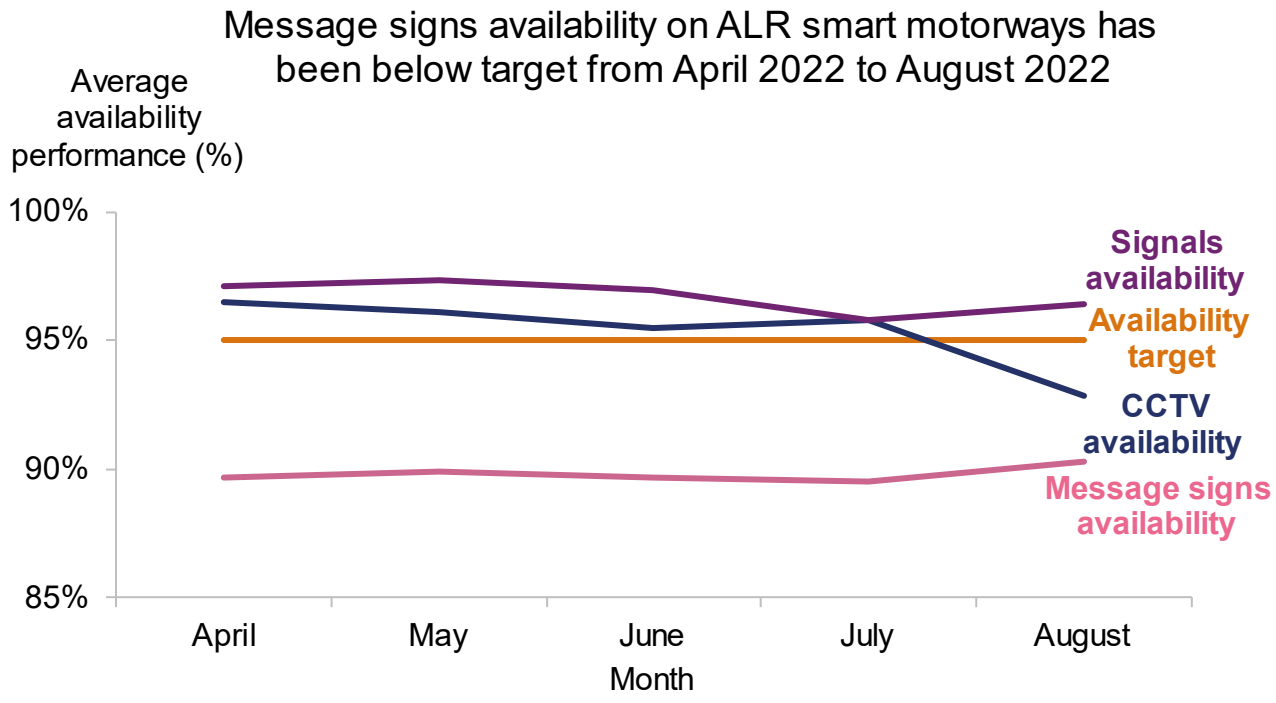
3.40 As part of this programme, National Highways is implementing a software upgrade. Testing results for one scheme with this upgrade showed that the requirements for the detection rate and the time to detect stopped vehicles were met. This is encouraging but it is too early to see the effect across all schemes with SVD in place. The company has more to do to roll-out these improvements across all ALR smart motorways and to reduce false detection rates.

3.41 We are closely monitoring progress through this phase. We can require National Highways to take further action, in line with our Holding to Account policy, if we do not think they are doing everything they reasonably can. We will take this action, if required and the company is not on track to make the necessary improvements.

Performance of other components of the end-to-end safety system on ALR smart motorways

3.42 Figure 3.3, below, shows the availability of CCTV, message signs and signals on ALR smart motorways from April 2022 to August 2022, against the availability requirement of 95% that National Highways has set itself.

Figure 3.3 National CCTV, message signs and signals availability on ALR smart motorways, April to August 2022



Source: National Highways ALR monitoring data

CCTV

3.43 National Highways met its 95% availability target nationally from April 2022 to July 2022, with a drop below the target to 92.9% in August 2022. Across the five months, the average national availability performance is 95.3%. It is important for the CCTV availability performance level to meet the target, as the system plays an important role in providing the SVD service and overall safety.

3.44 At a visit to the West Midlands ROC we spoke to the operators. They told us that the CCTV system had performance issues. Operators had both the original CCTV system with COBS and the new CCTV system on DYNAC at their desk. The pan, tilt and zoom functions on the new DYNAC deployment had response time issues. This could impact the operator's ability to classify stops and respond as required, within the required timescales.

3.45 Furthermore, during the visit to the ROC, operators raised concerns about the time taken to repair CCTV cameras. If the August availability performance were to continue, there is a risk that CCTV cameras will be unavailable to operators who need them to complete the stopped vehicle identification process.

3.46 National Highways has stated that a new contract is being implemented over the coming months, which will help with sourcing parts for CCTV and improve performance for all regions, including Yorkshire and North East, and Midlands, which have been the worst performing regions. Additionally, the company is implementing a strategy to speed up repair times by improving its utilisation of its available technology spare parts.

Message signs

3.47 The availability of message signs has not met the target nationally from April 2022 to August 2022. The average national availability performance for the five months covered is 89.8%. The message signs are an important part of the SVD service – they are the first response to SVD, displaying the message "Report of obstruction" – and also play an important role in providing wider information to drivers.

3.48 Based on the availability performance result, there is a risk that warning signs will be unavailable and cannot be set to alert road users of a stopped vehicle ahead.

Signals

3.49 The availability of signals has met the target nationally from April 2022 to August 2022, and in all the regions for August 2022 apart from the East. Average national availability performance for the five months is 96.7%.

MIDAS and enforcement cameras

3.50 National Highways' ongoing, monthly operational data for ALR smart motorways did not include the availability of MIDAS or enforcement cameras. We will explore with the company how this could be reported, so we can include this analysis in the next update of this report.

Maintenance

3.51 During RP2, National Highways has continued to report against a suite of defect performance metrics that we helped the company to develop during RP1. It reports these annually as part of its Performance Monitoring Statements. At this stage of our work, disaggregated performance data on the time taken to fix defects for different roadside technology assets is not available. We will work with the company as it develops more detailed technology performance reporting and plan to include this analysis in the next update of this report.

Summary and way forward

3.52 This section of the report provides a progress update on our assessment of the end-to-end safety systems on smart motorways. In the early stages of our work we have focused on ground truthing testing of SVD systems and available performance data for ALR smart motorways, primarily relating to system availability, covering the period from April 2022 to August 2022.

3.53 Our initial analysis has identified a number of areas where performance is falling short of the requirements National Highways has set itself:

- Across all National Highways' regions with ALR smart motorways, false detection rates are substantially above the required maximum. The company's specification states that false alerts may not constitute more than 15% of all alerts and performance ranged from 63.8% to 83.5% across the regions. This creates extra workload for operators; risks reducing operators' and drivers' confidence in the system (false alerts automatically trigger 'Report of Obstruction' messages on variable message signs ahead of alert locations); and, ultimately, could lead to real alerts being missed.
- Overall detection rates are below National Highways' minimum requirement of 80%. None of the company's five regions with ALR smart motorways are meeting this requirement, achieving between 59.6% and 79.6%.
- The required average time to detect stopped vehicles in less than 20 seconds is not being met. Four out of five of National Highways' regions with ALR smart motorways are not meeting this requirement, achieving between 43 and 65 seconds.
- In addition to the core SVD functionality, National Highways is failing to achieve the availability performance targets for essential supporting systems. The availability of variable message signs was below the 95% target set out in its performance requirements for the whole April 2022 to August 2022 period, and CCTV availability was also below 95% in August 2022, the most recent month of data available to us.

3.54 These issues need urgent action to establish their root causes and implement the required improvements. National Highways is aware of this and has programmes in place. For SVD, the company has initiated its STOE process. It is too early to see the effects of the initial actions it has taken on SVD performance, but there are encouraging signs from the testing of one scheme that was using upgraded

software. We are monitoring this closely and will consider requiring the company to take further action, in line with our Holding to Account policy, should it not be on track to achieve the required performance levels by the end of June 2023.

3.55 In the longer-term National Highways should consider alternative SVD technologies and suppliers to ensure they get the most efficient and accurate system for detecting stopped vehicles. The company started this exploration through a large-scale trial of CCTV analytics and establishing an SVD framework, with the prospective suppliers, appointed in February 2021, getting to the testing stage. National Highways has made this framework dormant due to the pause of the smart motorway programme, which resulted from the TSC's recommendations.

3.56 Investigations are also urgently required to establish the root causes of, and solutions to, the issues affecting message sign and CCTV availability. The performance of the DYNAC CCTV system requires review to ensure the functionalities are working and are suitable for use by the ROC operators. National Highways should take these investigations and improvements forward as part of its wider strategy for operational technology.

4. Evaluating the success of the Smart Motorway Safety Evidence Stocktake and Action Plan

4.1 In March 2020, DfT published the smart motorways evidence stocktake and action plan (referred to in this section as 'the action plan'). The action plan set out eighteen actions to improve smart motorway safety. National Highways committed to two additional actions in its first year progress report in April 2021 and also classified the 20 actions under three themes:

(a) giving clarity to drivers;

(b) finding a safe place to stop; and

(c) being safer in moving traffic.

4.2 In November 2021, the TSC published the outcome from its inquiry into the roll-out and safety of smart motorways. DfT responded to this review and, in line with the TSC's recommendation, commissioned ORR to report on the delivery of the action plan and evaluate its success in relation to:

(a) reducing incidences of live lane breakdowns;

(b) reducing the time for which people who breakdown or stop in a live lane are at risk; and

(c) educating drivers on what to do if they breakdown in a live lane.

4.3 In the initial stages of our work we have focused on:

- reviewing National Highways' progress with delivering the action plan, drawing from our ongoing monitoring;
- reviewing the company's plans for evaluating the success of the action plan; and
- assessing how it evaluates its educational campaigns.

4.4 This section reports our progress in these areas and is structured around these three areas.

National Highways progress with delivering the action plan

The scope of the actions

4.5 National Highways has mapped the actions defined within the action plan to show how each contributes to the intended outcomes. A brief summary of these actions is provided in the list below, with the actions numbered for ease of reference throughout this section.

- Reducing incidences of live lane breakdowns – actions related to increasing the frequency and visibility of emergency areas (EAs) to improve drivers ability to utilise these features, rather than stopping in a live lane:
  - Action 4 – committing to a new standard for spacing of places to stop in an emergency.
  - Action 5 – delivering ten additional EAs on the M25.
  - Action 6 – national programme to install more EAs on existing smart motorways.
  - Action 7 – investigate M6 Bromford viaduct and sections of the M1.
  - Action 8 – making EAs more visible.
  - Action 9 – more traffic signs giving the distance to the next place to stop in an emergency.
  - Action 12 – places to stop in an emergency shown on your satnav.
  - Action 17 – reviewing existing EAs where the width is less than the current standard.
- Reducing the time for which people who stop or breakdown in a live lane are at risk – action associated with the deployment of SVD technology to better detect broken down vehicles, alongside operational changes to improve traffic officer response times:
  - Action 2a – faster roll-out of SVD.
  - Action 2b – CCTV trial for SVD.

  - Action 3 – faster attendance by more National Highways Traffic officer patrols.
  - Action 11 – displaying “Report of obstruction” messages.
  - Action 16 – closer working with the recovery industry.
  - Action 18 – review the use of red flashing lights by recovery vehicles.
- Educating drivers on what to do if they break down in a live lane – actions intended to provide drivers with a better level of information around intended behaviours when driving on smart motorways:
  - Action 10 – more communication with drivers through targeted communication campaigns.
  - Action 13 – eCall, promoting awareness, understanding and use of the system.
  - Action 14 – Red X compliance through education and enforcement.
  - Action 15 – updating the Highway Code with enhanced guidance relevant to smart motorways.
  - Action 19 – working with fleet operators to influence the driving behaviour of drivers.

4.6 Four actions are outside the scope of our evaluation of the success of the action plan for the following reasons:

(a) Action 1 – ending the use of dynamic hard shoulder smart motorways – this action has been paused based on TSC recommendation regarding the roll-out of new smart motorways.

(b) Action 12 – places to stop in an emergency shown on your satellite navigation (satnav) device – this action is subject to satnav companies choosing to make use of the data available and, to date, none have done so.

(c) Action 17 – reviewing existing emergency areas where the width is less than the current standard – this action is believed to have little impact on usage of emergency areas and monitoring would be disproportionate to value gained.

(d) Action 18 – review the use of red flashing lights – this action is led by DfT and is at concept stage and so no evaluation can take place.

4.7 For completeness we have included these four actions in our assessment of National Highways' progress with the action plan, which is detailed below

Action plan progress

4.8 Significant progress has been made in completing the actions:

(a) 16 are complete, of which, four are subject to ongoing internal audit by National Highways at the time of writing;

(b) three (actions 7, 17 and 18) are ongoing and progressing to plan; and

(c) one (action 1) has been paused (following the TSC's recommendation).

4.9 Progress with the actions, as at November 2022, is summarised in the table below, which shows that National Highways has achieved or is on track to deliver the remaining actions.

Table 4.1 Progress with the action plan

Action reference	Description	Status (November 2022)
1	Ending the use of dynamic hard shoulders	Paused (following TSC recommendation)
2a	Faster rollout of Stopped Vehicle Detection	Complete – Subject to audit
2b	CCTV Trial for Stopped Vehicle Detection	Complete
3	Faster attendance by more National Highways traffic officer patrols	Complete – Subject to audit
4	Committing to a new standard for spacing of places to stop in an emergency	Complete
5	Delivering ten additional emergency areas on the M25	Complete
6	Considering a national programme to install more emergency areas on existing smart motorways	Complete
7	Investigate M6 Bromford viaduct and sections of the M1	Ongoing
8	Making emergency areas more visible	Complete

Action reference	Description	Status (November 2022)
9	More traffic signs giving the distance to the next place to stop in an emergency	Complete – Subject to audit
10	More communication with drivers through targeted communication campaigns	Complete
11	Displaying “REPORT OF OBSTRUCTION” messages	Complete – Subject to audit
12	Places to stop in an emergency shown on your satnav	Complete
13	eCall, promoting awareness, understanding and use of the system	Complete
14	Red X compliance through education and enforcement;	Complete
15	Updating the Highway Code with enhanced guidance relevant to smart motorways	Complete
16	Closer working with the recovery industry	Complete
17	Reviewing existing EA where the width is less than the current standard.	Ongoing
18	Review the use of red flashing lights by recovery vehicles	Ongoing (led by DfT)

4.10 We have been monitoring National Highways’ delivery of the action plan through regular discussions with the company and reviews of documents including dashboards, progress reports and data logs. We have complemented this with interviews with key National Highways staff and an observational visit to one ROC to provide context and an improved understanding of the status of the actions. This built on the programme of ROC visits we carried out throughout the year, which was focused on action 3 (faster attendance by more National Highways traffic officer patrols), and our activities in this area are described in more detail later in this section of the report.

Reducing incidences of live lane breakdowns

4.11 **Of the eight actions aligned to reducing incidences of live lane breakdowns, six have been completed (actions 4, 5, 6, 8, 9 and 12), with one of these (action 9) subject to ongoing audit, and two are ongoing (Actions 7 and 17).**

4.12 National Highways published a new standard for the design of smart motorways in October 2020 and updated it in December 2021. In support of actions 4, 8 and 9, the standard includes requirements for EAs to be provided at intervals no greater than 1.6km (1 mile); for EAs to have orange road surfacing; and to have additional advance signing to make them more visible to road users. National Highways has also installed the orange road surfacing and the additional traffic signs at all pre-existing and recently constructed EAs.

4.13 Following the publication of the new design standard and in response to action 6, National Highways committed in its second-year progress report to install an additional 150 EAs on ALR smart motorways by the end of RP2 in 2025. This £390 million retrofit programme will increase the number of EAs by almost 50% compared to the number of EAs in January 2022.

4.14 For action 5, National Highways installed ten additional EAs on the M25, as planned, by December 2020. The company's initial monitoring of the effect of the additional M25 EAs on the number of live lane breakdowns for the six-month period after installation proved inconclusive due to the impact of the COVID-19 pandemic on travel patterns.

4.15 National Highways, therefore, extended its monitoring to cover January to December 2021. This analysis found initial, statistically insignificant, findings of decreased live lane breakdowns and increased use of EAs for breakdowns. The company has committed to further post-installation monitoring of all EAs as part of the retrofit programme.

4.16 National Highways has also made EA location data available to satnav firms (action 12) to enable them to provide improved information to their users. To date, satnav firms have not taken the opportunity to provide this EA information to their customers. National Highways has committed, in its second-year progress report, to continue working with these companies to see what other information it can provide. This action, in the company's view, is complete insofar as what is within its control.

4.17 National Highways has completed a review of the width of 249 pre-existing EAs (action 17) and determined that 13 of them do not align with current standards. At this time, the company has committed to widening two of the 13 EAs which are in ALR sections (one on the M1 and one on the M25) by March 2023. It has concluded that a further four EAs in ALR sections should not be widened and is continuing to investigate the other seven EAs which are within dynamic hard shoulder (DHS) smart motorways.

Reducing the time for which people who breakdown or stop in a live lane are at risk

4.18 **National Highways has made substantial progress on all six actions aligned with reducing the time for which people who breakdown or stop in a live lane are at risk, with five of the actions complete (actions 2a, 2b, 3, 11 and 16) and one ongoing (action 18). Three of the five completed actions are, however, subject to ongoing audit by the company. There remains work to be done to ensure systems and processes for stopped vehicle detection (SVD) are optimised to achieve required performance levels where these are not currently being met.**

4.19 National Highways has put in place an SVD system on all existing ALR smart motorways (action 2a). The company also has SVD in place on four newly opened ALR schemes. Combined with those previously existing ALR sections, this amounts to coverage of more than 200 miles of ALR smart motorway. In the majority of these locations, SVD is in place and operational, but not yet as a business-as-usual system. As discussed in section 3, there are issues that require urgent action from National Highways to ensure the SVD system is operating to its specification in all locations. The company recognises this. It has plans in place to stabilise performance and expects that work to complete by the end of June 2023.

4.20 Whilst this system is not yet operating consistently to National Highways' requirements, it is enabling better detection of vehicles stopped in live lanes and enabling traffic officers to respond to these events. Initial piloting of alternative (or supplementary) SVD systems has also been completed (action 2b). This includes a large-scale trial of CCTV analytics on the M4 near Bristol, which reported in April 2021. Any further works in this area of piloting will be dependent on the success of ongoing SVD stabilisation works.

4.21 To supplement operation of the SVD system and to alert approaching drivers to stopped vehicles, National Highways has implemented a system change to automatically display a 'Report of obstruction' message (action 11) on message signs upstream of a vehicle detected by SVD. This solution has been implemented on all schemes with SVD in place and will continue to be implemented as new ALR schemes are completed and brought into operation.

4.22 In addition, National Highways established a partnership agreement in March 2020 for cooperation with the independent recovery industry (action 16) and has held and continues to hold working groups to look at EA-related working practices, among other topics. DfT has been tasked with investigating whether or not

recovery vehicles should be allowed to display red flashing lights (action 18). This investigation is ongoing.

Traffic officer response times

4.23 Action 3 was for "faster attendance by National Highways traffic officers". In March 2021, the company set a target date of July 2021 to achieve a 10-minute average response time for traffic officers responding to live lane stops on ALR sections where places to stop in an emergency are more than one mile apart. The company failed to achieve the July 2021 target, achieving an average response time of 12 minutes 40 seconds.

4.24 In August 2021, we published a report from a review we had commissioned looking at National Highways' progress against several actions in the action plan. This identified concerns around the resourcing of the traffic officer service and control room operators. We escalated this concern with the company and scrutinised detailed data on recruitment and staffing levels.

4.25 In January 2022, we wrote to National Highways to require: a new target date; the full list of activities to improve response times; how the company will assess the impact of each activity; how and when it will fill its vacancies; and any risks to achieving the 10-minute response time. The company committed to a revised target of September 2022.

4.26 We closely monitored and engaged with National Highways throughout 2022. We visited all of the ROCs and engaged with regional staff to understand and track the progress of improving response times.

4.27 We also scrutinised the activation of Operation Brock in Kent, a traffic management measure designed to improve the resilience of the SRN in the event of disruption to travel across the English Channel. During 2022, it was in place from 25 March until 6 June and from 11 July until 5 September. National Highways stated that this had a negative impact on its resourcing and its ability to meet its 10-minute response target before September 2022.

4.28 In September 2022, National Highways successfully met its revised national target. The company averaged a response time of 9 minutes 49 seconds. The company attributes the improvement in response times to:

(a) additional traffic officer vehicles and the rollout of single crewing on the network;

(b) improved analysis of incidents and traffic officer patrol locations;

(c) a strong focus on streamlining and improving the recruitment and training process for traffic officers and control room operators; and

(d) construction of additional outstations and park up points on the network.

4.29 Whilst the national average target was met, it was not met in four of the six operational regions. National Highways has assured us that it will continue to improve its response to incidents on smart motorways, using lessons learnt from these actions. The company is committed to maintaining its focus on this area. We will continue to monitor its performance as it will carry on reporting to us until the end of RP2.

Educating drivers on what to do if they breakdown in a live lane

4.30 **All five identified actions relating to educating drivers on what to do if they breakdown in a live lane have been completed (actions 10, 13, 14, 15 and 19) in line with the action plan.**

4.31 Since publication of the action plan and in support of actions 10 and 13, National Highways has completed five national education campaigns:

(a) The 'Go Left' breakdowns campaign with multiple waves (that is, distinct phases of campaign activity, potentially with changes to the approach or material building on lessons learnt) between March 2021 and August 2022.

(b) A campaign to accompany the roll-out of Red X sign enforcement between December 2021 and January 2022.

(c) The 'Space Invader' tailgating campaign with multiple waves between September 2020 and March 2022.

(d) A campaign relating to the eCall facility in modern vehicles, which can alert the emergency services of an incident if a vehicle is involved in collision or occupants of a vehicle press the vehicle's SOS button, from September 2021 to November 2021.

(e) A vehicle checks campaign from July 2021 to July 2022.

4.32 We commissioned consultants Agilysis to carry out a detailed review of how National Highways evaluates its education campaigns, focusing on the 'Go Left' breakdowns campaign. Further detail of this work is given later in this section of the report.

4.33 National Highways also launched a 'Driving on Motorways' hub on its website in January 2022 alongside a media campaign, all with the intention of improving drivers' understanding of appropriate driving behaviour on the SRN, including smart motorways.

4.34 For action 15, National Highways, working with DfT and the Driver and Vehicle Standards Agency (DVSA), updated the Highway Code in September 2021 to provide drivers with improved and up-to-date information on how to drive on smart motorways and what to do in the event of an emergency. The content of the updated Highway Code was informed by industry engagement and a public consultation, and included information on the eCall system and SOS buttons within modern vehicles in support of action 13.

4.35 Following the change in the law to enable automatic detection of Red X signal violations, National Highways has implemented system and infrastructure changes to update the digital enforcement cameras (HADECS3) on smart motorways to include this capability. This update has been completed across all 95 sites nationally.

Evaluating the success of the action plan

4.36 National Highways has commenced monitoring and evaluation activities to determine whether the action plan is contributing to the following outcomes:

(a) reducing incidences of live lane breakdowns;

(b) reducing the time for which people who breakdown or stop in a live lane are at risk; and

(c) educating drivers on what to do if they breakdown in a live lane.

4.37 National Highways has started with discrete evaluation of those actions where sufficient post-completion data is available, for example for the installation of additional EAs on the M25 (action 5) and for the 'Go left' breakdown campaign (part of action 10). For other actions, the company has prepared, and is in the process of implementing, a monitoring and evaluation plan (MEP) for the collection and evaluation of post-completion data.

4.38 National Highways has prepared the MEP in line with the Magenta Book which provides the UK government's guidance on the scoping, design, conduct, use and dissemination of evaluation for interventions like the action plan. Given that actions within the plan have been largely carried out in parallel, it would be very difficult to

disaggregate the specific impact made by each individual action. As such, the company proposes to evaluate the actions on the basis of their collective contribution to the three defined outcomes.

4.39 For each outcome, the MEP includes a baseline position, logic model, intended outcomes, unintended outcomes and impacts along with the datasets and questions to be used to determine levels of success. For baselining, the MEP recognises that adjustment will need to be made to account for the impact of the COVID-19 pandemic and the current energy crisis on travel patterns. The following table summarises the intended approach to evaluation:

Table 4.2 National Highways intended approach to evaluating the action plan

Outcome	Related actions	Baseline Period	Post implementation period
Reducing incidences of live lane breakdowns	4, 5, 6, 7, 8, 9, 12, 17	2017-2019	3 years for safety data (22-25) Annually for other statistics (to accommodate seasonal fluctuations)
Reducing the time for which people who breakdown or stop in a live lane are at risk	2, 3, 11, 16, 18	2017-2019	3 years for safety data (22-25) Annually for other statistics (to accommodate seasonal fluctuations).
Educating drivers on what to do if they breakdown in a live lane	10, 13, 14, 15, 19	2019 (also using HighView – National Highways' survey of road users – data from 2017-2018 to provide context to that 12-month period)	2023

4.40 National Highways is considering if it could complement this approach with additional methods to gauge how effective some of the actions have been in changing behaviour.

4.41 We consider that the proposal to evaluate the extent to which the outcomes have been achieved and to focus nationally, rather than on actions and specific locations, is reasonable to gain an overall understanding of the level of success of the action plan. National Highways has also correctly identified the complications arising from the COVID-19 pandemic and current economic downturn in affecting travel patterns – the methodology to account for this in evaluation terms will require close scrutiny.

4.42 We have also reviewed National Highways' benefits realisation and evaluation plan for SVD. Almost as a subset of the action plan as a whole, this will look at the effect of SVD on three high-level outcomes, aligned with its key performance indicators: reducing the number and severity of incidents; improving customer feelings of safety; and improving journey times and reliability. As with the action plan as a whole, it is too early in this stage of our work to report on the company's success in realising these benefits.

How National Highways evaluates its educational campaigns

4.43 We commissioned an independent review of National Highways' evaluation of its 'Go left' breakdown campaign, undertaken by Agilisys. This review, which we will publish on our website in due course, has established that National Highways' approach aligns strongly with many of the features of the Government Communications Service (GCS) Evaluation Framework 2.0, which provides guidance on evaluating paid-for campaigns across the wider public sector.

4.44 A particularly strong part of the campaign identified was the demonstration of recommendations which were informed by 'lessons learnt' and which mapped the evolution of the campaign between different waves. There was also evidence of additional C-SMART (challenging, specific, measurable, achievable, relevant and timed objectives) and OASIS (objectives, audience insight, strategy, implementation, scoring) planning used in the evaluation and it was positive that impact assessment was treated as a distinct element of evaluating the outcomes of the campaign. In this area, National Highways has extended beyond the GCS Framework.

4.45 The evaluation material for the breakdowns campaign that Agilysis reviewed showed that the campaign as a whole had been successful in raising awareness and understanding of what to do in the event of a breakdown on a motorway, but that this effect had decreased over time. However, the campaign has had less of an effect on driver confidence in smart motorways and what to do in the event of a breakdown.

4.46 To identify where National Highways' current campaign evaluation approach could be improved, Agilysis conducted a gap analysis. In part, at least, the identified gaps arose from the origins of the campaign as a requirement from the action plan. This meant that some of the usual processes in developing the evidence base for the campaign were not followed in this instance. However, there are opportunities for National Highways to strengthen any future phases of the campaign with additional analysis, including:

- extending the involvement of behaviour change experts could help to place the behaviours in context, influencing the messages provided and how they are measured;
- collecting snapshots of quantitative data to try to understand the campaign's on-road impact, for example looking at use of the left-hand lane as an indicator of improved understanding of how to drive on smart motorways; and
- drawing from elements of other best practice frameworks to enhance its application of the GCS framework, to delve more deeply into understanding the problem being addressed by the campaign by posing additional questions that explore the influences on behaviour to inform design and how a campaign is evaluated.

Summary and way forward

4.47 National Highways has made good progress against all of the actions in the action plan, completing substantial infrastructure and systems upgrades, changing operational processes and running national education and awareness campaigns. However, with significant elements of the action plan completed in 2022, at this stage in our work it is too early to make an overall assessment of the effectiveness of the action plan in:

(a) reducing the frequency of live lane stops;

(b) reducing the duration of live lane stops; or

(c) improving drivers' perception of safety.

4.48 We have reviewed National Highways' plans for evaluating the success of the action plan, and commissioned a detailed, independent review of how it evaluates its education campaigns. In both areas we conclude that its approach is well aligned to the relevant best practice guidance. We will report further on the outputs from the company's evaluations in future updates of this report, as outturn data is captured and analysed.

4.49 One area where we have observed significant progress is in the reduction in time for traffic officers to attend vehicles stopped or broken down in a live lane (on sections of ALR smart motorway with EAs greater than one mile apart). National Highways achieving its 10-minute response time target in September 2022 is likely to have reduced the duration of live lane stops. We have also observed, including on our visits to ROCs, that the roll-out of SVD technology will have improved the

detection of stopped vehicles, with a further likely positive impact on reducing the duration of live lane stops.

4.50 However, focused attention from National Highways is required in both these areas to maintain and maximise these benefits:

(a) Action 2a – Faster roll out of SVD – whilst roll-out installation has been completed to plan (now covering over 200 miles of ALR), the performance of this system is not yet stable nationally and not yet meeting the requirements set by National Highways. This is of critical importance and National Highways is intending to address this matter as a part of its ongoing stabilise and tune – optimise – enhance (STOE) programme of works for SVD.

(b) Action 3 – Faster attendance by National Highways traffic officers – substantial improvements in response times have been achieved and, in September 2022, the company met its revised 10-minute response time milestone. The company is committed to maintaining its focus on this area. We will continue to monitor its performance as it will carry on reporting to us until the end of RP2.

Annex A: Stopped vehicle detection performance requirements

A.1 Table A.1 summarises the SVD performance requirements from National Highways' technical specification (TR 2642) and SVD user requirement.

Table A.1 Stopped vehicle detection performance requirements

Item	Requirements	Outcome	Key Elements
1	The SVD detection coverage area should meet be a minimum of 95% coverage.	Continuous operation	SVD
2	Detection rate for Stopped Vehicle Events shall be at least 80%.	Detection rate	SVD
3	The false detection rate must be <15% of all alerts raised	Limited false detection	SVD
4	The SVD system will have the functionality to filter out SVD alerts when MIDAS 40mph speeds are displayed.	Alert suppression	MIDAS DYNAC / COBS NRTS
5	The SVD system will auto-sign 'report of obstruction'.	Automatic signing	SVD DYNAC / COBS Signs
6	The time to detect shall not exceed 20 seconds. The time to detect is the elapsed time between a Stopped Vehicle Event occurring and an SVD Alert message with status "alert" being generated.	Alert time	SVD DYNAC / COBS NRTS
7	The SVD system will identify the correct carriageway for the Stopped Vehicle Event and enable the operator to identify the nearest CCTVs for verification.	Location	SVD
8	The SVD system should be capable of automatically pointing the nearest CCTV camera at the stopped vehicle event location	Location	SVD DYNAC / COBS CCTV

Item	Requirements	Outcome	Key Elements
9	The longitudinal detection location accuracy for any Stopped Vehicle Event shall be ±25 metres or better.	Location	SVD
10	The user must be provided with a system that meets current Highways England roadside technology availability targets of 98%.	System availability	SVD
11	99% of alerts will be investigated within 30 seconds of being notified of the Stopped Vehicle Event.	Operator response time	Operator
12	95% of alerts will be classified within 90 seconds of being notified of the Stopped Vehicle Event (inclusive of the 30 seconds above).	Operator response time	Operator

Annex B: ALR smart motorway safety systems performance data

Table B.1 Initial SVD ground truthing testing results, weighted averages (median schemes in brackets)

Features	Minimum requirement	East	North West	Midlands	South East	Yorkshire and North East	National
Detection rate (%)	>80%	78.3% (78.5%)	74.0% (77.8%)	59.6% (67.0%)	73.4% (74.0%)	79.6% (79.0%)	67.5% (70.0%)
False detection (%)	<15%	67.2% (66.5%)	71.1% (68.0%)	83.5% (87.0%)	63.8% (47.0%)	70.2% (71.0%)	74.8% (73.0%)
Alert time (secs)	<20 secs	43.1s (44.1s)	15.7s (14.8s)	56.5s (34.9s)	45.7s (46.4s)	64.8s (43.9s)	47.6s (39.4s)
Alert time (%)	% <20 secs	80.9% (81.3%)	76.5% (80.0%)	64.4% (69.3%)	56.7% (55.2%)	58.5% (50.0%)	65.1% (65.5%)

National Highways ground truthing testing data

Table B.2 ROC operator response times, national performance April 2022 to August 2022

	April 2022	May 2022	June 2022	July 2022	August 2022
% classified <90 secs	67.7%	67.5%	69.8%	66.6%	70.2%

Source: National Highways ALR operational data

Table B.3 ROC operator response times, regional performance August 2022

	East	North West	Midlands	South East	Yorkshire and North East
% classified <90 secs	71.1%	72.0%	73.0%	66.0%	69.0%

Source: National Highways ALR operational data

Table B.4 Traffic officer attendance times, national performance April 2022 to September 2022

	April 2022	May 2022	June 2022	July 2022	August 2022	September 2022
Mins:secs	11:06	10:45	10:32	10:37	10:29	09:49

Average time to attend live lane stops on ALR sections where places to stop are more than one mile apart

Source: National Highways ALR operational data

Table B.5 Traffic officer attendance times, regional performance September 2022

	East	North West	East Mids	West Mids	South East	Yorkshire and North East
Mins:secs	10:29	08:19	08:43	10:05	11:01	10:12

Average time to attend live lane stops on ALR sections where places to stop are more than one mile apart

Source: National Highways ALR operational data

Table B.6 ALR roadside technology availability, national performance April 2022 to August 2022

	April 2022	May 2022	June 2022	July 2022	August 2022
SVD availability	99.3%	99.3%	98.5%	97.3%	98.8%
CCTV availability (ALR only)	96.5%	96.1%	95.5%	95.8%	92.9%
Message signs availability (ALR only)	89.7%	89.9%	89.7%	89.5%	90.3%
Signals availability (ALR only)	97.1%	97.4%	96.9%	95.8%	96.4%

Source: National Highways ALR operational data

Table B.7 ALR roadside technology availability, regional performance August 2022

	East	North West	Midlands	South East	Yorkshire and North East
SVD availability	99.0%	99.1%	99.3%	98.0%	98.8%
CCTV availability (ALR only)	96.9%	95.4%	91.6%	96.4%	84.4%
Message signs availability (ALR only)	93.1%	90.4%	90.3%	92.9%	80.4%
Signals availability (ALR only)	92.6%	96.0%	97.3%	96.3%	97.9%

Source: National Highways ALR operational data

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