NATIONAL HIGHWAYS – SMART MOTORWAY STOCKTAKE ACTION PLAN EVALUATION

FINAL REPORT

agilysis

OFFICE OF RAIL AND ROAD

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EXECUTIVE SUMMARY

1. In March 2020, following the publication of National Highways' second Road Investment Strategy (RIS2), the Department for Transport (DfT) released the *Smart Motorway Safety Evidence Stocktake and Action Plan*, or 'the Action plan' (Department for Transport, 2020), setting out eighteen actions to improve smart motorway safety. National Highways committed to two additional actions in its first-year progress report (National Highways, 2021) in April 2021.

2. Alongside this, the Transport Select Committee (TSC) launched an inquiry into the rollout and safety of smart motorways, publishing its findings in November 2021 (Transport Select Committee, 2021). In its response to the TSC's report, DfT agreed to take forward all nine recommendations, with ORR leading on *Recommendation 6* (TSC6) to undertake evaluation of how successful the Action Plan has been in:

   - Reducing incidences of live lane breakdowns on all-lane running motorways;
   - Reducing the time for which people who breakdown or stop in a live lane are at risk; and
   - Educating drivers on what to do if they breakdown in a live lane

3. Related to this purpose, since 2022 ORR have conducted annual assessments of safety performance on the SRN and the third annual safety report is due to be published in February 2025. As part of this, ORR commissioned Agilysis to expand on their previous review of National Highways' approach to evaluating its education campaigns: **to forensically examine its approach to evaluating the success of the Action Plan in reducing the frequency and duration of live lane stops, as well as educating drivers on what to do if they break down in a live lane.** There is now an ever-growing corpus of data available to assess these impacts, with National Highways expanding its evaluation work to include operational data on stopped vehicles.

4. To assess the organisation's evaluation approach, Agilysis reviewed documentation provided by National Highways outlining the methodology and findings to date. The assessment covered four key areas:

   - **Initial success and response to previous recommendations**: Considering how National Highways have responded to previous recommendations in assessments of SRN safety performance (smart motorway related) and the 2022 report;
   - **Use of data:** investigating data collection and analysis methods, identifying difficulties with data collection and any other challenges that may be impacting National Highways' measurement of quantitative impact;
   - **Overall evaluation approach:** Reviewing the level of adherence to stated best practice and ongoing consistency and alignment with what is considered methodologically robust evaluation;
   - **Continual impact and improvement:** assessing current and future plans on the longer-term to journey to continuous evaluation and improvement.

5. Overall, the evaluation approach shows alignment with best practice and utilises an appropriate range of data sources and analysis methods that account for the challenging context in which the actions have been delivered. The evaluation has evolved over time, incorporating new data sources to improve robustness.

6. There are also some areas for improvement, particularly relating to the challenges of some of the data sources, where the potential limitations should be identified early to manage risks and set out clear expectations of what the final reporting will look like. Contingency planning and the use of statistical analysis to interpret findings will help to build conclusive findings.

7. To ensure that maximum value is derived from this work, and conclusions reached by 2027, there are several focus areas for National Highways moving forwards:

   - **Analytical Approaches** - the complexities introduced through overlapping programmes of upgrades and improvements mean that enhancing the analytical approach could provide improved clarity in several areas
   - **Outlining Plans to 2027** - the original ambition to conclude reporting in 2027 is worth reviewing in the light of current and future assessments of when the data will be sufficient to provide a confident assessment of effect.
   - **Continuation of Good Practice** - the evidence to date indicates that National Highways has invested a significant amount of effort in adhering to best practice guidelines. Best practice guidance documents are periodically subject to updates, which should be considered accordingly to ensure alignment with contemporary thinking.

CONTENTS

INTRODUCTION

9. In March 2020, following the publication of National Highways' second Road Investment Strategy (RIS2), the Department for Transport (DfT) released the *Smart Motorway Safety Evidence Stocktake and Action Plan*, or 'the Action Plan' (Department for Transport, 2020), setting out eighteen actions to improve smart motorway safety. National Highways committed to two additional actions in its first-year progress report (National Highways, 2021) in April 2021, as it started to implement the various interventions stemming from the Action Plan; classified in total as 20 actions under three themes of delivery:

   - Giving clarity to drivers;
   - Finding a safe place to stop; and
   - Being safer in moving traffic.

10. Alongside this, the Transport Select Committee (TSC) launched an inquiry into the rollout and safety of smart motorways, publishing its findings in November 2021 (Transport Select Committee, 2021). In its response to the TSC's report, DfT agreed to take forward all nine recommendations – with ORR leading on *Recommendation 6* (TSC6) to undertake evaluation of how successful the Action Plan has been in:

    a) Reducing incidences of live lane breakdowns on all-lane running motorways;
    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.

11. In their first annual assessment of safety performance on the SRN (Office of Rail and Road, 2022), ORR reviewed National Highways' original plans for evaluating the success of the Action Plan, and commissioned a detailed, independent review of how it evaluates its education campaigns (Agilysis, 2022). In both instances, ORR found that the approach taken initially was well aligned to the relevant best practice guidance.

12. In their second annual assessment of safety performance on the SRN (Office of Rail and Road, 2023), ORR reported on the company's progress in delivering the Action Plan over the following year, including how it had responded to the recommendations from the independent review of its education campaigns. It was highlighted in the report that, in late 2023, data to support preliminary evaluation against the Action Plan was starting to become available. It was, however, clear that several more years' worth of data was required to enable the company to more fully assess the impact of its fulfilment of the Action Plan and associated imperatives, as National Highways' set to work on implementing agreed measures.

13. The third annual assessment of safety performance on the SRN is due to be published in February 2025. As part to this, ORR have commissioned Agilysis to expand on their previous review of National Highways' approach to evaluating its education campaigns: **to forensically examine its approach to evaluating the success of the Action Plan in reducing the frequency and duration of live lane stops, as well as educating drivers on what to do if they break down in a live lane.** There is now an ever-growing corpus of data available to assess these impacts, with National Highways expanding its evaluation work to include operational data on stopped vehicles. This independent review builds on the 2022 assessment and considers National Highways' approach to evaluating the impact of the Action Plan to assess if it continues to follow best practice.

14. In particular, this work has focused on:

- **Initial success and response to previous recommendations**: Considering how National Highways have responded to ORR's previous recommendations in assessments of SRN safety performance (smart motorway related) and the 2022 review;
- **Use of data:** investigating data collection and analysis methods, identifying difficulties with data collection and any other challenges that may be impacting National Highways' measurement of quantitative impact;
- **Overall evaluation approach:** Reviewing the level of adherence to stated best practice as well as ongoing consistency and alignment with what is considered methodologically sound evaluation;
- **Continual impact and improvement:** assessing current and future plans on the longer-term to journey to continuous evaluation and improvement for the stocktake programme.

15. **This report outlines Agilysis' overall findings and recommendations from the evaluation, following on from the emerging findings which were delivered in December 2024.**

CONTEXT

SMART MOTORWAYS AND STRATEGIC ROAD NETWORK (SRN) SAFETY

16. The first Smart Motorways programme, implemented in 2002, has been National Highways' technology-driven initiative to deal with congestion and increase the network's capacity via control of the flow and speed of traffic on the SRN.

17. This has been implemented through a combination of speed control on conventional motorways (Controlled Motorways or 'CM'), All Lane Running (ALR) and Dynamic Hard Shoulder (DHS) schemes which deploy varying speed limits alongside hard shoulders at intervals (including emergency refuge areas) on parts of the network, and in the process may convert hard shoulders permanently into live lanes (ALR schemes only). Smart Motorways integrate several existing technology systems, including variable (mandatory) speed limits, signs and signals (such as Red X enforcement cameras to close lanes), speed enforcement cameras (various), CCTV and the Motorway Incident Detection and Automatic Signalling (MIDAS) system. On all lane running (ALR) smart motorways only, these systems are further enhanced by the inclusion of stopped vehicle detection (SVD) technology to detect slow moving and stationary vehicles. The term 'Smart Motorways' denotes three scheme designs:

- *Controlled Motorways (CM),* introduced from 2002 onwards, which add variable mandatory speed limits (VMSL) to a conventional motorway to control the speed of traffic, while retaining a permanent hard shoulder. Overhead electronic signs display messages to drivers, such as warning of an incident ahead.
- *Dynamic Hard Shoulder Running (DHS) motorways*, introduced from 2006 onwards, which apply the above controlled motorway technology. The hard shoulder is some of the time, but not always, used as a live running lane, with electronic signs to guide drivers when it is safe to do so. Emergency areas are installed as on ALR motorways.
- *All Lane Running (ALR) motorways*, introduced from 2014 onwards, which apply the controlled motorway technology, and permanently convert the hard shoulder as a running lane and feature emergency areas. Emergency areas are places to stop in an emergency.

18. Since their inception, there have been several important contextual developments which have necessitated additional focus and intervention, alongside the regular programmes of scheduled activity promulgated by National Highways and partners to continually increase the operational performance of different schemes; with a view to improving their efficiency and safety for customers. In 2016, two years after their initial inception, the TSC concluded that it did not support the expansion of ALR schemes nationally based on uncertainty around whether safety risks had been sufficiently addressed. Similar concerns were raised over the following years after several high-profile incidents on the network and subsequent criticism from coroners' inquiries into those events.

19. Ongoing safety concerns led to DfT's *Smart Motorway Safety Evidence Stocktake and Action Plan* (Department for Transport, 2020). The Action Plan put forward an array of actions in seeking to address concerns, with National Highways agreeing to additional actions as it set about to implement agreed countermeasures under its remit (totalling 20 actions organised thematically under *giving drivers clarity*, *finding a safe place to stop,* and *being safer in moving traffic*). Whilst DfT's stocktake exercise concluded that "in most ways, smart motorways are as safe as, or safer than, conventional motorways" it found that the risk of breaking down in a live lane had notably increased. The Action Plan also set out associated directives including the planned expansion of SVD rollout to all sections of ALR motorways

(originally planned for 2023 but brought forward to 2022); conversion of DHS schemes into ALR schemes; faster attendance to incidents by traffic officers; emergency refuge area enhancements (quantity, visibility and interval distance improvements); and increased public information and awareness-building activity targeting road users in order to support them on what to do in an emergency.

20. Amidst further safety, operational, and fiscal concerns raised by several stakeholders and road user groups, a Transport Select Committee inquiry made nine recommendations which were then all taken forward by the Department for Transport. The inquiry concluded that the Government's previous decision in 2020 for all new Smart Motorways to be ALR schemes (including planned conversion of DHS schemes) was premature, with the safety performance data of ALR schemes ruled to be insufficient in warranting such a judgement (finding that steps were not taken to fully address the risks associated with the permanent removal of the hard shoulder in line the 2016 findings).

21. In light of this inquiry, the Office for Rail and Road were tasked with evaluating how successful the Action Plan had been (starting in 2022) in reducing live lane breakdowns on ALR motorways; reducing the time for which people who breakdown or stop in a live lane are at risk; and educating drivers on what to do if they breakdown in a live lane. In response to the Committee's recommendation that all new ALR motorway schemes should be paused whilst at least five years of data was available for schemes introduced prior to 2020, the Government went further, by not only announcing that all new ALR schemes would be paused in early 2022, but by subsequently cancelling all new smart motorway construction plans in April 2023, due to ongoing concerns around public confidence and financial pressures.

22. National Highways has been fulfilling its responsibilities with regard to the Action Plan and associated TSC imperatives against this backdrop, and it is within this broader context that measurement of impact and overall success in its fulfilment that evaluative action should be viewed when considering how evaluation has been conducted so far by National Highways in collaboration with technical partners.

23. **National Highways' evaluation approach has been assessed within this challenging context, considering what Agilysis would expect to see as independent evaluators.**

DELIVERY AND EVALUATION AGAINST THE ACTION PLAN

24. The context of delivering and evaluating stocktake actions should evidently be viewed in light of how the Smart Motorways programme has itself evolved in the years since its inception, with National Highways committed to improving the efficiency and safety of all existing smart motorways for customers. The vast majority of the 20 actions undertaken by National Highways were completed prior to the publication of ORR's second annual assessment (Office of Rail and Road, 2023). Only Actions 2 has parts remaining for completion in 2025, but for the purposes of evaluation activities (covering 'in-scope' actions), actions can be regarded as complete (see Figure 1). Actions across a number of areas covered in the initial monitoring and evaluation planning (which culminated in the Stocktake Evaluation Plan (**Stocktake Monitoring and Evaluation Plan**), have changed including amendments to the scope of evaluation activity, subsequent baseline changes, and changes to planned reporting outputs and other methodological choices.

25. The nature of the Action Plan's development and profile have heavily influenced how different interventions have been designed and subsequently implemented, with the imperative for timely action on implementing stocktake actions, as a remedial package of countermeasures, affecting how the Action Plan has been fulfilled as an ongoing priority. Naturally, this has meant that implementation has been spread over many interrelated but distinct projects whose delivery timelines have often overlapped, with some interventions having been implemented almost simultaneously over the same parts of the network. This has impacted the evaluation design and the plausible range of applicable methods available for selection at the outset (see **Evaluation Approach**).

EVALUATION ACTIVITIES

26. The Stocktake Monitoring and Evaluation Plan was originally set out in November 2022 by National Highways with support from their evaluation technical partner, AECOM. The main report (AECOM, 2022) and several supplementary methodological notes together outline the evaluation approach taken, selected designs and specified methodologies, as well as scheduled evaluation activities and reporting. A phased approach was proposed, beginning with the driver education actions and concluding with the assessment of key safety outcomes, such as collision statistics into 2026 when preliminary insight was deemed to be available. This plan's scope has changed since the original inception as actions have been delivered, and as data availability is starting to be better understood.

27. Figure 1 lists the actions together with their associated evaluation products. Most of the actions are in scope for evaluation and have an envisaged final evaluation product associated with them as part of one of three thematic areas of delivery. Action 10, relating to driver education, has a final evaluation report as of November 2024 (Action 15 was outside of the scope for initial evaluation plan devised with the technical partner). For the other actions, evaluation is ongoing or at verification stage and review stages or are due to conclude in 2025 or later (See **Continual Impact and Improvement**). A review of delivery and evaluation options for faster SVD rollout is envisaged for March 2025, for example. Interim reports and/or methodological notes were made available for the purpose of this research and have been shared for several programme areas and stocktake actions

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Figure 1 - Summary of action progress and planned evaluation products as of January 2025, as shared by National Highways

No.	Category of Action	Action Description	Action Completion Date	Planned Evaluation Product	National Highways Fieldwork Completion Date	2025/26 Activity
10	Driver Education	More communication with drivers	31/03/2023	Driver Education Evaluation Report	End Nov 2024	No
15	Driver Education	An update of the Highway Code	31/03/2022	Out of scope for evaluation		
4	Reducing stopped vehicles	A new standard for spacing of places to stop in an emergency	30/11/2020	Stopped Vehicle Evaluation Report	Interim Report Complete, Final Report, End March 2025	No
5	Reducing stopped vehicles	Delivering ten additional emergency areas on the M25	31/03/2022			
8	Reducing stopped vehicles	Making emergency areas more visible	31/03/2020			
9	Reducing stopped vehicles	More traffic signs giving the distance to the next place to stop in an emergency	31/03/2023			
12	Reducing stopped vehicles	Places to stop in an emergency shown on your satnav	31/03/2021			
2	Keeping drivers safe	Faster rollout of stopped vehicle detection (SVD)	31/03/2023	Review and delivery of evaluation options	End March 2025	Yes
3	Keeping drivers safe	Faster attendance by more Highways England traffic officer patrols	31/07/2021	Safety in Live Lanes, Evaluation Report, Year One	End May 2025	Yes
6	Keeping drivers safe	Considering a national programme to install more emergency areas on existing smart motorways	31/03/2022			
11	Keeping drivers safe	Displaying 'report of obstruction' messages	31/12/2022			
13	Keeping drivers safe	Making it easier to call for help if broken down (E-Call)	30/11/2020	No further evaluation action: Qualitative Narrative only		
14	Keeping drivers safe	Automatic detection of red 'X' violations and enforcement (3 points, £100 fine) using cameras	31/07/2023	Red X Evaluation Note	End Nov 2024	Subject to data availability
16	Keeping drivers safe	Closer working with the recovery industry	30/09/2020	No further evaluation action: Qualitative Narrative only		
19	Keeping drivers safe	Driving for Better Business campaign to urge businesses to always switch on Automatic Emergency Braking (AEB)	31/10/2020			
1	Out of scope	Ending the use of dynamic hard shoulders (DHS)	NFA	Out of scope for evaluation		
7	Out of scope	Investigate M6 Bromford viaduct and sections of the M1	30/11/2022			
17	Out of scope	Reviewing existing emergency areas where the width is less than the current standard	31/10/2020			
18	Out of scope	Review of use of red flashing lights to commence immediately	NFA			

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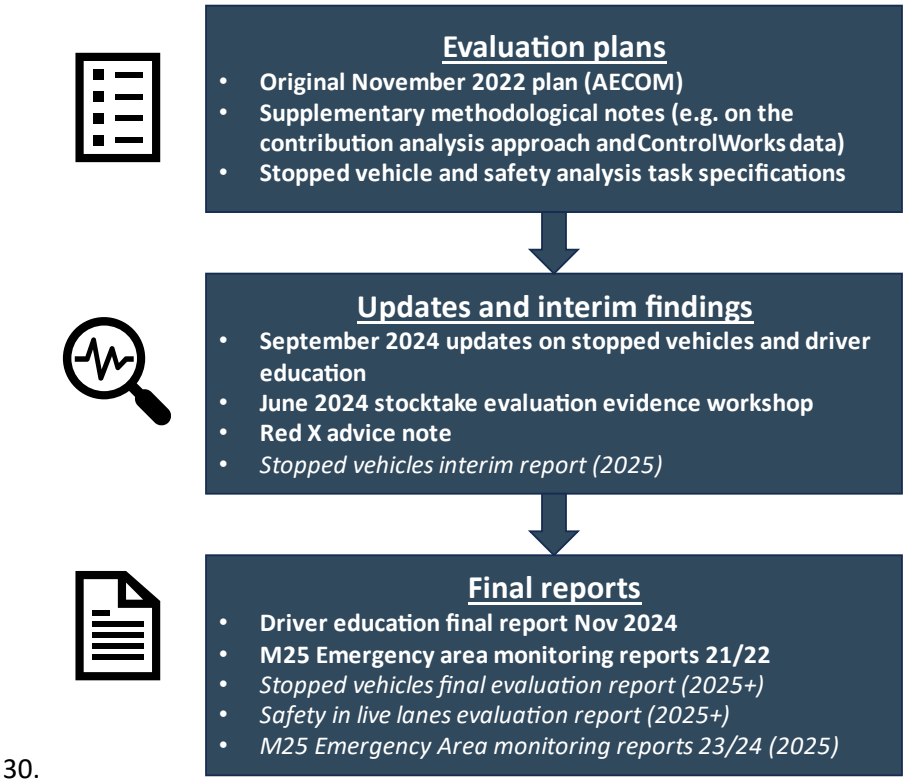
METHODOLOGY

28. To assess National Highways' evaluation of the Action Plan, Agilysis systematically reviewed the documentation provided by National Highways and ORR (**Appendix A**) on the understanding that these collectively represent the evaluation approach undertaken. Further discussions with National Highways helped to consolidate the information provided and fill gaps in understanding.

29. Figure 2 shows the important evaluation documents, from original plans through to interim updates and final reports. Documents reviewed as part of this work are highlighted in bold and those yet to be produced are in italics.

Figure 2: Summary of the main evaluation documents (those reviewed in bold)



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31. In addition to these, annual ORR assessments of safety performance on the SRN, and National Highways' own stocktake progress reports, have provided important contextual and validatory information, particularly in understanding reported progress against stocktake actions and responses to recommendations made to date (including monitoring streams and evaluative milestone progression).

32. This independent review was split into four overarching areas of assessment, each addressing key questions from the technical specification. These form the basis for the findings set out in this report:

14.

1) Evaluation of National Highways' **initial success** in fulfilling ORR's recommendations (Action Plan related) contained within their first two annual assessments of SRN safety performance:
    - Is National Highways' current approach to monitoring the impact of the Action Plan on live lane breakdowns on all-lane running motorways still aligned with best practice methodologies and standards?
2) Forensic investigation around the competencies and difficulties in the collection and **use of data** that inform National Highway's own evaluation:
    - Are the data collection and analysis methods used for evaluating the impact of the Action Plan on live lane breakdowns effective?
3) Review of National Highways' overarching **evaluation approach** based on adherence to and incorporation of best practice:
    - Is National Highways following best practices in evaluating the impact of the Action Plan on the effectiveness of measures designed to reduce the time individuals are at risk after breaking down in a live lane?
    - How well does National Highways' evaluation framework measure and track the impact of the Action Plan on the response times and outcomes of live lane incidents?
    - Is the methodology used by National Highways to monitor and evaluate the impact of driver education campaigns on live lane breakdowns consistent with current best practices?
    - What are the challenges the company has faced in implement the monitoring and evaluation framework and how often is this reviewed to ensure its effectiveness?
4) Review of National Highways' monitoring and evaluation against the Action Plan with a view of generating **continual impact and improvement**:
    - Does National Highways' approach remain in line with best practice, has this changed, and, if so, on what basis and how does this compare with best practice in other sectors?
    - Does the evaluation process effectively capture changes in driver awareness and behaviour, and how are lessons learnt from previous campaigns reflected in future campaigns?
    - What processes does National Highways have in place to ensure continuous improvement based on emerging monitoring and evaluation outcomes?

FINDINGS

33. This section outlines the findings for each of the four assessment areas within the structure adopted for this independent review (see **Methodology**). Whilst each of the four sections dissect a different 'element' of National Highways' approach to evaluating its impact against the Action Plan, they are closely connected, with interdependent measures of evaluation effectiveness. For example, engagement with previous recommendations and initial evaluation planning will naturally affect what ongoing activities are set to take place for continued impact. Likewise, the available data landscape and the utilisation of different datasets have a direct influence on what evaluation approaches are likely to be feasible in a given context. The challenges and limitations experienced within the evaluation are not specific to one particular element but instead reflect the environment in which it is taking place (e.g. speed of response and changing data landscapes). This also means that seizing opportunities moving forward will have benefits for multiple areas of evaluation delivery (see **Continual Impact and Improvement**)

34. The findings represent a forensic examination that brings together assessment of what evaluative activity has taken place (including efficacy and applicability of work conducted) with a view as to the robustness of what the future of the evaluation might look like, based upon what can be plausibly assessed at this stage. Fulfilment of the directives on smart motorways alongside compliance with statutory duties is a very significant undertaking for National Highways requiring close collaboration and tangible progression being made alongside key delivery partners in meeting the high expectations of many stakeholders. The standards of operational safety performance incumbent in securing ongoing trust across the existing parts of the smart motorway programme are equally high, for what is ostensibly a complex set of integrated countermeasures.

RESPONSE TO PREVIOUS RECOMMENDATIONS

35. Evaluation of the impact of stocktake actions has developed within a broader sphere of annual reporting by National Highways on the safety of the Strategic Road Network and its operational performance in keeping road users safe and ensuring an efficient network for all. This has been a flexible process that is increasingly enabled by the growing data landscape stemming from the implementation of the stocktake actions themselves from 2020 onwards.

ORR Annual Assessments

36. The ORR has now reported twice on the status of TSC's *Recommendation 6* on evaluating the success of the Action Plan with a focus on reducing the frequency and duration of live lane breakdowns and educating drivers on what to do should they breakdown in live lane. These first two annual assessments, covering progress made in 2021 and 2022 (reported in 2022 and 2023 respectively) show that National Highways had made quick progress in implementing a significant proportion of the agreed stocktake actions (implementing substantial infrastructure and systems upgrades over this period) with corresponding initial planning having established several important activities pursuant with setting the groundwork for sound evaluation:

- **Good initial progress in evaluation planning and monitoring:** Active decisions being made early on for how different stocktake actions would be evaluated (with a decision to assess the collective contribution for related actions for each of the three TSC6 imperatives) was evident. This was accompanied by clear identification and assessment of applicable datasets

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(for more information see **Use of Data**). Baseline monitoring and post-implementation periods for groups of actions (2023 onwards) were set out with evident consideration given as to where supplementary and discrete evaluations were thought to be necessary moving forward (Action 5 and Action 10 etc.).

- **Evaluation design work across TSC6 imperatives:** National Highway's inception of a **Stocktake Monitoring and Evaluation Plan** (completed in 2022 with support from technical evaluation partner AECOM) as the guiding instrument to facilitate measurement of the overall impact of stocktake actions (and thereby fulfilment of the Action plan) demonstrates a concrete commitment to integrating evaluation at an early stage (considering the contextual constraints on design and setting out preparatory evaluation parameters for the stocktake actions accordingly). The Stocktake Evaluation Plan sets out a comprehensive roadmap for measuring impact and includes important detail on the specifics of the evaluation's approach, design choices and justification, as well as underpinning methodological components selected from best practice guidance (see **Evaluation Approach**)
- **Articulation and engagement with some initial challenges:** Difficulties in disaggregating the impacts of different actions; accounting for COVID-19 impacts on the data (use of multi-year averages where possible to smooth out fluctuations etc.); and operational attention given to the performance of critical monitoring capabilities early on, particularly SVD verification or 'ground-truthing' work, were evident (National Highways has similarly set out a benefits and realisation plan for SVD as a subset to the overall evaluation, which includes further quantification of the impact of SVD technology across the relevant TSC6 imperatives). Engagement with initial challenges is broadly reflected in the evaluation methodologies selected.

37. Overall, National Highways' plans for evaluating success against the plan were found to be satisfactory and additionally there was evidence of swift action based on initial assessment. Although too early to make a concrete judgement in the first annual assessment in 2022 (despite positive indications that evaluation plans were being put into action and best practice guidelines were consulted), ORR subsequently confirmed in 2023 that they had "seen evidence that the company [National Highways] continues to develop and strengthen its approach [to evaluation]". It was felt at this stage that despite initial data becoming available in 2023 "a full and robust assessment would require more data over several years". This most recent assessment affirmed that National Highways continued to build the groundwork for evaluation moving forward. This was identified most notably in relation to the setting out of methodologies for attributing future impacts to the stocktake actions themselves; reviewing the ongoing impact of driver education and communications campaigns; preparatory work for carrying out longitudinal analysis over the lifetime of the evaluation; and the framework for a process evaluation (linking changes in the scope of stocktake actions to changes in the impact of the actions themselves and inculcation of review processes).

Independent Review of National Highways' 'Go Left' Breakdown campaign

38. In 2022, the ORR commissioned an independent review of National Highways' approach to evaluating its main education campaign. This report on the smart motorways education campaign 'Go Left' , also known as 'Breakdowns', found that National Highways' approach to measuring impact was well aligned to best practice, specifically the **Government Communications Service Framework 2.0**, which is one of a number of government resources that are mandated for use within central government and beyond when designing

public sector paid-for campaigns and evaluation of such programmes to assess their impact. The framework helps plan for effective communications and provides practical guidance for public sector agencies and bodies when evaluating communication and outreach campaigns.

39. Whilst alignment with the mandated guidance was found to be good (with National Highways' approach sometimes exceeding recommended evaluation standards), the report found that there were several potential opportunities to strengthen future education campaign delivery and evaluation:

    - A more extensive and indicative use of the evidence base to inform campaign inputs;
    - Greater application of behavioural insight both from previous research and via extending the involvement of internal behaviour change expertise;
    - Use of more quantitative data and resulting insight to understand driver behaviour on the SRN (such as the rate of breakdowns in live lanes and proportion of drivers using the left-hand lane);
    - Use of more qualitative data and testing to gauge ongoing relevance and reception of campaign content;
    - Practical use of other evaluation frameworks from transport and public health communications to enhance the use of the GCS Framework to ensure problems being addressed are understood and engaged with in a critical manner.

40. National Highways responded to the independent review of the smart motorways education campaign evaluation and set out actions accordingly to build upon the positive findings of that report and address the results of the gap analysis. As set out in ORR's second annual assessment of safety performance, National Highways agreed to partner with internal and external behaviour change experts, grounded in the recognition of the need to increase the use of logic models ('Theory of Change') and customer segmentation research. National Highways also stated that it was directly using quantitative data from its internal incident management system (ControlWorks) together with casualty data to join the dots between communications activity and improved safety outcomes (acknowledging the limitations of cause-and-effect attributions in this way).

41. Building on from the 2022 independent review, evidence of National Highways' approach to measuring the impact of educating drivers on what do if they breakdown in a live lane is considered further in **Evaluation Approach**. This previous report has provided a solid foundation for further assessment; with this review now covering the evaluation approach towards fulfilment of the Action Plan more generally (and by extension the TSC6 imperatives) that is concurrent with additional work that has now been carried out by National Highways since its publication, necessitating broader assessment.

Annual Smart Motorways Stocktake Reporting

42. National Highways has produced progress reports on an annual basis following on from the publication of the Action Plan in March 2020. These smart motorways stocktake reports set out National Highways' activities annually against achievement of the Action Plan, notably setting out the state-of-play for stocktake actions. This includes progress to date and consideration of next steps for giving clarity to drivers; finding a safe place to stop; and being safer in moving traffic.

43. The **first-year progress report 2021** highlights the significant progress made in the delivery of stocktake actions during the first year, with notable progress on the implementation of

SVD on existing ALR schemes and a commitment to the technology being in place on any new schemes (new schemes were subsequently paused and later cancelled (see **Smart Motorways and Strategic Road Network (SRN) Safety**). Crucially, the report outlined the practical use of existing Post-Opening Project Evaluation (POPE) reporting to support smart motorway stocktake evaluation. This established format creates a baseline measure with follow up 'one-year after' and 'five years after' measurement post-implementation.

44. Building on initial reporting, the **second-year progress report 2022** identified ongoing evaluative attention to the expansion of SVD technology and increased Red X camera signal enforcement and performance enhancement (with most stocktake actions having been implemented by this point). There was clear evidence of acknowledgment of the lag in the data for these two cross-cutting strands of activity within the Smart Motorways programme, and the implications of this for their emerging operational and safety effectiveness. Related to this, the second report demonstrated strong engagement with related work to quality assure safety statistics and the underlying calculations used for measuring outcomes, with support and methodological verification from ORR in March 2022.

45. Alongside the **third-year progress report 2023**, it was clear that multiple years of stocktake progress reporting had fostered a timely focus on the question *what additional data and evaluative activity can be utilised?* (for further information, see **Use of Data**). Again, this included consideration of the POPE reports being used to capture insight, and specifically where safety benefits are occurring and their potential diffusion between smart motorway schemes and the wider SRN network as different interventions were being implemented. Similarly, customer research and segmentation (understanding impacts on drivers' experiences) and safety reviews were identified as supplementary areas of potential work. The third-year report confirmed this growing focus on capturing scheme specific data, where possible; in order to generate a more granular and deeper understanding of the most contemporaneous safety data and compare impacts between the different smart motorway scheme configurations.

46. Together the stocktake progress reports show that National Highways has made good progress in leveraging the value of their existing safety data, reporting, and evaluation systems for the purpose of monitoring progress against the Action Plan, and taking stock of evaluative activity itself to address this priority area of operational safety management. This continued reporting demonstrates a commitment to taking stock of actions with a view to incorporating learnings from broader operational work and feeding this back into smart motorway evaluation as a dynamic and proactive means of demonstrating impact and procedural competence. This can be enhanced and developed moving forward (See **Continual Impact and Improvement**)

Stocktake Monitoring and Evaluation Plan

47. In November 2022, National Highways formally put forward its Stocktake Action Plan Evaluation Plan, with support from AECOM and informed by a workshop earlier in March 2022 with TRL. National Highways provided this to ORR on the basis of its use as the primary mechanism to conduct the evaluation, and as a supplementary resource to ORR's own assessments of the company's safety performance outputs. The Stocktake Evaluation Plan represents the overarching evaluation design and the guiding structure to measuring both the overall impact of stocktake actions as well as the underpinning groundwork and selected methodologies chosen for the constituent stocktake actions of the Action Plan (Figure 3).

48. The unique context of delivery and assessment has raised a number of practical challenges and methodological limitations to pursuing the 'absolute' impact of work stemming from National Highways' fulfilment of the Action Plan. The principal challenges identified in the Stocktake Evaluation Plan are centred on attribution (how far observed impacts can be attributed to a specific intervention) and contribution (the extent to which any observed outcomes (for example, changes in the frequency of live lane breakdowns or changes in perceptions of safety when driving on a smart motorway) can be connected to stocktake actions rather than alternative explanations. This fostered a practical focus on establishing, where possible, the counterfactual (what would have happened in the absence of a specified intervention, i.e. a non-randomised control group measure). Assessment of the evaluation approaches and selected methods is found in **Evaluation Approach**. The primary challenges in evaluating are comprehensively articulated in the Plan and in associated documentation:

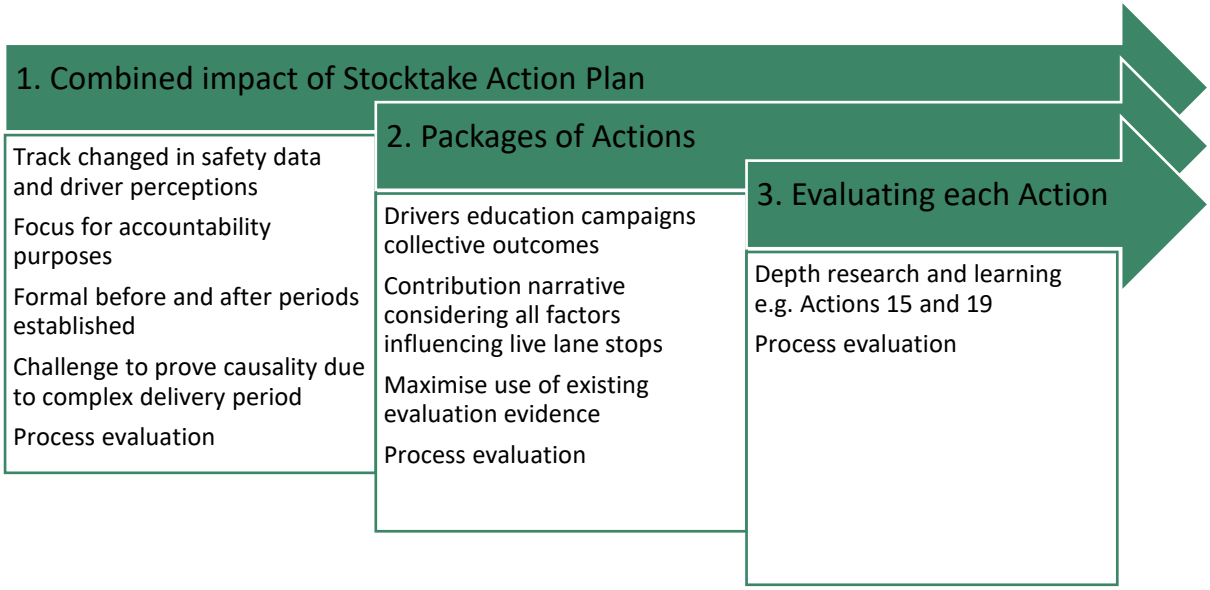
    - **How the stocktake actions were implemented**: The Action Plan's publication and imperative for quick action meant that the scope for 'perfect' intervention design and deployment was severely limited. Simultaneous and overlapping implementation meant that there was no realistic possibility of embedding some of the more rigorous and 'scientific' evaluation methodologies such as randomised control trial (RCT) methods (with innate difficulties in establishing random intervention and control group samples);
    - **Actions affecting ALR schemes:** A number of stocktake actions targeting ALR motorways naturally affect all sections of corresponding ALR motorway (SVD and Red X technologies, for example). The evident ubiquity of potential impacts via such intervention renders counterfactual information hard to obtain;
    - **External factors and influences:** The high public profile and status of the smart motorway programme generally, fostering the interest of many stakeholders, the media, the public, and numerous road user groups (coupled with the changing context and delivery timescales), all incur an array of known and unknown influences, and therefore other potential explanations may be possible for changes in driver behaviour and related outcomes relevant to the assessment of live lane breakdown impacts;
    - **Similar or overlapping targets for specific countermeasures:** Many of the actions (even across the three TSC6 imperatives) target the same or very similar outcomes and are delivered through equally similar mechanisms of delivery (enforcement cameras or gantry-related infrastructure etc.) hence disaggregating how different countermeasures target and affect different behavioural and system outcomes is complex.

49. The Stocktake and Evaluation Plan evidences a clear and comprehensive foundational roadmap to measuring outcomes at different levels. National Highways originally considered the feasibility of measuring impact at the national level, amalgamating multiple streams of impact into one overall assessment. The company quickly reviewed this and decided that accountability, learning and a more valuable approach would be best served by defining evaluation parameters across three levels (the combined impact of the Action Plan; packages of countermeasures; and lastly, specific evaluations, where possible). The Evaluation Plan sets out the evaluation design parameters extensively for the second level of impact assessment (packages of countermeasures); with each TSC6 outcome having a baseline position and logic model, with strong critiques of the planned, intended and potential unintended outcomes. The Evaluation Plan connects the overall theory of change

to corresponding datasets and the critical questions that are to be used to determine success in each area. Adherence to best practice and the mandated **Magenta Book** is considered in **Evaluation Approach**. The critical engagement with and quick assembly of a strong evaluation plan demonstrates that ORR's initial assessment of the annual safety performance and the company's initial plans for evaluating success were sound overall. Engagement with the recommendations of the 2022 independent review of the smart motorway education campaign evaluation was sufficient, with scope for further engagement as the evaluation continues.

50. National Highways' current approach to monitoring the impact of the Action Plan with a focus on live lane breakdowns is well aligned to what is considered to be good practice. National Highways' inception of an evaluation plan and subsequent groundwork, spread across both regular and stocktake progress reporting, demonstrates that strong foundations remain in place. This is built upon further in the **Evaluation Approach**.

Figure 3 Overarching Evaluation Design



14.

Summary - Response to Previous Recommendations

- National Highways' initial response to the ORR's previous recommendations, as well as evaluation planning, demonstrate strong early engagement and concrete evaluative effort, despite the innate challenges identified in fulfilling and evaluating success against DfT's *Smart Motorway Safety Evidence Stocktake and Action Plan* and the Transport Select Committee's *Recommendation 6.*

- National Highway's own annual **stocktake reporting** demonstrates that key strands of action (stocktake output and evaluation activity related) have been receiving significant focus from the organisation.

- Swift complementary work on the development of **SVD** and **Red X** technology, alongside the development of quality-assured safety statistics and confidence testing is positive.

- Early efforts to bring together established monitoring and evaluation activity with the imperatives of the Action Plan were pragmatic and effective.

USE OF DATA

Data sources

52. National Highways are utilising several data sources as part of the evaluation activities. These data sources have been identified as being most suitable for the evaluation purposes and are informed by the theory of change. The major sources are:

    - **ControlWorks data** – an incident log for the SRN, containing core information around resources and timing. This data is one of the main sources for assessing changes in the rate of live lane stops. National Highways has a user guide to support understanding of how this data source is used and where it elicits value.
    - **STATS19 data** – Great Britain's database of road traffic collision and casualty data, to be used in the medium-long term to assess key safety outcomes.
    - **Education campaign surveys** and **HighView data** – used as part of the driver education workstream and the main sources analysed in the final report for action 10 (AECOM, 2024).

53. **ControlWorks** data details the number, time, and location of live lane stops. This is the most suitable data source relating to live lane stops and is well used internally by National Highways. There are also standard procedures governing its use. However, as the primary purpose for this data does not relate to this evaluation, there are several drawbacks, such as regional variation and the fact that not all incidents are recorded. National Highways have documented these well to date (for example, in section 4.5 of the ControlWorks Methodological Note (Bradshaw & Page, 2021)) and should continue to present, and account for, limitations clearly. The methodological note also outlines sensible baseline, interim, and post periods for analysis of ControlWorks data to allow for sufficient sample sizes and to avoid overlap with actions that may impact findings. The frequency of live lane stops is sufficiently large that this data is not subject to the same sample size challenges as STATS19, and thus, there is more flexibility in the choice of baseline and post periods.

54. **STATS19** data is the key source for understanding collisions and casualties as part of the safety analysis workstream. A longer timeframe is needed for assessment of this data compared to other sources, due to small numbers of collisions on the network. As such, the Safety Analysis Task Specification discusses the possibility of additional baseline periods for the STATS19 safety metric comparisons (compared with using just 2018 for the live lane stops analysis). It is noted that work has already been undertaken in 2024 on the safety analysis to prepare for evaluation from 2025, including assessment of possible baselines. However, further work should be done outlining a clear methodology for analysis of STATS19 data and supporting sources from 2025-27, with contingency plans if sample sizes or baselines are not suitable, or uncertainty too large. A lack of robust conclusions relating to collisions and casualties in STATS19 is a risk to the evaluation finishing conclusively in 2027. A review of the data in 2025 should provide an indication of when enough data will be available and hence the robustness of conclusions that can be made by 2027.

55. It is important that limitations relating to STATS19 data are understood and accounted for during analysis; for instance, underreporting of slight injuries and the phased national implementation of new severity reporting could influence the statistics. These challenges may present greater uncertainty in the results and should also be considered when assessing the roadmap to 2027.

56. Utilising the extra detail within STATS19 (such as road safety factors, formerly 'contributory factors') will add value in understanding the types of collisions occurring, and this is referred to in the Safety Analysis Task Specification. Further data sources should also be used to enhance the safety analysis, such as the RAIDS data from DfT (mentioned in the Evaluation workshop from June 2024).

57. The **survey data** from the individual education campaigns underpins the contribution analysis for action 10 (AECOM, 2024). It was not the objective of this work to re-visit the work done on evaluating individual campaigns (which sits outside the Stocktake Evaluation plan), however, sample sizes of 800 to 3000 per campaign wave, together with weighting of the data, render these a reliable source. HighView data is a well-established data source within National Highways having been collected since 2017 and is used for a variety of purposes. Whilst not collected specifically for the Stocktake Evaluation, this data of 22,000 respondents per year provides a useful additional source in assessing general attitudinal shifts over time within the driver education workstream.

58. National Highways are also utilising **flow data** for contextual information on traffic levels to complement the collision and incident data. This is important as variation in traffic levels is strongly linked with change in collision risk. Due to inaccuracies with flow data, it is sensible for National Highways to compare multiple sources - NTIS with DfT count point data – when calculating rates, as is discussed in the Safety Analysis scope.

Challenges

59. To make robust conclusions using these sources, sensible baseline and post-intervention **time periods** need to be considered, ensuring sample sizes are large enough and periods are comparable. National Highways has considered time periods carefully to date, accounting for the impacts of the Covid pandemic on potential baseline data. In the initial evaluation plan (AECOM, 2022) it was acknowledged that the Covid pandemic will have affected traffic conditions and therefore a baseline period of 2017-19 is more sensible. Cognisance of limitations relating to external factors such as Covid has been consistently demonstrated since the original plan. For example, the recent final report on driver education (AECOM, 2024) notes the impact of the media, weather, inflation and other areas as part of the contribution analysis, all of which are important when assessing attribution.

60. There are also a number of 'internal' challenges with the **data sources**. Prominent limitations to date relating to the ControlWorks data, including recording changes in June 2019 (to how Emergency Area stops are recorded) and phased SVD introduction, are all well documented and mitigations considered to establish suitable baseline periods and counterfactuals. Given the central importance of ControlWorks data to the analysis, it would be useful to better understand the impact of these limitations, quantifying the level of 'measurement' uncertainty. Within the Stopped Vehicle Task Specification it states: "the expectation is that this is sufficiently accurate". National Highways should consider whether the level of uncertainty in the ControlWorks data can be quantified (for example, through geolocation analysis of incident reporting) or ground truthing undertaken.

61. In the most recent updates presented (Stopped Vehicles Interim Evaluation, September 2024) on **stopped vehicles**, several data challenges are discussed. It is acknowledged that many of these are outside of National Highways' control and the aim for this work should be to perform the most robust analysis possible within the constraints presented. The interim results for this work, outlining a general increase in detection rates, have raised several

questions and it is clear that various factors are impacting the findings. A few areas were suggested for further work to account for these factors, which could involve further statistical approaches, multiple comparisons or qualitative analysis as part of a mixed methods approach. Analysis of 2024 data will also be important to see if the current trends to 2023 continue once changes with the SVD system are all in place.

62. The Red X evaluation work undertaken is also part of protecting drivers and reducing the time they are at risk, with evaluation in this area currently postponed owing to data management. Data is available from the enforcement cameras, but needs to be combined with traffic flow information, counts of compliant vehicles and the timing of Red X Operation itself to provide an accurate view of compliance rates, nationally, over time. National Highways has reported that a monitoring tool, for implementation during 2024/25, is currently under development within the newer data environment.

Analysis Methods

63. It is acknowledged that, due to the rapid nature of the implementation of the stocktake actions, experimental approaches are not feasible (see next section for a more detailed discussion of evaluation approaches). However, where feasible, quasi-experimental approaches can be deployed. A **counterfactual** should be used alongside before/after comparisons when assessing changes. Crucially, the use of a counterfactual accounts for the general (small) downwards trend in casualties on the SRN between 2016-19 and 2021-23. National Highways has employed a thorough methodology for determining a counterfactual in the Emergency Area retrofit programme evaluation (which has now been moved outside of the scope of the main evaluation plan) and should continue to utilise counterfactuals as the evaluation progresses. It is noted that a counterfactual of controlled motorways is currently being explored as part of the stopped vehicles analysis.

64. With a complex set of conditions for the stocktake evaluation generally, **statistical analysis** can support with unpicking the impact of different factors. The to-date statistical approaches using Poisson and T-test comparison is valid and justified. Regression modelling or time series analysis may enhance the longer-term safety analysis and National Highways should work closely with their statistical experts to understand whether different techniques can add value. For example, time-series analysis can account for changes over time and any seasonality effects. It is possible that other techniques are too complicated or difficult to explain, and the optimal balance of simplicity and complexity should be considered. However, exploring different options is sensible at this point in the evaluation process, to justify final approaches taken. Sample size calculations would also help to give advanced warning on when enough data might be obtained to make robust conclusions relating to collisions.

65. **Assurance** processes and appropriate **engagement** of experts are well documented. With the complexity of this work, this continues to be vital, particularly in understanding the stopped vehicles work, where ‘significant consultation internally’ is suggested as further work and will be critical to interpreting the interim findings. Data collection and analysis methods used for the evaluation are therefore being leveraged to effectively measure a number of impacts despite ongoing challenges that will require close attention.

Summary - Use of Data

- A suitable range of **data sources** are being considered relating to the evaluation outcomes in the theory of change. These data sources are well understood, however, there are challenges relating to their use that should continue to be well documented and accounted for, quantifying uncertainty where possible.

- There is a risk that **findings in 2027** will not be conclusive by using STATS19 data for the safety analysis task and a clear methodology for analysis of this data should be outlined, with contingency plans if sample sizes are not suitable.

- National Highways are cognisant of the **external factors** influencing baseline and post-intervention periods for analysis and have carefully considered these. **Counterfactuals** are also being used effectively.

- The recent **stopped vehicles** work has raised several questions, some relating to data challenges, and follow up work is needed to further understand the results. Internal consultation will be critical to interpretation and should guide efforts with further work.

- **Statistical analysis** can add a lot of value with the complex mix of factors and National Highways should continue to work with their statistical experts to ensure these techniques are deployed effectively.

14.

EVALUATION APPROACH

66. Measuring impact is naturally a flexible and iterative process, one that should be based on establishing the most effective methods possible based upon what is practical, feasible, and realistic given the resources available and nature of the programmes and interventions being evaluated. Ideally, evaluation starts by asking *What are we trying to achieve?* (building in evaluation thinking at the start) and involves setting out critical questions and corresponding objectives that can be used to measure an impact over time (longitudinal analysis) or to measure comparative outcomes at a specific point in time (cross-sectional analysis). The information gathered from the start of an evaluation and over its duration should be incorporated into the overall lifespan of the evaluation project to fully inform delivery (including both quantitative and qualitative data) with interim results informing subsequent actions and feedback processes to keep the overall evaluation design relevant. Evaluation is not a one size fits all, with different approaches and selected methods applicable to different scenarios.

67. As part of its initial response to the Action Plan and setting out groundwork for measuring its impact, National Highways produced a comprehensive **Stocktake Monitoring and Evaluation Plan**. The Evaluation Plan itself reflects National Highways' decision to assess impact for the whole of the Stocktake Programme; for packages of measures (organised under TSC6 imperatives); and lastly, for individual stocktake actions, where feasible. Early scoping activity and design groundwork have been focused primarily on accountability, followed by learning as a secondary focus.

68. This approach suits the central requirement of demonstrating and measuring impact in fulfilling the Action Plan. In defining the purpose of the evaluation, posing evaluation questions, and setting **SMART** objectives (**S**pecific, **M**easurable, **A**chievable, **R**elevant, and **T**ime-Bound), the current Evaluation Plan brings these critical components together with logic models across those three levels of selected evaluation. These theory of change exercises within the Evaluation Plan concisely consider how the main groups of actions are intended to achieve desired changes; the assumptions surrounding their implementation; as well as the contextual factors and unintended consequences relative to their levels of potential impacts as groups of highly interrelated countermeasures targeting the similar outcomes.

Evaluation Methodology

69. These initial scoping and parameter design exercises have fed directly into consideration of which specific evaluation methodologies are most appropriate, based on the requirements and their feasibility of use and available data and the broader delivery context. For each of the three levels of evaluation, the following methodologies have been selected which demonstrate a mixed methods approach that is highly cognisant of contextual factors and limitations on the use of a fully 'scientific' evaluation approach to all areas of the evaluation:

    - **theory-based contribution analysis methodology** assessing the theory of change (causal links) for the whole Stocktake Action Plan. This will allow establishment of a theoretical casual chain to be established once the attribution / contribution analyses have been completed at the 'package' level;
    - Focus on **attribution *or* contribution analysis methodology** on the three planned thematic programmes or 'packages of measures' (driver education, stopped vehicles, and keeping vehicles safe). This allows for the impact of highly similar actions to be

accounted for as amalgamated impacts that contribute to measuring impact for one of the TSC6 areas.

- A mixture of **theory based and quasi-experimental approaches** for individual stocktake actions (the latter prioritised where counterfactual information can be established with a degree of robustness). This had been set out for the Emergency Area retrofit programme where there was scope to establish an observable counterfactual (non-randomised control) and is currently being used to assess SVD evaluation activity.

70. In addition to these selected approaches, a **process evaluation** running across all levels of activity was defined to consider how actions were delivered and to identify learnings to be applied to future investments. An **outcome evaluation** to delineate 'before and after' effects on network safety is being carried out using baseline safety data (2017-2019) for the overall picture; covering all stocktake actions implemented between 2020-2022, with post-implementation analyses up until 2027 (see **Continual Impact and Improvement**).

71. For assessing the impact of the overarching Stocktake Action Plan, using a theory-based contribution analysis for the overall plan enables assessment of the collective impact as a proxy for more scientific evaluation methodologies conducted at the lower programme and constituent actions levels. It is important to recognise that for a programme or constituent action, a narrative of impact (theory-based approach) and then defined contribution is set out. This feasibly reflects the need to ensure the robustness of final reporting as to ensure that where 'attribution' or 'contribution' type impacts are not able to be gathered, that conclusions can still be drawn from each area (meaning actions without counterfactuals still have a resulting effect on reported programme and Action Plan-level impacts, despite representing a more 'theoretical' level of change).

72. For areas and specific actions within the evaluation that are subject to attribution or contribution-type analysis, supplementary 'methodological notes' have been set out by National Highways and their technical evaluation partner, AECOM. The methodological notes provide further elaboration on the underpinning tenets of the type of evaluation undertaken and other corresponding information. Notably, they give updated assessments of ongoing status and enabling criteria, covering:

    - **Current Evaluation Scope:** Setting out the contemporaneous scope, recognising that changes may have occurred since the original inception of the Stocktake Evaluation Plan;
    - **Datasets and supporting evidence being used:** Consideration of the datasets being used within the specified area of evaluation, including where required information on the source of the data and approaches to its collection, and for related methodological considerations;
    - **Delivery considerations:** Covering associated deliverables and assurance of their validity and quality as actions are delivered.

73. These supplementary notes on the methodology of technical areas similarly delve deeper into various phases set down originally in the Evaluation Plan, where it was deemed necessary to elicit further clarity on approaches taken. For each of these selected areas of the evaluation, largely covering some of the areas designed for contribution analyses (overall Stocktake Plan, the packages of measures, and technical work areas within the packages (Red X Compliance and Control Works data monitoring, and ongoing qualitative research)), the notes set out the methodological approach embarked on as an iterative process as more evidence becomes available.

74. For attribution and contribution analyses areas, this process starts with **setting out the attribution problem to be addressed**, which involves quantifying the attribution problems; determining cause-and-effect questions to be addressed; as well as the level of confidence required in the results and what the anticipated contribution may look like, including defining other core influencing variables.

75. The second stage sets out the **development of the Theory of Change** covering anticipated impact, underlying assumptions, areas of direct and indirect control, and critiques of the logical flow of each model. Thirdly, the **collation of evidence** to strengthen or weaken the underlying theoretical basis (including for outputs, outcomes, assumptions and potential explanations), followed by **assembly of the 'contribution story'** utilising data and insights gathered (provided a credible 'sense check' of the different moving parts). This is followed by the penultimate step of **collecting any additional evidence** before revising the **final contribution story** to draw out the key conclusions.

76. The identification, selection and review of appropriate evaluation methodologies undertaken in developing the Stocktake Evaluation Plan is comprehensive, with reasonable methods chosen amid varying and significant methodological limitations at the outset of the programme's inception.

The Magenta Book

77. The Magenta Book provides a comprehensive guide to evaluation. Whilst its primary target is government-defined evaluations and is designed to sit alongside HM Treasury's Green Book (economic appraisal and evaluation), it is highly useful given its exhaustive breadth and advice; and is therefore, as with other guidance used by National Highways, often mandated for consultation across the public sector. It provides a forensic framework for the scoping, design, management, and dissemination of evaluations and their associated outputs.

78. For this independent review of National Highways' approach to evaluating the success the Action Plan, the core areas have been broken down (Figure 4) to provide ease of understanding when thinking about how it has been used by National Highways' and its technical evaluation partners.

79. The unique inception of the stocktake programme of actions, as a complex set of related countermeasures, has necessitated flexibility and practicality, alongside an unusually quick central imperative to implement an array of large-scale interventions and lay down supporting activities. An undertaking of this magnitude has nonetheless provided National Highways with the opportunity to leverage their organisational experience in designing and managing evaluations, and from tried and tested methodologies developed for monitoring and evaluating SRN safety performance more generally.

80. Considering this operational context, compliance with the Magenta Book as a standard of best practice is considered here primarily through the creation of the Stocktake Evaluation Plan itself and emerging evaluation parameters now that more data and related decisions can start to be adjudicated on, and as different milestones on the stocktake evaluation timeline are surpassed.

Figure 4 - Magenta Book distilled thematically

Why, how and when to evaluate (Chapter 1)	
1.1-1.4	Rationale and role of evaluation
1.5-1.7	Evaluation as a cycle
1.9-1.10	Good Practice
Evaluation scoping (Chapter 2)	
2.1-2.2	Defining scope
2.3	Evaluation design
Evaluation Methods (Chapter 3)	
3.1-3.2	Selecting analytical methods
3.2-3.5	Research methods for different approaches
Data collection, data access and data linking (Chapter 4)	
4.1-4.2	Deciding on data to be collected
4.3-4.4	Data sources and sampling
4.5.4.6	Handling and linkage
Managing an evaluation (Chapter 5)	
5.1-5.3	Establishing and resourcing evaluations
5.4	Intervention design and evaluation
5.5-5.9	Commissioning and management considerations
Use and Dissemination (Chapter 6)	
6.1-3	Creating a plan and channels
6.4-6.6	Evaluation culture and value
Evaluation Capabilities (Chapter 7)	
7.1-7.3	Knowledge and ways of working
7.3-7.4	Skills Method and requirement

81. Some of the key areas synthesised from the Magenta Book are artefacts of the context through which the stocktake programme has itself come about and therefore are not wholly relevant for forensic assessment within this independent review. The evaluation's rationale, commissioning, use, as well as delivery competencies, therefore, fall largely outside of what is reasonable to assess here. The focus here is the *approach to evaluation* rather than the organisational imperatives for its delivery.

82. The overarching evaluation plan (**Stocktake Monitoring and Evaluation Plan**) and selected methodologies (**Evaluation Methodology**) demonstrate that not only has the evaluation proceeded from a methodologically sound basis , but that many aspects of its delivery continue to stem from astute prioritisation of the most appropriate methods for measuring impact across the evaluation itself. A variety of relevant analytical methods (**Analysis Methods**) have been assessed to be of use, based on their direct value in helping to gather as much information as is possible from available sources.

83. Consideration of the underpinning datasets of the evaluation across the methodology notes and workshops further indicates this ethos of attaining quality assured insight across many areas of assessment. Significant levels of attention and focus on improvements to the more technical aspects of the evaluation (notably SVD and Red X operational performance, in addition to safety statistics and analytic assurance testing) testify that the data landscape surrounding the project and its management has been a consistent area of strong evaluative effort since the Evaluation Plan's inception.

84. The use of the Book's **ROAMEF Cycle** (**R**ationale; **O**bjective; **A**ppraisal; **M**onitoring; **E**valuation; **F**eedback) for process evaluation, and incorporating lessons learned, has been used to practical effect as part of the methodological review and adjustment of several areas of evaluation. The management of the evaluation, including taking stock of progress across each of the thematic areas of assessment, is evidenced by a small number of workshop-style events that have taken place to discuss progress and interim findings.

14.

85. To this end, it is evident that some methodology amendments have been adjudicated on (via the Evaluation Steering Group), following on from review and feedback exercises (evidenced from the 'positioning statement' changes and decisions to move elements originally outside of the scope of the main Stocktake Evaluation Plan into separate work streams (or cancelled entirely)). The most prominent examples of this are the Emergency Area retrofit programme valuation which was moved outside of the main frame of assessment (notwithstanding the extensive evaluative efforts in assessing the feasibility of counterfactuals in this area which has proved highly valuable); cancellation of driver simulation work and counterfactual establishment thereafter; and the Red X evaluation (which has been postponed due to data management issues).

86. Overall, compliance with the Magenta Book is good, with strong foundational evaluation planning and design work followed through by review and feedback exercises that have enabled a dynamic and fit- for-purpose evaluation to take place thus far. There is evidence of consistent efforts having taken place to ensure that data collection and monitoring are also fit-for-purpose and that they are integrated sufficiently into the main implementation period and beyond. This approach to evaluation has been particularly fruitful in facilitating internal forensic examination as more data has started to become available, and as decisions surrounding ongoing monitoring have been made. Whilst it clear that scheduled delivery and current timelines (often aligned to key datasets) are guided by tangible evaluation outputs, moving forward it will be imperative to take necessary steps to stay on the road to producing meaningful interim and final reporting on evidence pursuant to measuring fulfilment of the Action Plan.

87. In light of the comprehensive engagement and use of the Magenta Book, use of the most recent GCS guidance for future education and communication intervention (building on from the use of best practice in the 2022 independent review of the company's education campaign evaluation approach) is recommended. Use of the **GCS Evaluation Lifecycle**, which provides contemporary guidance on targeted communication interventions to influence behaviour (with an updated focus on optimising digital outreach, 'real-time' measurement, and hard to reach audience segments) will be beneficial as the stocktake programme moves forward. This evaluation cycle contains well-structured theory of change development guidance; inculcating **OASIS** and **COM-B** models in the lifespan of well-planned evaluation.

88. Utilising what has worked so far, whilst confronting what can feasibly be said in the years ahead, will be important for generating as robust and as informed conclusions as is possible, and within a scheduled timeframe that is realistic (see **Continual Impact and Improvement**).

89. The deployment of a variety of credible evaluation methodologies and supplementary measures are clearly helping to track impact over time as the evaluation of the stocktake programme progresses. Whilst the contribution analysis methodologies developed are well-suited, there is additional scope to utilise updated best practice guidance on the design of evaluations for driver education campaigns (alongside comprehensive adoption of the 2022 independent review recommendations). This will enhance the efforts required to generate continued improvement of the evaluation itself.

Summary of key points – Evaluation Approach

- Theory-based approaches selected for evaluation of the overall Stocktake Plan provide focus on **generating reasonable casual connections** between interventions and their expected outcomes that are clearly critical to establishing evidence-based lines of reasoning as to the impact of the Action Plan and its programmes.

- Establishment of evaluation parameters (at all three levels: Action Plan, programme, and individual stocktake action level**) have encouragingly enabled contribution and quasi-experimental methodologies to be implemented,** which is notably positive given the various methodological challenges and limitations incumbent in the inception of the stocktake programme

- **The overall methodological structure adopted is well suited to the evaluation being conducted** and has helped guide credible but useful evaluative efforts.

CONTINUAL IMPACT AND IMPROVEMENT

90. The fulfilment of the Action Plan and measurement of success via the Stocktake Evaluation Plan is a multi-year endeavour that has brought together evaluative efforts spread across technically complex packages of countermeasures. The natural lag between implementation of the stocktake actions and their impact on safety and corresponding datasets has inevitably meant that as the stocktake programme progresses, more insight can be deliberated on as to how the best continued impact is secured. Improvements resulting from this process, particularly around the constituent elements of the evaluation delivery, will enhance success against the Plan itself and subsequent reporting on it. National Highways has an evaluation roadmap, with a scheduled timeline having been created and reviewed as the evaluation has progressed. Currently, the evaluation is set to run until 2027, when more conclusive evaluation reporting is envisaged to be possible. The long-term trajectory for the evaluation (in line with TSC's 2021 recommendation that the ALR smart motorway rollout should be paused until **five-years of safety data is available** for schemes introduced before 2021) contains key milestones:

    - 2023 data (reported June 2025) - Year 1: Indicative impact of stocktake programme
    - 2024 data (reported June 2026) - Year 2: Two full years of data to assess emerging trends
    - 2025 data (reported June 2027) - Year 3: Three full years of data (five years from the start of the main implementation period (2020-2022)

91. For the overall Action Plan, three reports are currently scheduled for delivery. A baseline report for the period prior to March 2020 (covering data for 2018-2020), an interim report covering updates to the baseline (supplementing stocktake annual progress reporting); and a final evaluation report prepared towards the end of 2025. This report will not include the final data and evidence relating to safety outcomes, due to the lag in available data. An updated report will therefore be prepared in late 2027 to incorporate the full 5-year post implementation period. Supplementary reporting focused on live lane stops is also envisaged with baseline, interim, and final evaluation deliverables planned up to 2025.

Evolution of the Roadmap

92. For each area of the evaluation undertaken by National Highways (driver education, reducing live lane stops, and reducing time at risk), evaluation deliverables have been agreed and have either been completed or are ongoing (Figure 1). In May 2024, the Evaluation Steering Group took stock of progress and the status of the key deliverables in each of three area. The Driver Education final reporting is complete, with the results having been considered as to how changes in driver knowledge and behaviour correspond to evidence of the contribution of National Highways' education campaigns in stocktake impact. In reducing live lane stops, in-depth analysis of stopped vehicles has been commissioned to assess changes with a focus on differences at the smart motorway scheme level (stage one of the stopped vehicles analysis is complete).

93. The workshop also identified additional planning and monitoring activities having taken place for the adjacent Emergency Area retrofit programme evaluation (pre-work now complete), which contributes to reducing the frequency of live lane stops. As outlined in **Use of Data**, the three main strands of evaluative activity on reducing the frequency and duration of live lane breakdowns (SVD; Red X; and outcomes measurement in STAT19) are at different development stages of their reported deliverables, with the methodological

approach for each having now been agreed in principle. For these areas, estimated scheduled delivery for additional and future outputs have been provisionally reviewed, in partnership with AECOM, for 2024/2025.

94. There is, therefore, some evidence of consideration of the status of core areas of evaluation within the stocktake programme, and a strong sense in the medium-term (up to 2025) which deliverables are scheduled. It is, however, clear that there have been many changes to the evaluation, with decisions having altered the general scope of the evaluation and some key areas within it since the inception of the original Stocktake Evaluation Plan in November 2022. Whilst some of these changes have received notable attention by National Highways, assessment of what the overarching evaluation plan now looks like, including the status of its components, and forecasting of potential risks and what final reporting can feasibly cover, will be useful.

95. National Highways continues to build upon the strong foundations for evaluation set out following the Action Plan's publication in 2022, with evident commitment to future interim and progress reporting. There is a risk that this may change if the outlook for the evaluation moving forward is not sufficiently grappled with to reflect both the many changes that occurred so far, contextual realities, and risks potentially impacting the stocktake programme in the years ahead. Additionally, lessons learnt from the 2022 review of the company's education campaign can help ensure driver awareness and behaviour continue to be targeted effectively and tracked (quantitatively and qualitatively) taking forward contemporaneous communications design guidance (updated GCS resources). National Highways has a moderate level of process in place to capture and incorporate learnings as part of a feedback loop; formalising this for all areas of the evaluation will be of benefit for robust final reporting.

Summary of key points – Continued Impact and Improvement

- National Highways has set out a **credible long-term roadmap to evaluating impact against the Action Plan**, with interim and final reporting set to run until 2027 when robust and conclusive evaluation is envisaged to be possible.

- Whilst stock has been taken of the status of the evaluation plan, **the scope of many evaluation parameters and developments within specific areas have evolved considerably.** Consideration of what the Plan now looks like and how this influences the evaluation will be beneficial. This will help future evaluation, feeding back what is and isn't working, and noting programme changes that may arise.

- The many contextual and methodological changes experienced so far have created a natural degree of uncertainty. **Assessment of potential risks, setting out expectations, and starting to think about the long-term outlook of final reporting would similarly help to ensure that feasibility and quality continue to be at the heart of the evaluation approach adopted by National Highways.**

14.

CONCLUSIONS

97. In forensically examining National Highways' evaluation approach, several positive areas of action have been identified:

98. **Best Practice Alignment**

- There is a clear demonstration of strong early engagement with the Action Plan requirements.
- There is evidence of a strong focus on both the actions and evaluation efforts by National Highways.
- There has been a swift development of SVD and Red X technologies, alongside the development of quality-assured safety statistics and confidence testing.
- There were pragmatic early efforts to establish monitoring and evaluation activities for the Action Plan.

99. **Data/Analysis**

- A range of suitable data sources have been used, related to the evaluation outcomes from the theory of change.
- National Highways are cognisant of the external factors influencing the baseline and post-interventions periods and have considered the impact on analysis. Counterfactuals are being used effectively.
- Theory-based approaches have been selected to generate reasonable causal connections between interventions and outcomes.
- Contribution and quasi-experimental methodologies are being used, fostering a robust of approach and recognition of the need for the best methods to be utilised given the circumstances.
- The overall methodological structure is well suited to the evaluation being conducted.

100. **Continual Improvement**

- A credible long-term roadmap of evaluation has been set out by National Highways.

101. There are also areas for improvement that should be considered moving forwards:

102. **Data/Analysis**

- There are challenges related to some of the data sources, and these should continue to be well documented, and the uncertainty quantified, where possible.
- There is a risk that findings in 2027 will not be conclusive by using STATS19 to measure safety so there is a need to produce a clear methodology for analysis and contingency plans for if sample sizes are not suitable.
- Recent SVD work has raised questions related to the data and more follow up work is required the understand the results.
- Statistical analysis can add value, and National Highways should continue to work with their statistical experts to deploy techniques effectively.

103. **Continual Improvement**

- The evaluation has developed over time and consideration of what the Plan now looks like, and how this influences the evaluation, would be beneficial.
- The contextual and methodological changes have created a degree of uncertainty. National Highways should assess the risks associated with these changes and set out clear expectations of what the final reporting will look like.

RECOMMENDATIONS

105. Several recommendations have been identified to maximise the effectiveness of the evaluation activities within the Action Plan to 2027:

106. **Analytical Approaches**

107. The complexities introduced through overlapping programmes of upgrades and improvements mean that enhancing the analytical approach could provide improved clarity in a number of areas:

- Develop an early view on how soon robust analysis of STATS19 data will be feasible, through sample size analysis, drawing on the advice and guidance of statistical experts to challenge or validate approaches.
- Explore with experts the inclusion of a wider array of analyses (such as regression or time-series) to provide greater confidence in the findings.
- Involve analytical expertise in the ongoing exploration of the Stopped Vehicle Detection data to derive maximum value from the current process.
- Quantify uncertainty within the data, especially where sources (such as ControlWorks) are being used for a secondary purpose within the evaluation.
- Continue to explore the additional value that might be derived from independent data sources (such as connected vehicle data) which could validate findings or clarify the counterfactual.

108. **Outlining Plans to 2027**

109. The original ambition to conclude reporting in 2027, as this would provide 5 years' worth of post implementation data (including 3 full years of casualty data), is worth reviewing. Staged delivery of implementation for some countermeasures and confidence in the data might lead to an updated plan:

- Ascertain when sufficient post-implementation data will be available to provide confidence that measures have been effective.
- Review the timeline to 2027 in the light of these findings, creating certainty among all parties the timeline is achievable.
- Provide clarity to stakeholders, if required, on any changes to the timeline at the earliest opportunity, demonstrating commitment to provide timely reporting of findings.
- Effectively communicate how the evaluation plan has changed over time, reflecting National Highways efforts to improve the methodology, establishing clear expectations of how this will be borne out in the final reporting.

110. **Continuation of Good Practice**

111. The evidence to date indicates that significant efforts have been made to adhere to best practice guidelines, which will be an important to persist with:

- Continue to assess alignment to Magenta Book, giving consideration to how evaluation practices and the Stocktake Evaluation Plan might need to change should guidance be updated.

- Build on previous success in using the GCS Framework for smart motorways education campaigns, ensuring updated GCS Guidance (GCS Evaluation Lifecycle, with its updated focus on optimising digital outreach, 'real-time' measurement, and hard to reach audience segments) is utilised

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14.

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APPENDIX A – SUMMARY OF DOCUMENTS

A summary of all the documents shared by National Highways and ORR for this work is given in Table 2 below.

Table 1: Documents shared by National Highways and ORR

Document (Date, where known)	Author	Summary
Smart Motorways Stocktake Action Plan: Evaluation Plan (Nov 2022)	AECOM	National Highways' plan for evaluation of the Action Plan relating to TSC recommendation 6. Prepared in collaboration with AECOM.
Stocktake Methodological Note: Contribution Analysis (Dec 2022)	AECOM	A methodological note to supplement the Stocktake Action Plan – Evaluation Plan. The methodological note sets out the detailed methodological approach, data analysis, and metrics for use in the Stocktake Action Plan evaluation.
Additional stocktake methodological notes (March 2023)	AECOM	Notes to supplement the main evaluation plan covering use of ControlWorks data, driver education campaigns and qualitative research.
First Annual Assessment of safety performance on the SRN (Dec 2022)	ORR	ORR report outlining their assessment of safety performance on the SRN following the 2020 stocktake and Action Plan, based on 2021 data.
M25 Additional Emergency Areas - Summary Monitoring Report – January 2021 to December 2022	National Highways	This report considers the impact of ten additional emergency areas on the M25 All Lane Running (ALR) sections between junctions 23 to 27 and junctions 5 to 7 for a two-year period between January 2021 and December 2022.
Assessing National Highways' evaluation of its Smart Motorway education campaigns (Dec 2022)	Agilysis	Agilysis' report from ORR commissioned piece of work that contributed towards the first annual assessment of safety on the SRN.
Smart Motorways Emergency Area Retrofit: Kickstarter Evaluation Plan (Jan 2023)	AECOM	The evaluation approach for the emergency area retrofit programme.
ORR Annual Safety Report ASR13 - Campaigns Evaluation and Agilysis Report	ORR	National Highways' response to Agilysis' recommendations in their 2022 report evaluating the Smart Motorway education campaigns.
National Highways Monitoring & Evaluation Position Statement (Sep 2023)	National Highways	National Highways' response to ORR's information request relating to the second annual assessment of safety performance on the SRN.

Second Annual Assessment of safety performance on the SRN (Dec 2023)	ORR	Follow up to the 2022 ORR report.
Task Specification – Stopped Vehicles	National Highways	Overview of the methodological approach to stopped vehicle evaluation relating to the Stocktake evaluation.
Stocktake Methodological Note: Red-X Compliance (Jan 2024)	AECOM	An addition to the main evaluation plan, setting out the approach for evaluation of action 14 relating to red-X compliance.
Smart Motorways Stocktake Evaluation Timeline – 2024/25 (May 2024)	National Highways	Lists the commissioned evaluation products (relating to the actions) from AECOM and associated timescales for delivery.
Stocktake Evaluation Evidence Workshop 1: Preliminary Review of Evidence (June 2024)	AECOM	Slides prepared for the workshop covering evidence to date. This was not published and findings presented were not assured.
Advice Note: Stocktake Action 14: Install Automatic Red X violation detection cameras and introduce enforcement	National Highways	A note confirming that National Highways Evaluation Steering Group has accepted the recommendation that no further action is taken under the stocktake evaluation workstream to evaluate action 14 aimed at improving Red X compliance through enforcement.
Evaluation Steering Group Stocktake progress paper	National Highways	Notes prepared for the Evaluation Steering Group on progress towards achieving the Action Plan.
National Highways updates for ORR (Sep 2024)	National Highways	Three presentations for ORR relating to overall stocktake progress, the final evaluation report for driver education and the interim report for stopped vehicles.
Contribution Analysis and Evaluation Report for Action 10 – Driver Education Campaigns (Oct 2024)	National Highways (AECOM)	AECOM's comprehensive evaluation of the contribution of Action 10 to the wider objectives of the Stocktake Action Plan.
Smart Motorways stocktake progress reports	National Highways	Three annual National Highways progress reports since 2021 following the 2020 stocktake.

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