

Quality Assurance of Smart Motorways Second Year Progress Report Data and Evidence

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Executive summary

In February 2022, the Department for Transport commissioned the Office of Rail and Road to carry out a quality assurance review of the data and evidence in National Highways' [Smart Motorways Second-Year Progress Report](#). The scope of our review focused on the evidence in the *Second-Year Progress Report* – primarily high-level statistics comparing safety outcomes across different types of roads – the company's own assurance processes and its progress with recommendations from our previous review, published in September 2021, [ORR Quality Assurance of All Lane Running Motorway Data](#).

We completed our review over a six-week period, with the majority of our assurance activity concentrated in two weeks in March 2022. We found that:

- the underlying calculations supporting the *Second-Year Progress Report* (such as the calculation of collision and casualty rates and five-year averages) are correct;
- National Highways' Analytical Assurance framework is a strong application of the cross-government Aqua Book guidance – National Highways has followed these processes to ensure its evidence is reliable and the strengths, risks and uncertainties in the analysis are clearly reported;
- National Highways has taken significant steps to increase transparency, both in how it has communicated new methods (e.g. for statistical testing) and by publishing more detailed collision and casualty data alongside its report; and
- the company has addressed the relevant recommendations relating to high-level statistics from our previous review in 2021.

1. The scope of our review

- 1.1 In February 2022, DfT commissioned ORR to carry out a quality assurance review of the data and evidence in National Highways' [Smart Motorways Second-Year Progress Report](#) (referred to as the *Second-Year Progress Report*). This report describes the scope of our review, how we carried it out and our conclusions. The commissioning letter setting out the scope of our work is available on our website [here](#).
- 1.2 This review had a narrower scope and shorter timescales than our 2021 review, [ORR Quality Assurance of All Lane Running Motorway Data](#) (all lane running motorways are a subset of smart motorways where the hard shoulder is converted into a permanent running lane). The scope of our review this year focused only on the expanded "Updated safety evidence" section of the *Second-Year Progress Report*. This centres on high-level comparisons of safety outcomes on different road types.
- 1.3 Our scope was based around the following questions:
- (a) Are the data and evidence used in the *Second-Year Progress Report* reliable (based on the detailed questions as follows)?
 - (i) Are the underlying calculations correct?
 - (ii) Has National Highways followed the required analytical assurance processes to ensure the evidence is reliable?
 - (iii) Where there has been a change in existing methods, new methods have been developed or methods applied to new sources of data, has National Highways communicated this transparently in the *Second-Year Progress Report*?
 - (iv) Has National Highways followed the required analytical assurance processes to ensure the new methods (or new applications of methods) are reliable?
 - (b) Has National Highways taken account of the established/best practice recommendations made in ORR's 2021 review for high-level statistics?
- 1.4 Our scope was limited to the high-level statistics included in the *Second-Year Progress Report*. As well as National Highways' [Smart Motorways Stocktake: First](#)

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[Year Progress Report](#) (the *First Year Progress Report*), our previous review covered National Highways' [Smart Motorway All Lane Running Overarching Safety Report](#) (the *Overarching Safety Report*) and DfT's [Smart Motorway Safety Evidence Stocktake and Action Plan](#) (the *Stocktake*), both of which were published in March 2020. These reports included before-after (also referred to as evaluation) evidence, which was considered the strongest form of evidence on the safety of smart motorways in the *Stocktake*. We understand that National Highways intends to produce updated before-after analysis in an expanded *Overarching Safety Report* in winter 2022.

- 1.5 We completed our review in around six weeks, with the majority of the assurance activity concentrated in the first two weeks. We received an initial set of documents from National Highways on 8 March 2022, and provided our initial comments and findings on 22 March 2022. This reflects the rapid nature of our review.
- 1.6 We continue to monitor National Highways' delivery of the Smart Motorway Action Plan, but this was not within the scope of our review, or this report. We will provide an overview of this work in our annual assessment of National Highways' performance in July 2022.

2. Our approach

- 2.1 Based on the review's scope, we structured our review around three workstreams considering:
- (a) data and calculations;
 - (b) National Highways' assurance process; and
 - (c) the relevant recommendations from our 2021 review.
- 2.2 At a high level, following two pre-submission discussions with the company to understand what we would be working with, our approach involved reviewing documents and, where necessary, interviewing relevant staff (via Microsoft Teams) to better understand National Highways' approach. We had good quality, regular contact with the relevant team at National Highways, and the consultants who had supported the company's work. We would like to thank them for their open approach to our review.

Data and calculations

- 2.3 National Highways provided a set of spreadsheets in which it calculated the various high-level statistics, charts and tables that feature in the *Second-Year Progress Report*. We traced all the statistics, charts and tables in the report back to these spreadsheets and spot-checked and reproduced the calculation of collision rates, casualty rates, linear trends and multi-year weighted averages (including limited testing of different time periods for the trends and averages).
- 2.4 Where possible we traced the data used back to the original sources. But we did not undertake a detailed audit of those original sources, such as DfT road length and traffic statistics (which are classified as National Statistics), or how National Highways had allocated collisions and casualties to different road types on the strategic road network. However, given the importance of this allocation to all of the analysis that followed, we focused on this in the assurance process workstream of our review.
- 2.5 The statistical tests that National Highways describes in its progress report and supporting documents were carried out using specialist statistical software, outside of these core spreadsheets. Similar to the above, we handled this element of National Highways' work through looking at the assurance processes it had followed, rather than auditing or reproducing the statistical tests.

National Highways' assurance process

- 2.6 We initially focused our approach in this area on National Highways' Analytical Assurance framework, considering it against established best practice and the cross-government [Aqua Book guidance](#), and its standard assurance products, including an academic peer review commissioned for the statistical testing approach.
- 2.7 As is often the case, these standard products are relatively high-level, so we requested additional detail on the assurance activities that National Highways had carried out. This included a more detailed understanding of the process National Highways followed to allocate collisions and casualties to road types.

Relevant recommendations from our 2021 review

- 2.8 In our 2021 review we recommended that, in its subsequent analysis (for the areas included in scope for this report), National Highways should:
- (a) focus on a smaller number of headline metrics;
 - (b) develop statistical tests of the differences in collision and casualty rates;
 - (c) always consider conventional and controlled motorways separately from other types of smart motorway; and
 - (d) include scheme level safety statistics (in an updated *Overarching Safety Report*).
- 2.9 We reviewed progress against these recommendations in the documents provided by National Highways.

3. Findings

Are the underlying calculations correct?

- 3.1 We identified a small number of minor issues that National Highways was able to correct easily. These mainly related to rounding or drafting errors in the draft we were reviewing.

Has National Highways followed the required analytical assurance processes to ensure the evidence is reliable?

- 3.2 National Highways' Analytical Assurance framework is a strong application of the cross-government Aqua Book on assurance. The documents provided showed that the correct processes were followed and included a short summary of the strengths and weaknesses of the analysis performed. They explained the key risks, uncertainty and rated the levels of assurance.
- 3.3 Where we requested additional detail, the company was quickly and easily able to provide this. This included additional detail on the process of allocating collisions and casualties to road types, which focused on the c.5% of STATS19 records where this matching is not straightforward. National Highways' assurance processes in this area appear thorough. The company is taking a significant step to improve transparency by releasing this more detailed data alongside the *Second-Year Progress Report*. This will allow the wider analytical community to engage with National Highways more fully on its methods and safety analysis.
- 3.4 National Highways responded to our feedback by including more detail in its analytical assurance statements on the rationale for the level of assurance given, and where development plans could improve future assurance. However, National Highways' convention of keeping analytical assurance statements to one page in length can limit the level of detail and ease of comprehension for those not familiar with the analysis.

The relevant recommendations from our 2021 review

Focus on a smaller number of headline metrics

- 3.5 National Highways has clearly identified three headline metrics in its report – personal injury collisions (PICs), fatal and weighted injuries (FWIs) and killed and

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seriously injured (KSIs) – reporting both the absolute numbers and traffic-adjusted rates, giving six metrics in total. The company consistently uses these metrics in the safety headlines section, improving the clarity of the analysis from the *First Year Progress Report*.

- 3.6 Six is more headline metrics than we would have envisaged when making this recommendation. We understand the reasons for including both absolute value and traffic-adjusted rates and consider that the rates are a more useful tool in comparing safety outcomes across road types. National Highways recognises this and the commentary and conclusions in the safety headlines section are appropriately focused on rates.
- 3.7 The analysis begins with a comparison of fatality rates and absolute numbers, which are not included in the headline metrics. This is understandable, as fatalities are the most reliable measure of international comparison. When this comparison moves from international to British or English roads, National Highways reports both fatality rates and the absolute numbers. Both measures support National Highways' overall findings but a greater focus on the fatality rates would better indicate the relative risks of travelling on different road types.

Develop statistical tests of the differences in collision and casualty rates

- 3.8 National Highways has made good progress in this area. The company has developed a robust statistical approach and sought out expert independent input, and academic peer review in developing its method. It is also positive that National Highways is now seeking the input of the wider road safety analytical community.
- 3.9 In this report National Highways has applied a limited number of tests. As these methods become more established, it will be important for the company to consider how it can apply them more widely and integrate the additional insight on uncertainty into the conclusions it can draw from its analysis.

Always consider conventional and controlled motorways separately from other types of smart motorway

- 3.10 National Highways has implemented this action and consistently and clearly differentiated between different types of (conventional and smart) motorway throughout the evidence section of the report.

Include scheme level safety statistics

- 3.11 This recommendation was for National Highways to include scheme-level “high-level” statistics (such as collision and casualty rates) in its next update to its *Overarching Safety Report*, expected to be published in winter 2022.
- 3.12 The first set of documents we reviewed for the *Second-Year Progress Report* included scheme level traffic and road length data, but not the associated collision or casualty data. We challenged National Highways on whether this could be included to accelerated timescales. The company responded very positively to that challenge by including alongside the progress report a [data set](#) showing how individual STATS19 records have been allocated to different road types on the strategic road network.
- 3.13 This is a step forward in the transparency of National Highways’ analysis of smart motorway safety that will allow the wider road safety community to engage more fully with the company’s work in this area.

4. Conclusion

4.1 In summary, we conclude that:

- (a) the underlying calculations supporting the *Second-Year Progress Report* (such as the calculation of collision and casualty rates and five-year averages) are correct;
- (b) National Highways' Analytical Assurance framework is a strong application of the cross-government Aqua Book guidance – National Highways has followed these processes to ensure its evidence is reliable and the strengths, risks, and uncertainties in the analysis are clearly reported;
- (c) National Highways has taken steps to increase transparency, both in how it has communicated new methods (e.g. for statistical testing) and by publishing more detailed collision and casualty data alongside its report; and
- (d) the company has addressed the relevant recommendations relating to high-level statistics from our review in 2021.



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