PROJECT REPORT CPR4835

Monitoring and evaluation of the 60mph trials
Report for the on-road trials of 60mph on the M4 junction 3-12

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<table>
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<tr>
<th>Report prepared for:</th>
<th>Highways England, CSD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project/customer reference:</td>
<td>11225342</td>
</tr>
<tr>
<td>Copyright:</td>
<td>© TRL Limited</td>
</tr>
<tr>
<td>Report date:</td>
<td>July 2020</td>
</tr>
<tr>
<td>Report status/version:</td>
<td>Final</td>
</tr>
</tbody>
</table>

Quality approval:

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Executive summary

Temporary mandatory speed restrictions are considered for road works on high-speed roads to limit the risks posed to road users from specific traffic management features. Guidance at the time of the trial recommended a speed reduction of 20mph for many traffic management features. Where safe to do so, a change in the recommended speed reduction could bring about potential benefits to road users in the form of improved journey times and increased satisfaction.

This report presents the findings from the on-road investigation of a 60mph speed restriction on the M4 junction 3-12 scheme. A 60mph speed restriction was implemented on the westbound carriageway between junction 11 and 12 within the road works on overnight weekdays and weekends where minimal works were carried out. The impacts of this change on driver behaviour, customer satisfaction, and scheme costs and delivery were monitored over an extensive period of almost six months. The penultimate weeks of the trial monitoring period fell during the UK COVID-19 pandemic restrictions, which substantially reduced traffic volumes through the scheme. A sensitivity analysis was therefore conducted as part of the analysis to account for this change.

The weekday and weekend data were analysed separately to account for anticipated differences in driver behaviour and vehicle flow. In total, 203 weekday hours and 471 weekend hours were collected during the baseline period, in comparison to 17 weekday hours and 82 weekend hours of data that was collected during the trial period. The difference in sample sizes was largely due to external factors such as adverse weather which restricted the scheme’s ability to progress the works. As a result, the scheme was unable to implement the 60mph speed restriction more regularly as works had to be undertaken on weekends and overnight weekdays to mitigate delays to the program.

Analysis of the data collected during this monitoring period yielded the following findings:

- During the weekday investigation, road users responded to the change in speed restriction by increasing their speed; average speeds at the trial location increased from about 49mph before the speed restriction change, to 53mph after the speed restriction change. This resulted in an estimated journey time reduction of approximately 27 seconds per road user. The COVID-19 restrictions and the resulting lower traffic flows may have also attributed to the increase in average speeds.
- A similar increase was also observed during the weekend investigation, where the average speed at the trial location increased from about 48mph to 54mph following the implementation of the 60mph speed restriction. This resulted in an estimated journey time reduction of approximately 41 seconds per road user.
- This increase in average vehicle speed had a positive impact on the levels of speed compliance shown by road users, compliance observed in the 60mph speed restriction was higher than in the 50mph speed restriction across both investigations. On weekdays, the levels of speed compliance remained fairly constant across the baseline and trial period at the control location (where a 50mph speed restriction was always in place). Compliance reduced at the control location during the weekend investigation, however.
Some statistically significant variations in vehicle composition by lane were found for both the weekday and weekend investigations, but these variations were very small in effect size. As such, differences in vehicle composition are unlikely to have affected vehicle speeds and speed compliance.

The proportion of HGVs engaged in close following (see 3.2.4) decreased as a result of the change in speed restriction, reducing by around 4% and 21% respectively on weekdays and weekends. The overall amount of close following observed was not greatly affected during the weekday investigation (reducing by around 2%) but was more substantial (reducing by around 16%) during the weekend investigation.

The number of reported incidents (Road Traffic Collisions and breakdowns) was too small to enable statistical analysis. A substantial reduction in the number of incidents was seen between the baseline and trial periods, but this was observed both at the control and experimental locations. This was likely due to the limited sample of data collected during the trial period in comparison to the baseline period. As such, there was no evidence to suggest the change in speed restriction had an impact on the number of reported incidents observed at the scheme.

For the workforce satisfaction survey, there were 516 responses relating to the 50mph speed restriction and 53 responses relating to the 60mph speed restriction. Results were mixed: most participants who reported on the 50mph speed restriction reported the speed restriction made them feel safe, whereas most participants who reported on the 60mph speed restriction reported the speed restriction made them feel unsafe. However, most participants felt both speed restrictions were about right when asked how appropriate the speed restrictions were in terms of safety. These findings suggest that the change in speed restriction may not have been the only factor that affected the workforce’s feelings of safety.

For the customer satisfaction survey, 34 useable responses during the baseline period and 4 useable responses during the trial period were analysed. Results were mixed and due to the limited number of responses, it was not possible to conduct any statistical analyses and draw firm conclusions regarding the impact of the speed restriction change on customer satisfaction.

Based on these findings, the scheme subsequently looked to implement a 60mph speed restriction for the remaining phase of work.

Findings from this and previous investigations into the use of 60mph speed restrictions will be collated to produce a toolkit that will provide guidance for future schemes to safely implement 60mph speed restrictions within road works.
1 Introduction

1.1 Background

Safety and customer satisfaction are critical components of Highways England’s vision for the future. As part of this vision, Highways England is committed to improving road user experience through road works by ensuring that road works are implemented with appropriate speed restrictions to minimise disruption for customers, whilst also ensuring risk to road users and road workers is as low as reasonably practicable.

Following on from previous investigations into varying speed restrictions within road works, consultation with stakeholders from across Highways England and the Supply Chain, this project was established to support the safe implementation and monitoring of three new trial scenarios. A key defining feature of many of these scenarios is the trial implementation of a 60mph speed restriction within road works with narrowed lane width restrictions.

1.2 Contents of this report

This report summarises the findings from the on-road trial of a 60mph speed restriction on the M4 junction 3-12 scheme during late 2019 to early 2020.

The investigation took place across two sections of the scheme’s traffic management, both on the westbound carriageway. TRL was commissioned by Highways England to monitor driver behaviour (along with customer satisfaction and scheme cost/delivery) to ensure that the safety of road users and road workers was not compromised by the increase in speed restriction during the investigation.

This report outlines the scheme and data collection methodology, presents the results from the monitoring, summarises these findings and outlines the next steps required.

1.3 Study objectives

The key objectives of the research were to gather evidence of the impact of changing the speed restriction on the M4 junction 3-12 scheme from 50mph to 60mph on:

a) Lane distribution
b) Vehicle speeds
c) The number of non-compliant vehicles
d) The number of incidents
e) The levels of close following (vehicle headway)
f) Customer satisfaction
g) Scheme delivery and cost
2 Method

2.1 Overview of the scheme

To reduce congestion and smooth the flow of traffic across this key strategic route, works started in July 2018 on upgrading the M4 between junctions 3 to 12 to an all-lane running smart motorway as part of the smart motorway programme. The package of work was planned for several distinct phases and sections, with the timeline for the work on-site running until Spring 2022.

The design of the scheme provided an opportunity to use a dynamic traffic management scenario to investigate increasing the speed restriction from 50mph to 60mph. The road works were designed to operate with a 60mph speed restriction during the implemented traffic management; but was only used during hours where minimal work was carried out (i.e. overnight weekdays or weekends). When implemented, the speed restriction between junction 11 and 12 on the westbound carriageway was changed to 60mph, while the speed restriction across the rest of the scheme and the eastbound carriageway remained at 50mph.

An overview of the monitoring locations used in the investigation can be seen in Figure 1 below.

![Figure 1: Overview of monitoring locations used on the M4 junction 3 - 12 scheme investigation (EB = eastbound; WB = westbound)](image)

2.2 Monitoring approach

The on-road investigation sought to monitor the effect of the change in speed restriction on driver behaviour and customer satisfaction. Monitoring took place between the 4th October 2019 and 14th April 2020, with speed restrictions in place as shown in Table 1.

<table>
<thead>
<tr>
<th>Dates</th>
<th>Description of activity</th>
<th>Control location</th>
<th>Experimental location</th>
</tr>
</thead>
<tbody>
<tr>
<td>4th Oct 2019 – 14th April 2020</td>
<td>Baseline monitoring period</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>21st Feb – 14th April 2020</td>
<td>Trial monitoring period</td>
<td>50</td>
<td>60</td>
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As the dynamic scenario restricts the use of a 60mph speed restriction to hours where minimal work was carried out (overnight weekdays or weekends), monitoring of driver
behaviour focused on these periods. Principally, data were analysed from the overnight period, with data from the remaining hours of each day being used to provide background trends. The baseline period covered the following situations:

- Overnight weekdays (2000h Monday to 0500h Friday) and weekends (2000h Friday to 0500h Monday) when minimal work was being undertaken and a 50mph speed restriction was in place, prior to dynamic signs being installed, or;
- Overnight weekdays and weekends (times as above), after installation of the dynamic signs, when work was being undertaken and a 50mph speed restriction was in place.

The trial period also included data from overnight and weekends (times as above) when minimal work took place and the speed restriction of 60mph was used (facilitated by the dynamic signs). In total, 203 weekday hours and 471 weekend hours were collected during the baseline period, in comparison to 17 weekday hours and 82 weekend hours of data that were collected during the trial period.

The difference in sample sizes was largely due to external factors such as adverse weather which restricted the scheme’s ability to progress the works. As a result, the scheme was unable to implement the 60mph speed restriction more regularly as works had to be undertaken on weekends and overnight weekdays to mitigate delays to the programme. The weekend and weekday data were analysed separately to account for anticipated differences in driver behaviour and vehicle flow.

The number of open lanes and the width of the lanes did not vary during the trial. The lane widths used during both centre reservation and verge works phases were:

- Lane 1: 3.25m
- Lane 2: 3.25m
- Lane 3: 2.75m

The composition and placement of the traffic management varied during the trial, as outlined in Table 2 below.

Table 2: Traffic management composition

<table>
<thead>
<tr>
<th>Description of activity</th>
<th>Control location</th>
<th>Experimental location</th>
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<tbody>
<tr>
<td>Baseline monitoring period</td>
<td>Narrow lane restrictions (verge works)</td>
<td>Narrow lane restrictions (centre reservation works)</td>
</tr>
<tr>
<td>Trial monitoring period</td>
<td>Narrow lane restrictions (verge works)</td>
<td>Narrow lane restrictions (verge works)</td>
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Delineation between the running lane and the work zone was provided by a vehicle restraint system which was maintained at a setback of 600mm.

2.3 Risk assessment

As part of the proposed risk management approach and safety governance for the trialling of 60mph speed restrictions within road works, a programme level safety risk assessment was
produced by TRL. This assessment was informed by previous relevant on-road trials, simulator trials, and associated GG 104 risk assessment, and was used to feed into the scheme-specific risk assessments carried out by participating schemes (Fordham & Glaze, 2019).

Prior to implementing the change in speed restriction, Arcadis Jacobs carried out a scheme-specific safety risk assessment in line with GG 104 standards. This assessment examined the risks posed to all affected parties from the change in speed restriction, detailing required mitigation measures to address the potential increase in risks posed from the anticipated increase in vehicle speed as part of the investigation on the M4 junction 3-12 scheme.

This assessment concluded that if the change in speed restriction was adopted, the introduction of several additional mitigations must accompany it. Details of these additional mitigations are outlined within section 2.3.1.

In accordance with the safety governance requirements outlined within GG 104, the schemes existing project safety control review group (PSCRG) reviewed the scheme-specific assessment. This led to a decision to proceed with trial of the 60mph speed restriction between junctions 11 and 12 on the westbound carriageway from mid-February 2020.

The PSCRG is a cross-functional group that reviews ‘safety work’ to agree that the safety risks are correctly identified, reviewed and managed appropriately (Highways England, 2015). The group is required to comprise of principal and specialist members. Principal members collectively determine decisions taken and endorse evidence presented to the group. Specialist members provide additional subject matter specialism experience to the group. A list of required roles for each member type can be seen in Appendix A.

### 2.3.1 Scheme-specific mitigations

Several additional mitigations, above those already outlined within the programme level risk assessment, were identified as being required to manage risks as part of the scheme-specific risk assessment. These additional mitigations were implemented on the scheme prior to the start of the on-road investigations; they are outlined below.

#### 2.3.1.1 Vehicle restraint system

The use of terminal end crash cushions that are compliant with operating speed of 60mph and above (Arcadis Jacobs, 2019). In addition, a 600mm setback between the running lane and the vehicle restraint system was to be implemented.

#### 2.3.1.2 Temporary Stopped Vehicle Detection (SVD)

The implementation of SVD to provide early warning to the scheme traffic control centre so action could be taken more promptly when an incident takes place (Arcadis Jacobs, 2019). This enabled the dispatch of an on-site recovery vehicle accompanied by an Impact Protection Vehicle (IPV) as soon as an incident was reported. The IPV was also designed to work in a 60mph speed environment.
2.3.1.3 The use of Portable Variable Message Signs (p-VMS)

The provision of p-VMS to warn road users approaching any reported incident within the road works.

2.3.1.4 Other scheme specific mitigations

In addition to the above, the following mitigations were implemented:

- The perception of average speed enforcement to maintain speed compliance. This included the presence of average speed cameras visible to drivers within the trial section.
- The lowering of the speed restriction to 50mph until an incident had been cleared, and when any road works took place.
- Clear signage to indicate the applicable speed restriction through the road works. This included the use of variable speed signs to interchangeably display 50mph and 60mph.
- Overnight lane closures minimised from 6-7 days a week to 3-4 days a week during non-60mph night operations.
- Operation of the revised site guidance (April 2019) for handling vehicle incursions to site and their return to the live lane.
- A restriction of construction traffic exiting the works into the live lane during 60mph operations. This included the implementation of a process to confirm no vehicles were waiting to exit the works zone, prior to the activation of 60mph signs.
- Appropriate consultation with the supply-chain workforce carried out prior to the commencement of the trial.
- The formulation of a process for safely collating safety monitoring data needed to support safety monitoring review meetings.

2.4 Safety reviews and abort process

During the trial monitoring period, weekly safety reports were provided outlining changes in the average speed of vehicles during free-flow\(^1\) periods, the proportion of vehicles over the posted speed restriction during free-flow periods and the proportion of vehicles over the enforcement threshold during free-flow periods. These weekly reports fed into an agreed abort process. The details of this process are outlined in the scheme-specific safety risk assessment; Figure 2 below provides a summary.

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\(^{1}\) ‘Free-flow’ was defined as any period where the one-minute averaged speed of all vehicles across the carriageway was greater or equal to 40mph.
Data from the radar units (outlined later in Section 2.5.1) were issued weekly to TRL and the Safety Reports were created and issued by TRL ahead of each review. A scheduled review call was carried out and during this call the review group discussed the reported safety proxies and any weekly incidents. These review calls acted as the abort decision points outlined within Figure 2 above. An emphasis was placed on any feedback from the Traffic Management Supplier and work crews.

During the trial monitoring period, the abort process was not implemented at any point.

2.5 Data collection and statistical comparisons

To achieve the objectives of this research (see section 1.3), several different data sources were used:

- Radar data
- Incident data
- Survey data
- Workshop data

These data sources and any statistical comparisons which were made are outlined in more detail in the following sections. Suitable statistical comparisons were undertaken only when a sufficient sample of data was available.

2.5.1 Radar data

To monitor speed, flow, headway and lane choice during the baseline and trial periods, two temporary radar installations were installed at the scheme. Each radar installation was capable of monitoring traffic on a single carriageway, down to the level of individual vehicles.
For each investigation two separate installations were used to monitor the control and experimental locations.

2.5.1.1 Location of radar installations

The radar installations were situated to monitor the westbound carriageway within the work zone. The radar units which monitored the westbound experimental and control locations were located in the verge near marker posts 71/4 and 63/9 respectively.

2.5.1.2 Data collected

The radar installations provided data on vehicle flow, speed and headway\(^2\) for each carriageway and lane. These metrics were recorded for each vehicle passing the unit and captured data on vehicle length which was used to classify vehicle types.

2.5.1.3 Data processing

To understand the potential impact of the speed restriction change on vehicle speeds, data on driver behaviour were required for periods when drivers were free to choose their own speed. This required conditions with free-flowing traffic. Periods with congested traffic were therefore removed; defined as periods when the average speed of vehicles in a lane across a minute was lower than 40mph. This resulted in the removal of just over 5% of the available data.

To classify vehicles by type, the following definitions were used:

- Car/LGV (≤25ft)
- HGV (>25ft)

2.5.1.4 Comparison of flow

It was essential to understand how vehicle flow changed between the baseline and trial periods, since any changes in vehicle flow can affect the behaviour of road users and impact their speed. The following comparisons were made:

1. A comparison of overall and daily average vehicle flows between the baseline and trial periods at both experimental and control locations, on both weekdays and weekends.
2. A comparison of average vehicle flow split by vehicle class between the baseline and trial periods.
3. A comparison of average vehicle flow composition by lane at the experimental location.

The results of these comparisons are presented in sections 3.2.1 and 3.3.1.

\(^2\) Headway was defined as the time separation between vehicles, measured from the front bumper of the first vehicle to the front bumper of the following vehicle, averaged over one-minute intervals.
2.5.1.5  Comparison of speed

The following comparisons were made using the one-minute average speed data collected from the radars:

1. A comparison of average speed between the baseline and trial periods by monitoring location on both weekdays and weekends.
2. Comparison of average speed by lane between the baseline and trial periods at the experimental location.
3. A comparison of average speed by vehicle type between the baseline and trial periods at the experimental location.
4. A comparison of compliance with the posted speed restriction between the baseline and trial periods by monitoring location.

The results of these comparisons are presented in sections 3.2.2 and 3.3.2.

2.5.1.6  Comparison of congestion

Data collected during periods of congestion were removed from the comparisons of flow and vehicle speed. This allowed for the impact of the speed restriction change to be explored, since comparisons were focused on free-flow conditions where drivers had free choice of speed. It was however also important to understand the impact of the speed restriction change on the levels of congestion seen at the scheme. A comparison of average daily periods of congestion between the baseline and trial periods by monitoring location was made. The results of this comparison are presented in sections 3.2.3 and 3.3.3.

2.5.1.7  Comparison of close following

The following comparisons were made using the individual vehicle data (IVD) collected from the radars:

1. A comparison of close following\(^3\) between the baseline and trial periods by monitoring location on both weekdays and weekends.
2. Comparison of close following by vehicle type between the baseline and trial periods at the experimental location.

The results of these comparisons are presented in sections 3.2.4 and 3.3.4.

2.5.1.8  Statistical comparisons

To determine if driver behaviour changed following the implementation of the 60mph speed restriction, appropriate statistical tests were used to test for significant differences between data recorded during the baseline and trial periods. Three types of statistical tests were used, depending on the type of data available:

\(^3\) A vehicle was defined as engaging in ‘close following’ if there was a gap of less than two seconds to the vehicle in front.
Chi-squared tests were used to test for a difference in the distribution of categorical data, for example to test for a difference in the distribution of vehicle flows between the baseline and trial periods.

Analysis of Variance (ANOVA) was used to test for a difference in the mean response between groups, for example to test for a difference in the average speed between the baseline and trial periods.

Two-proportion z-tests were used to test for a difference in proportions, for example to test for a difference in percentage of vehicles close following.

Results were classified as ‘statistically significant’ if the p-value was less than 0.05 (a common standard in behavioural sciences). The p-value is a measure of probability and a value of less than 0.05 implies that any differences between the groups being tested has a less than 5% chance that the difference occurred at random.

It must be noted that when the sample size is extremely large (as it is in this study), even very small differences could result in statistical significance. In such cases, an effect size is calculated to measure the magnitude of the phenomenon or the degree of association between two variables. Generally, an effect size of less than 0.2 denotes a small effect, 0.5 is a medium effect and 0.8 denotes a large effect. Throughout the report, the effect size has been reported if any result is statistically significant to understand if the effect is due to large sample sizes or a strong relationship between two variables.

2.5.1.9 Sensitivity analysis

A sensitivity analysis was conducted to understand the impact of the government-imposed restrictions caused by COVID-19. Additional comparisons were made between the baseline period and trial period prior to the start of the government-imposed restrictions.

Statistical tests were conducted in order to understand if there were significant differences in driver behaviour between the baseline period and the trial period before the start of the restrictions on the 23rd of March.

Any changes to the results have been noted within each section.

2.5.2 Incident data

Throughout both the baseline and trial phases of the investigation, incidents which occurred within the confines of the scheme traffic management were documented and collated by the scheme’s traffic management contractor. These logs identified the type of reported incidents (breakdowns and road traffic collisions) along with the location of the incident (carriageway and marker post number) and the date it took place.

Comparisons of the number of reported incidents between the baseline and trial phase were made; a summary of these data is presented in section 3.4.

2.5.3 Workforce survey data

To provide further insight into the potential impact of changing the speed restriction at the scheme from 50mph to 60mph, a workforce survey was conducted during the investigation.
The survey aimed to capture insight from project managers, site workers and members of the workforce who operate within the carriageway environment.

Comparisons of the survey responses between the baseline and trial periods are presented in section 3.6.

2.5.4 Customer satisfaction survey data

Throughout the on-road investigation, surveys were used to collect information on the impact of increasing the speed restriction on the satisfaction levels of road users travelling through the scheme. These surveys were administered to individuals who had identified themselves as having travelled through the scheme during either the baseline or trial periods.

Targeting of these individuals was achieved using a social media advertising campaign, with individuals within a 50km radius of both junctions 3 and 12 of the M4 being targeted to take part in the study. The adverts were also shared with multiple special interest groups on social media platforms. This approach ensured the recruitment of individuals who regularly drove the route over the duration of the investigation.

The surveys collected data on customers’ feelings of safety affected by both the posted speed restriction and the width of the scheme’s lanes. Levels of journey satisfaction and how they were affected by the posted speed restriction and the width of the lanes were also captured. Comparisons of the survey responses between the baseline and trial periods are presented in section 3.7.

2.5.5 Delivery and cost impacts

To understand the impact of the change in speed restriction on the scheme’s delivery and costs, a lessons-learned workshop was held after the monitoring periods had ended. The session sought to capture details on any impacts to the scheme associated with implementing the change in speed restriction. Attendees included the scheme’s Highways England Project Manager, Principal Contractor, Traffic Management Supplier, Traffic Officers, Communications Manager and Risk Contractor.

A summary of the findings of this workshop is presented in Section 3.8.
3 Results

3.1 Overview

This section provides an overview of the findings from the on-road trial and the impact of the change in speed restriction on:

- Driver behaviour
- Incidents and breakdowns
- Journey times
- Welfare of the workforce
- Customer satisfaction
- The scheme’s delivery and cost

The main findings are summarised in Table 3 below, with full results from the detailed analysis presented in the succeeding sections.

Table 3: The key findings from the on-road trials of 60mph on the M4 J3-12 scheme

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<thead>
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<th>Vehicle flow</th>
<th>Weekday driver behaviour</th>
<th>Weekend driver behaviour</th>
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<tr>
<td>The control location had an average hourly flow of 1,257 vehicles during the baseline period and 568 vehicles during the trial period. The experimental location had a lower average hourly flow of 567 during the baseline period and 402 during the trial period. There was a significant difference in flow between the control and experimental locations and between the baseline and trial periods ($p &lt; 0.01$) with a small effect size of 0.1.</td>
<td>The control location had an average hourly flow of 3,107 vehicles during the baseline period and 1,339 vehicles during the trial period. The experimental location had a lower average hourly flow of 747 during the baseline period and 442 during the trial period. There was a significant difference in flow between the control and experimental locations and between the baseline and trial periods ($p &lt; 0.01$) with a small effect size of 0.01.</td>
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<table>
<thead>
<tr>
<th>Vehicle speed</th>
<th>Weekday driver behaviour</th>
<th>Weekend driver behaviour</th>
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<tbody>
<tr>
<td>The free-flow average speed at the experimental location increased from 49mph during the baseline period to 53mph in the trial period. There was also a marginal increase in the free-flow average speed at the control location, increasing from 48mph to 49mph between the two periods. The compliance rates improved for all vehicles when the speed restriction was 60mph compared with 50mph, and compliance remained relatively constant at the control location where the speed restriction remained at 50mph.</td>
<td>The free-flow average speed at the experimental location increased from 48mph during the baseline period to 54mph in the trial period. There was also a noticeable increase in the free-flow average speed at the control location, increasing from 47mph to 50mph between the two periods. The compliance rates improved for all vehicles when the speed restriction was 60mph compared with 50mph, and compliance reduced during the trial period at the control location where the speed restriction remained at 50mph.</td>
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### Congestion

Weekday driver behaviour:
There was minimal routine congestion at the scheme. During the baseline and trial monitoring periods, 3% and 4% of the total time was classified as congested at the experimental location, respectively. At the control location 10% of the total time was classified as congestion.

Weekend driver behaviour:
There was minimal routine congestion at the scheme. During both the baseline and trial monitoring periods, 1% of the total time was classified as congested at the experimental location, respectively. At the control location 5% of the total time was classified as congestion.

### Close following

Weekday driver behaviour:
During the baseline period the proportion of vehicles close following was 13% at the experimental location, but marginally lower (11%) during the trial period. Likewise, the proportion of HGVs engaged in close following decreased from 10% during the baseline period, to 6% during the trial period. These differences were statistically significant ($p < 0.01$), but with a very small effect size of 0.14.

Weekend driver behaviour:
During the baseline period the proportion of vehicles close following was 34% at the experimental location, but substantially lower (18%) during the trial period. Likewise, the proportion of HGVs engaged in close following decreased from 29% during the baseline period, to 8% during the trial period. These differences were statistically significant ($p < 0.01$), but with a very small effect size of 0.56.

### Incidents and breakdowns

There were no safety concerns raised by the scheme around the number of reported incidents during the trial. The number of incidents (Road Traffic Collisions and breakdowns) was too small to enable statistical analysis.

### Journey time

Weekday driver behaviour:
Increasing the speed restriction from 50mph to 60mph decreased the average journey time by around 27 seconds per driver at the experimental location. At the control location, where the speed restriction remained consistent throughout both monitoring periods the average journey time decreased by around 8 seconds.

Weekend driver behaviour:
Increasing the speed restriction from 50mph to 60mph decreased the average journey time by around 41 seconds per driver at the experimental location. At the control location, where the speed restriction remained consistent throughout both monitoring periods the average journey time decreased by around 24 seconds.

### Workforce satisfaction

For the workforce satisfaction survey, there were 516 responses relating to the 50mph speed restriction and 53 responses relating to the 60mph speed restriction. Results were mixed: most participants who reported on the 50mph speed restriction reported the speed restriction made them feel safe, whereas most participants who reported on the 60mph speed restriction reported the speed restriction made them feel unsafe. However, most participants felt both speed restrictions were about right in terms of safety when asked how appropriate the speed restrictions were in terms of safety. These findings suggest that the change in speed restriction may not have been the only factor that affected the workforce’s feelings of safety.

### Customer satisfaction

For the customer satisfaction survey, 34 responses during the baseline period and 4 responses during the trial period were analysed. Results were mixed. Overall, most participants felt the speed restrictions did not affect their feelings of safety. However, participants who reported on the trial period mostly felt dissatisfied with the speed restriction, whereas most participants who reported on the baseline period felt the speed restriction did not affect their levels of journey satisfaction. In terms of safety and journey satisfaction, most participants who reported on the...
Weekday driver behaviour | Weekend driver behaviour
---|---
Baseline period felt the speed restriction was about right, whereas most participants who reported on the trial period felt the speed restriction was too slow. Most participants reported that the width of the lanes did not affect their feelings of safety or journey satisfaction. Participants reported that they felt the width of the lanes was either about right or too narrow in terms of feelings of safety and journey satisfaction. Due to the limited number of responses, it was not possible to conduct any statistical analyses and caution should be taken when interpreting these results.

| Scheme delivery | There was no feedback from the scheme to suggest that the delivery of the work activities or scheme program were delayed. |
| Scheme cost | An additional cost was incurred by the scheme to implement the trial of the 60mph speed restriction. |

### 3.2 Weekday driver behaviour

This section presents the driver behaviour data collected on the M4 J3-12 during weekdays at both monitoring locations. As the 60mph speed restriction could only be implemented overnight on weekdays, data has only been analysed between 8pm and 5am in this section.

Results from the sensitivity analysis are presented after the main results from each section. This sensitivity analysis presents the results from additional statistical tests conducted to test for differences in driver behaviour between the baseline and trial period with data impacted by the COVID-19 restrictions removed. When compared to the main results, this helped identify if the data from the trial period impacted by the COVID-19 restrictions had an impact on the overall results.

#### 3.2.1 Vehicle flow

Figure 3 shows the average hourly vehicle flow across the baseline and trial monitoring periods between the control and experimental monitoring locations on the M4 between junction 3 and 12.

Some of the below results have been illustrated in the form of a boxplot. In comparison to the previous trials, a reduced sample of data was collected and as such a boxplot has been used as it better illustrates the findings. A boxplot is a standardized way of displaying a summary of the distribution of the data. The coloured boxes show the interquartile range (25th to 75th percentile) of the data: the bottom of the box represents the lower (25th) quartile, the middle line represents the median (an average), and the top of the box the upper (75th) quartile. The lines show the range of the data with outliers displayed as dots.
The hourly vehicle flow varied over the course of the investigation at both the control and experimental locations. The control location had an average hourly flow of 1,257 vehicles during the baseline period and 568 during the trial period. The experimental location had a lower average hourly flow of 567 during the baseline period and 402 during the trial period. The difference in average flows can be explained due to the government-imposed restrictions caused by COVID-19. Moreover, only 17 hours of data were collected during the trial period, compared to the 203 hours of data collected during the baseline.

A chi-square test was conducted to test for statistically significant differences between the average hourly vehicle flows by monitoring period and location. The test found that there was a significant difference in flow between the control and experimental locations and between the baseline and trial periods ($p < 0.01$) with a small effect size of 0.1. This suggests that any changes to the flows could be attributed to the difference in sample sizes between the baseline and trial periods.

Sensitivity analysis showed that the control location had an average hourly flow of 856 vehicles during the trial period prior to the start for the COVID-19 restrictions (compared to 568 observed over the entire duration of the trial period), and the experimental location had an average hourly flow of 602 (compared to 402 observed over the entire duration of the trial period). Statistical tests showed that the difference in flow between the two locations and monitoring periods prior to the start of the COVID-19 restrictions was significant ($p < 0.01$).
with a small effect size of 0.1. This suggests that the changes in flow observed during the COVID-19 restrictions period did not have a significant impact on the overall results as the sensitivity analysis showed a statistically significant difference with and without the inclusion of flow data gathered during the COVID-19 restrictions period.

The number of HGVs by monitoring location and period is presented in Figure 4. This shows that the number of HGVs decreased at both locations through the investigation. The control location had an average hourly HGV flow of 318 vehicles during the baseline period and 151 during the trial period. The experimental location had a lower average hourly HGV flow of 112 vehicles during the baseline period and 92 during the trial period. Once again, a drop in the HGV flow in the trial period can be attributed to the government-imposed restriction due to COVID-19. It is worth noting that this graph has a different scale along the Y-axis as the hourly flows of HGVs were a lot lower than hourly flows for all vehicles.

Figure 4: Hourly HGV flow by location and monitoring period

The proportion of HGVs increased during the trial period at both locations despite the reduction in the total flow due to the reduced number of vehicles travelling during this period. At the control location, the proportion of HGVs increased from 25% to 27% from the baseline period to the trial period. At the experimental location, a similar increase was seen from 20% to 23%. A two-proportion z-test indicated that the small difference in the HGV proportions at the experimental location between the baseline and trial periods was not significant ($p = 0.30$). Tests also showed that there were significant differences ($p < 0.01$) in HGV hourly flow between the control and experimental locations during both periods, with a small effect size.
of 0.1. Therefore, this difference is unlikely to have had a significant impact on driver behaviour as the proportion of HGVs was similar during both the baseline and trial periods.

A sensitivity analysis was conducted by excluding data from the trial period post- COVID-19 restrictions to see if there were any changes to the statistical test results. That analysis showed that the proportion of HGVs at the control location decreased from 25% to 21% from the baseline to the trial period prior to the implementation of COVID-19 restrictions. At the experimental location, a similar decrease was seen from 20% to 17%. Statistical tests showed that the difference in HGV proportions at the experimental location was not significant ($p = 0.27$). The difference in HGV flow between the two locations and monitoring periods was significant ($p < 0.01$), but with a small effect size of 0.1. This suggests that there were no significant changes to the results due to the implementation of the COVID-19 restrictions.

The distribution of vehicles between Lanes 1, 2 and 3 within the experimental location is shown in Table 4.

**Table 4: Distribution of vehicles by lane and monitoring period at the experimental location**

<table>
<thead>
<tr>
<th>Monitoring period</th>
<th>Vehicle type</th>
<th>Lane 1</th>
<th>Lane 2</th>
<th>Lane 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline period</td>
<td>All vehicles</td>
<td>49%</td>
<td>26%</td>
<td>25%</td>
</tr>
<tr>
<td>Trial period</td>
<td>All vehicles</td>
<td>59%</td>
<td>30%</td>
<td>11%</td>
</tr>
<tr>
<td>Trial period (pre-COVID-19 restrictions)</td>
<td>All vehicles</td>
<td>55%</td>
<td>33%</td>
<td>12%</td>
</tr>
</tbody>
</table>

The distribution of vehicles across the three available lanes at the experimental location changed between the baseline and trial periods.

A chi-square test showed that the small variation in vehicle distribution between the baseline and trial periods at the experimental location was statistically significant ($p < 0.05$) but with a very small effect size of 0.07. Sensitivity analysis conducted by excluding trial data over the COVID-19 restrictions period showed small changes in the distribution of vehicles by lane, as shown in the table above. Statistical tests showed similar significant results with a small effect size of 0.06, suggesting no impact in results due to the implementation of COVID-19 restrictions.

The proportions of each vehicle type in Lanes 1, 2 and 3 within the experimental location are shown in Table 5.

**Table 5: Composition of vehicle by lane and monitoring period at the experimental location**

<table>
<thead>
<tr>
<th>Monitoring period</th>
<th>Vehicle type</th>
<th>Lane 1</th>
<th>Lane 2</th>
<th>Lane 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline period</td>
<td>Cars + LGVs</td>
<td>78%</td>
<td>87%</td>
<td>78%</td>
</tr>
<tr>
<td></td>
<td>HGVs</td>
<td>22%</td>
<td>13%</td>
<td>22%</td>
</tr>
<tr>
<td>Trial period</td>
<td>Cars + LGVs</td>
<td>78%</td>
<td>71%</td>
<td>76%</td>
</tr>
<tr>
<td></td>
<td>HGVs</td>
<td>22%</td>
<td>29%</td>
<td>24%</td>
</tr>
<tr>
<td>Trial period (pre-COVID-19 restrictions)</td>
<td>Cars + LGVs</td>
<td>78%</td>
<td>92%</td>
<td>79%</td>
</tr>
<tr>
<td></td>
<td>HGVs</td>
<td>22%</td>
<td>8%</td>
<td>21%</td>
</tr>
</tbody>
</table>
The vehicle composition of Lane 1 at the experimental location remained consistent between the baseline and trial periods. A chi-square test showed that the small variation in vehicle composition between the baseline and trial periods at the experimental location was statistically significant ($p < 0.01$) but with a very small effect size of 0.04. Statistical tests for the sensitivity analysis showed that there was no significant difference ($p = 0.35$) in vehicle composition between the baseline and trial periods at the experimental location prior to the start of the COVID-19 restrictions.

The composition of vehicles in Lane 2 was made up of 87% cars and LGVs and 13% HGVs during the baseline period. During the trial period this composition changed, where 71% of total vehicles were cars and LGVs, and 29% HGVs. Like Lane 1, a chi-square test showed that there was a significant difference ($p < 0.01$), but with a small effect size of 0.02. There were no changes to the result from the sensitivity analysis of data collected prior to the COVID-19 restrictions.

The composition of vehicles in Lane 3 also remained similar between baseline and trial periods. A chi-square test showed that the difference was not significant ($p = 0.18$). Similarly, statistical tests comparing baseline and trial period (prior to COVID-19 restrictions) at the experimental location showed no significant differences ($p = 0.9$).

Taken together, these results suggest that the statistical significance seen can be attributed to the large sample sizes used in the test rather than a large difference in vehicle composition between monitoring periods, as outlined earlier in section 2.5.1.8. Additionally, the sensitivity analysis suggests that there were no significant changes to the results when data from the period with COVID-19 restrictions was excluded. As such, any changes identified in the following vehicle speeds and speed compliance comparisons are unlikely to have resulted from differences in vehicle composition.

### 3.2.2 Vehicle speed

To ensure that comparisons of vehicle speed were not conflated by the presence of small numbers of high-speed vehicles, the one-minute average speed data were weighted by vehicle flow. This ensured that more weight was given to data from periods when the flow was higher, compared to times when there were fewer vehicles (low flow), since averages calculated from small numbers of vehicles may be more greatly biased by high speed outliers.

Comparisons were made between control and experimental locations to account for background factors (aside from the speed restriction change) which may have influenced driver behaviour between the two monitoring periods.

Figure 5 shows the free-flow average speeds at the control and experimental locations across the two monitoring periods.
Free-flow average speed at the control location increased slightly through the investigation, from 48mph during the baseline period to 49mph during the trial period. At the experimental location, there was an increase in free-flow average speed from around 49mph in the baseline period to around 53mph in the trial period.

A statistical test (ANOVA) confirmed that there was a significant difference in free-flow average speed ($p < 0.01$) between the baseline and trial periods at the experimental location, explaining around 95% of the total variance. There was also a significant difference in the average speeds between baseline and trial periods at the control location ($p < 0.01$), explaining about 90% of the variance. There were no changes to the result from the sensitivity analysis of data collected prior to the COVID-19 restrictions.

As the difference in flow between monitoring periods and monitoring locations was attributed to changes in sample size, these identified changes in average speed are unlikely to have been impacted by differences in flow.

The free-flow average speeds by lane are shown in Table 6.

**Table 6: Free-flow average speed (mph) by monitoring period and lane at the experimental location**

<table>
<thead>
<tr>
<th>Monitoring period</th>
<th>Lane 1</th>
<th>Lane 2</th>
<th>Lane 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline period</td>
<td>47.8</td>
<td>51.1</td>
<td>49.4</td>
</tr>
<tr>
<td>Trial period</td>
<td>50.6</td>
<td>56.4</td>
<td>58.3</td>
</tr>
</tbody>
</table>

**Figure 5: Free-flow average speed during the monitoring period by location**

Free-flow average speed during the monitoring period by location.
During the trial period, speeds were highest in Lane 3, followed by Lane 2 and then Lane 1. However, during the baseline period however, speeds were highest in Lane 2, followed by Lane 3 and then Lane 1. Table 6 shows that the free-flow average speed in Lane 1 at the experimental location increased by 2.8mph between the baseline and trial periods and in Lane 2 there was an increase of 5.3mph. Lane 3 had an increase of 5.1mph between the baseline and trial periods. Although not shown here, there was little change in the average speeds by lane at the control location.

To understand the compliance of road users with the posted speed, data were separated into speed bins. These speed bins (0-40, 40-50, 50-57, 57-60, 60-68, 68+mph) allow for vehicles to be identified as travelling: below the speed restriction, above the speed restriction but below the enforcement limit (10% of speed restriction +2mph) and above the enforcement limit.

Figure 6 and Figure 7 show the proportion of vehicles recorded in each speed bin across the two monitoring periods at the experimental location.

The grey bars show the proportion of vehicles travelling below the speed restriction; the orange bars show the proportion of vehicles travelling above the speed restriction but below the enforcement threshold (10% of speed restriction +2mph); and the red bars show vehicles travelling above the enforcement threshold.

Figure 6: Proportion of vehicles in each speed bin during the baseline period at the experimental location
The proportion of vehicles travelling above the posted speed restriction at the experimental location decreased between the baseline and trial periods, dropping from 28% to 9%. The proportion of vehicles travelling above the enforcement limit decreased from 6% during the baseline to 2% during the trial period.

When looking at the differences in the proportion of vehicles in each category (below speed restriction, above speed restriction but below enforcement threshold and above enforcement threshold), two-proportion z-tests showed that, for all three categories, the proportion of vehicles in the category was significantly different ($p < 0.01$) between the baseline and trial periods at the experimental location. Additionally, the three tests showed medium to small effect sizes of 0.48, 0.40 and 0.25, respectively. Sensitivity analysis showed no difference in results, and the distribution of vehicles in each speed bin during the trial period (prior to the introduction of COVID-19 restrictions) was the same as above. Additionally, there were no changes to the statistical test results.

Figure 7 and Figure 9 show the proportion of vehicles recorded in each speed bin across the two monitoring periods at the control location.
Figure 8: Proportion of vehicles in each speed bin during the baseline period at the control location

Figure 9: Proportion of vehicles in each speed bin during the trial period at the control location
The proportion of vehicles in each speed bin at the control location remained fairly consistent between the baseline and trial periods. This is expected as the posted speed restriction remained the same during both periods at the control location, and further demonstrates that the changes observed at the experimental location were due to the change in speed restriction.

Even though statistical tests showed that the proportion of vehicles in each of the three speed categories were significantly different ($p < 0.05$) between the baseline and trial period at the control location, with small to medium effect sizes (0.08, 0.18 and 0.50 respectively). Sensitivity analysis showed no changes to the results when data from the COVID-19 restrictions period were excluded.

Figure 10 and Figure 11 show the proportion of cars and LGVs (namely, the figures above repeated but with HGVs excluded) recorded in each speed bin across the two monitoring periods at the experimental location.
Figure 10: Proportion of cars and LGVs in each speed bin during the baseline period at the experimental location

Figure 11: Proportion of cars and LGVs in each speed bin during the trial period at the experimental location

The proportion of cars and LGVs travelling above the posted speed restriction at the experimental location reduced between the baseline and trial periods, dropping from 27% to
10%. The proportion of vehicles travelling above the enforcement limit decreased from 6% during the baseline period to 1% during the trial period.

When looking at the differences in the proportion of vehicles in each category (below speed restriction, above speed restriction but below enforcement threshold and above enforcement threshold), two-proportion z-tests showed that, for all three categories, the proportion of vehicles in the category was significantly different ($p < 0.01$) between the baseline and trial periods at the experimental location. Additionally, the three tests showed medium to small effect sizes of 0.44, 0.34 and 0.25, respectively. Sensitivity analysis showed no changes to the results when data from the COVID-19 restrictions period were excluded.

Figure 12 and Figure 13 show the proportion of HGVs recorded in each speed bin across the two monitoring periods at the experimental location.

![Figure 12: Proportion of HGVs in each speed bin during the baseline period at the experimental location](image-url)
The proportion of HGVs travelling above the posted speed restriction at the experimental location decreased between the baseline and trial periods, dropping from 29% to 6%. The proportion of HGVs travelling above the enforcement threshold reduced from 6% during the baseline period to 3% during the trial period.

When looking at the differences in the proportion of vehicles in each category (below speed restriction, above speed restriction but below enforcement threshold and above enforcement threshold), two-proportion z-tests showed that, for all three categories, the proportion of vehicles in the category was significantly different \((p < 0.01)\) between the baseline and trial periods at the experimental location. The effect sizes were 0.64, 0.65 and 0.14, respectively. There were no changes to the results when the sensitivity analysis was conducted.

In summary, the results of the analysis show that compliance rates (in relation to speed) improved for all vehicles when the speed restriction of 60mph was compared with 50mph. Compliance remained relatively constant at the control location where the speed restriction remained at 50mph during both monitoring periods.

### 3.2.3 Congestion

A check was conducted on the total duration of congestion observed during the investigation. At the experimental location, 2% of the total monitored time during the baseline period and 4% of the total monitored time during the trial period was classified as congested; defined as any period where the one-minute averaged speed of all vehicles in a lane was less than 40mph. At the control location, 9% of the total monitored time was classified as congested. Figure 14 outlines the average speeds per hour of the day, by monitoring period and location.
The figure only shows the hours of data that has been analysed (20:00 to 05:00). At both monitoring locations during the baseline period, the speed was fairly consistent throughout these times of interest. At the control location, during the trial period, there was a steady increase in speed which peaked around 2am, but it steadily decreased thereafter. It is important to note that only 15 hours of trial data was analysed and this observable increase in speed was only for a two hour period. However, at the experimental location, there was also a small reduction in average speed noticed in the early hours of the morning (02:00 to 05:00). The hourly flow during the trial period was relatively low in comparison to the baseline period so a small sample of vehicles could have skewed the data.

As the hourly average speed did not fall below 40mph it can be concluded that there was minimal routine congestion at the scheme during the monitored times. As such the introduction of a 60mph speed restriction did not appear to have an impact on the amount of congestion seen through the scheme.

Figure 14: Average hourly vehicle speed by location and monitoring period

3.2.4 Close following

A vehicle was defined as engaging in ‘close following’ if there was a headway of less than two seconds to the vehicle in front. This section presents comparisons of close following between monitoring periods and locations; both for all vehicles and split by vehicle class.

Figure 15 shows the proportion of total vehicles close following across the course of the trial at both the control and experimental locations.
Figure 15: Proportion of vehicles close following by monitoring period and location

At the control location, the proportion of vehicles engaged in close following decreased between monitoring periods. From 36% of total vehicles during the baseline period to 33% during the experimental period. The experimental location also saw a decrease in the proportion of vehicles engaged in close following between monitoring periods, from 13% to 11%.

A two-proportion z-test indicated that the small difference in the proportion of vehicles close following at the experimental location between the baseline and trial periods was statistically significant \((p < 0.01)\), but with a very small effect size of 0.07. There were no changes to the test results from the sensitivity analysis when data from the COVID-19 restrictions period were excluded.

Figure 17 shows the proportions of HGVs and cars/LGVs close following at the experimental location. HGVs are defined as any vehicle over 25ft long.
Figure 16: Proportion of vehicles close following by period and vehicle type at the experimental location

A significantly higher proportion of cars/LGVs were close following at the experimental location ($p < 0.05$) than HGVs during both monitoring periods, although the effect sizes were very small (0.13 during the baseline and 0.22 during the trial period).

At the experimental location:

- 14% of cars/LGVs were close following in baseline period
- 12% of cars/LGVs were close following in the trial period
- 10% of HGVs were close following in the baseline period
- 6% of HGVs were close following in the trial period

A two-proportion z-test indicated that these differences were statistically significant ($p < 0.01$) but with a very small effect size of 0.14.

### 3.3 Weekend driver behaviour

This section presents the driver behaviour data collected on the M4 J3-12 scheme during weekends at both monitoring locations. As the 60mph speed restriction could have been implemented anytime throughout the weekend, the baseline period includes data that has been analysed between 8pm on Fridays to 5am on Mondays. This was compared against the trial periods where the speed restriction was increased to 60mph. Any day which had a period of overnight/lane closures has been discounted for analysis as behaviours are expected to be influenced by the introduction of additional temporary traffic management.

Results from the sensitivity analysis are presented after the main results from each section and additional statistical tests have been conducted to test for differences in driver behaviour between the baseline and trial periods (prior to the implementation COVID-19 restrictions).
3.3.1 Vehicle flow

Figure 17 shows hourly vehicle flows for the baseline and trial monitoring periods between the control and experimental monitoring locations.

The hourly vehicle flow varied over the course of the investigation at both the control and experimental locations. The control location had an average hourly flow of 3,107 vehicles during the baseline period and 1,339 during the trial period. The experimental location had a lower average hourly flow of 747 vehicles during the baseline period and 442 during the trial period. Once again, government advice to restrict travel due to COVID-19 resulted in a reduction in flow during the trial period. It is worth noting that there were 471 hours of data in the baseline period sample as compared to 82 hours in the trial period.

Statistical tests showed that there was a significant difference ($p < 0.01$) in average vehicle flow between the baseline and trial period and the two monitoring locations, however, with a small effect size of 0.01.

Sensitivity analysis showed that the control location had an average hourly flow of 1,295 vehicles during the trial period prior to the implementation of the COVID-19 restrictions (a decrease from 1,339 vehicles per hour over the entire duration of the trial period). The experimental location had an average hourly flow of 746 vehicles (an increase from the 442 vehicle per hour observed during the entire duration of the trial period). Statistical tests showed that the difference in flow between the two locations and monitoring periods prior to the implementation of the COVID-19 restrictions was significant ($p < 0.01$).
to the start of the COVID-19 restrictions was significant \((p < 0.01)\) with a small effect size of 0.06. This suggests that the changes in flow during the COVID-19 restrictions period does not impact the results from the trial period.

The average hourly number of HGVs by monitoring location and period is presented in Figure 18. This shows that the number of HGVs decreased at both locations through the investigation. The control location had an average hourly flow of 383 HGVs during the baseline period and 122 during the trial period. The experimental location had a lower average hourly flow of 77 HGVs during the baseline period and 52 during the trial period. Once again, a drop in the flow in the trial period can be attributed to the government-imposed restriction due to COVID-19. It is worth noting that this graph has a different scale along the Y-axis compared to previous hourly flow graphs as the hourly flows of HGVs were lower than hourly total flows.

---

**Figure 18: Hourly HGV flow by location and monitoring period**

The proportion of HGVs changed across both periods at both monitoring locations. At the control location, the proportion of HGVs decreased from 12% to 9% from the baseline period to the trial period. At the experimental location, a slight increase was seen from 10% to 12%.

A two-proportion z-test indicated that the difference in the HGV proportions at the experimental location between the baseline and trial periods was not significant \((p = 0.30)\). Therefore, this difference is unlikely to have had a significant impact on driver behaviour.
Sensitivity analysis showed that the proportion of HGVs at the control location increased from 12% to 13% from the baseline to the trial period prior to the start of the government-imposed restrictions. At the experimental location, a similar increase was seen from 6% to 8%. Statistical tests showed that the difference in HGV proportions at the experimental location was not significant ($p = 0.11$). This suggests that there were no significant changes to the results due to the implementation of the COVID-19 restrictions.

The distribution of vehicles between Lanes 1, 2 and 3 within the experimental location is shown in Table 7.

### Table 7: Distribution of vehicle by lane and monitoring period at the experimental location

<table>
<thead>
<tr>
<th>Monitoring period</th>
<th>Vehicle type</th>
<th>Lane 1</th>
<th>Lane 2</th>
<th>Lane 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline period</td>
<td>All vehicles</td>
<td>40%</td>
<td>33%</td>
<td>27%</td>
</tr>
<tr>
<td>Trial period</td>
<td>All vehicles</td>
<td>55%</td>
<td>35%</td>
<td>12%</td>
</tr>
<tr>
<td>Trial period (pre-COVID-19</td>
<td>All vehicles</td>
<td>51%</td>
<td>37%</td>
<td>12%</td>
</tr>
</tbody>
</table>

The distribution of vehicles across the three available lanes at the experimental location varied between the baseline and trial periods. A chi-square test showed that the small variation in vehicle distribution between the baseline and trial periods at the experimental location was statistically significant ($p < 0.05$) but with a very small effect size of 0.08. Sensitivity analysis conducted by analysing data prior to the start of the COVID-19 restrictions during the trial period showed small changes in the distribution of vehicles by lane. Statistical tests showed similar significant results with a small effect size of 0.07, suggesting no impact in results due to the implementation of the government restrictions.

The proportions of each vehicle type in Lanes 1, 2 and 3 within the experimental location is shown in Table 8.

### Table 8: Composition of vehicle by lane and monitoring period at the experimental location

<table>
<thead>
<tr>
<th>Monitoring period</th>
<th>Vehicle type</th>
<th>Lane 1</th>
<th>Lane 2</th>
<th>Lane 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline period</td>
<td>Cars + LGVs</td>
<td>93%</td>
<td>96%</td>
<td>95%</td>
</tr>
<tr>
<td></td>
<td>HGVs</td>
<td>7%</td>
<td>4%</td>
<td>5%</td>
</tr>
<tr>
<td>Trial period</td>
<td>Cars + LGVs</td>
<td>82%</td>
<td>96%</td>
<td>95%</td>
</tr>
<tr>
<td></td>
<td>HGVs</td>
<td>18%</td>
<td>4%</td>
<td>5%</td>
</tr>
<tr>
<td>Trial period (pre-COVID-19</td>
<td>Cars + LGVs</td>
<td>88%</td>
<td>96%</td>
<td>98%</td>
</tr>
<tr>
<td>restrictions)</td>
<td>HGVs</td>
<td>12%</td>
<td>4%</td>
<td>2%</td>
</tr>
</tbody>
</table>

The vehicle composition in Lane 1 at the experimental location changed between the baseline and trial periods. A chi-square test showed that the variation in vehicle composition between the baseline and trial periods at the experimental location was statistically significant ($p < 0.01$) but with a very small effect size of 0.09. Statistical tests for the sensitivity analysis showed similar results ($p < 0.01$ with a small effect size of 0.04).
The composition of vehicles in Lane 2 remained consistent between the baseline and trial periods. A chi-square test showed that there was no significant difference in vehicle composition between the baseline and trial periods at the experimental location. Statistical tests for the sensitivity analysis comparing baseline and trial period (prior to the COVID-19 restrictions) showed significant difference ($p < 0.01$), however with a very small effect size of 0.009.

The composition of vehicles in Lane 3 saw a change between baseline and pre-COVID-19 restrictions trial periods. However, a chi-square test showed that this difference was not statistically significant. Statistical tests for the sensitivity analysis showed a significant difference ($p < 0.01$) between baseline and trial periods (prior to the COVID-19 restrictions) at the experimental location, albeit with an extremely small effect size of 0.01.

As with the weekday data, the variations in vehicle composition by lane at the experimental location, even though statistically significant, were found to be very small in terms of effect size. As such, differences in vehicle composition are unlikely to have impacted on vehicle speeds and speed compliance.

### 3.3.2 Vehicle speed

As explained previously in this report, to ensure that comparisons of vehicle speed were not conflated by the presence of small numbers of high-speed vehicles, the one-minute average speed data were weighted by vehicle flow.

Comparisons were made between control and experimental locations to account for background factors (aside from the speed restriction change) which may have influenced driver behaviour between the two monitoring periods.

Figure 19 shows the free-flow average speeds on the control and experimental locations across the two monitoring periods.
Figure 19: Free-flow average speed during the monitoring period by location

Free-flow average speed at the control location increased slightly through the investigation, from 47mph during the baseline period to 50mph during the trial period. At the experimental location, there was an increase in free-flow average speed from around 48mph in the baseline period to around 54mph in the trial period.

A statistical test (ANOVA) confirmed that there was a significant difference in free-flow average speed ($p < 0.01$) between the baseline and trial periods at the experimental location, explaining around 93% of the total variance. There was a significant difference in average speeds between baseline and trial periods at the control location ($p < 0.01$) explaining about 89% of the variance. Sensitivity analysis showed no changes to the results when the COVID-19 restrictions period was excluded from the trial data.

Despite the speed restriction remaining unchanged, an increase in average speed was noticed at the control location. As the difference in flow between monitoring periods and monitoring locations was significant, changes in speed are likely to have been impacted by differences in flow, with a decrease in hourly flow resulting in an increase in average vehicle speed.

Free-flow average speeds by lane are shown in Table 9.

Table 9: Free-flow average speed (mph) by monitoring period and lane at the

<table>
<thead>
<tr>
<th>Monitoring period</th>
<th>Lane 1</th>
<th>Lane 2</th>
<th>Lane 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline period</td>
<td>45.9</td>
<td>49.0</td>
<td>48.4</td>
</tr>
<tr>
<td>Trial period</td>
<td>51.1</td>
<td>56.9</td>
<td>59.3</td>
</tr>
</tbody>
</table>
In the trial period, speeds were highest in Lane 3, followed by Lane 2 and then Lane 1. During the baseline period, the speeds were highest in Lane 2, followed by Lane 3, and then Lane 1. Table 9 shows that the free-flow average speed in Lane 1 at the experimental location increased by 5.2mph between the baseline and trial periods. Lane 2 had an increase of 7.9mph between the two periods, while Lane 3 had a 10.9mph speed difference. Although not shown here, there was little change in the average speeds by lane in the control location.

To understand the compliance of road users with the posted speed, data were separated into speed bins. These speed bins (0-40, 40-50, 50-57, 57-60, 60-68, 68+mph) allow for vehicles to be identified as travelling: below the speed restriction, above the speed restriction but below the enforcement limit (10% of speed restriction +2mph)and above the enforcement limit.

Figure 20 and Figure 21 show the proportion of vehicles recorded in each speed bin across the two monitoring periods at the experimental location.

The grey bars show the proportion of vehicles travelling below the speed restriction; the orange bars show the proportion of vehicles travelling above the speed restriction but below the enforcement threshold (10% of speed restriction +2mph); and the red bars show vehicles travelling above the enforcement threshold.
Below speed restriction

Above speed restriction but below enforcement limit

Above enforcement limit

Figure 20: Proportion of vehicles in each speed bin during the baseline period at the experimental location

Figure 21: Proportion of vehicles in each speed bin during the trial period at the experimental location
The proportion of vehicles travelling above the posted speed restriction at the experimental location reduced from 17% in the baseline period to 9% in the trial period. Similarly, the proportion of vehicles travelling above the enforcement limit reduced from 2% in the baseline period to 1% in the trial period.

When looking at the differences in the proportion of vehicles in each category (below speed restriction, above speed restriction but below enforcement threshold and above enforcement threshold), two-proportion z-tests showed that, for all three categories, the proportion of vehicles in the category was significantly different ($p < 0.01$) between the baseline and trial periods at the experimental location. Additionally, the three tests showed small to medium effect sizes of 0.26, 0.22 and 0.14, respectively. Sensitivity analysis showed no changes to the results when the COVID-19 restrictions period was excluded from the trial data.

Figure 22 and Figure 23 show the proportion of vehicles recorded in each speed bin across the two monitoring periods at the control location.

**Figure 22: Proportion of vehicles in each speed bin during the baseline period at the control location**
The proportion of vehicles recorded as traveling above the posted speed at the control location changed from 33% to 41% between the baseline and trial periods. The proportion of vehicles over the enforcement threshold changed from 9% to 12% between the baseline and trial periods.

Statistical tests showed that the proportion of vehicles in each of the three speed categories were significantly different ($p < 0.05$) between the baseline and trial period, with small to medium effect sizes (0.20, 0.13 and 0.13 respectively). Sensitivity analysis showed no changes to the results when the COVID-19 restrictions period was excluded from the trial data.

Figure 24 and Figure 25 show the proportion of cars and LGVs recorded in each speed bin across the two monitoring periods at the experimental location.
Figure 24: Proportion of cars and LGVs in each speed bin during the baseline period at the experimental location.

Figure 25: Proportion of cars and LGVs in each speed bin during the trial period at the experimental location.
The proportion of cars and LGVs travelling above the posted speed restriction at the experimental location reduced between the baseline and trial periods, from 17% to 9%. The proportion of vehicles travelling above the enforcement limit reduced from 2% to 1% between the two periods.

When looking at the differences in the proportion of vehicles in each category (below speed restriction, above speed restriction but below enforcement threshold and above enforcement threshold), two-proportion z-tests showed that, for all three categories, the proportion of vehicles in the category was significantly different ($p < 0.01$) between the baseline and trial periods at the experimental location. Additionally, the three tests showed small to medium effect sizes of 0.23, 0.18 and 0.40, respectively. Sensitivity analysis showed no changes to the results when the COVID-19 restrictions period was excluded from the trial data.

Figure 26 and Figure 27 show the proportion of HGVs recorded in each speed bin across the two monitoring periods at the experimental location.

---

**Figure 26**: Proportion of HGVs in each speed bin during the baseline period at the experimental location
Figure 27: Proportion of HGVs in each speed bin during the trial period at the experimental location

The proportion of HGVs travelling above the posted speed restriction the experimental location reduced across the baseline and trial periods, from 18% to 5%. Similarly, the proportions of HGVs travelling above the enforcement limit reduced from 4% during the baseline period to 2% during the trial period.

When looking at the differences in the proportion of vehicles in each category (below speed restriction, above speed restriction but below enforcement threshold and above enforcement threshold), two-proportion z-tests showed that, for all three categories, the proportion of vehicles in the category was significantly different ($p < 0.01$) between the baseline and trial periods at the experimental location. The effect sizes were medium to small - 0.40, 0.36 and 0.16, respectively. There were no changes to the results when the sensitivity analysis was conducted.

### 3.3.3 Congestion

A check was conducted on the total duration of congestion observed during the investigation. At the experimental location, 1% of the total monitored time during the baseline period and 2% of the total monitored time from the trial period was classified as congested; defined as any period where the one-minute averaged speed of all vehicles across a lane was less than 40mph. At the control location, 5% of the total monitored time was classified as congested.

Figure 28 outlines the average speeds per hour of the day, by monitoring period and location.

Figure 28 shows that average speed was generally higher during the night (between 20:00 and 06:00) and lower during the day. This pattern is consistent during the baseline period at both locations and for the control location at the trial period. However, at the experimental
location during the trial period, higher speeds were seen between 06:00 and 16:00. As on average the hourly average speed did not fall below 40mph it can be concluded that there was minimal routine congestion at the scheme. As such the introduction of a 60mph speed restriction did not appear to have an impact on the amount of congestion seen through the scheme.

Figure 28: Average hourly vehicle speed by location and monitoring period

3.3.4 Close following

A vehicle was defined as engaging in ‘close following’ if there was a headway of less than two seconds to the vehicle in front. This section presents comparisons of close following between monitoring period and location; both for all vehicles and split by vehicle class.

Figure 29 shows the proportion of total vehicles close following across the course of the trial at the experimental location.
The control location saw a decrease in the proportion of vehicles engaged in close following between monitoring periods. In the baseline period 59% of vehicles were recorded as close following, compared with 34% during the trial period. The experimental location also saw a reduction in proportion of close following between monitoring periods, 34% to 18% respectively, but overall experienced less close following than the control location.

A two-proportion z-test indicated that the small difference in the proportion of vehicles close following at experimental location between the baseline and trial periods was statistically significant ($p < 0.01$), but with a medium effect size of 0.54. These results did not change in the sensitivity analysis.

Figure 30 shows the split of HGVs and cars/LGVs close following at the experimental location. HGVs are defined as any vehicle over 25ft long.
A significantly higher proportion of cars/LGVs were close following at the experimental location \( (p < 0.05) \) than HGVs, although the effect sizes were small (0.11 during the baseline and 0.33 during the trial period). At the experimental location:

- 35% of cars/LGVs were close following in baseline period
- 20% of cars/LGVs were close following in the trial period
- 29% of HGVs were close following in the baseline period
- 8% of HGVs were close following in the trial period

A two-proportion z-test indicated that these differences were statistically significant \( (p < 0.01) \) with a medium effect size of 0.56.

### 3.4 Incidents and breakdowns

In total 39 incidents were reported at both monitoring location across both the weekday and weekend investigations. A single incident was reported during the trial monitoring period, with the remaining 38 being reporting in the baseline monitoring period. Additionally, a greater number of incidents were observed during the weekend investigation in comparison to the weekday investigation. This uneven distribution of reported incidents between both, the two monitoring periods and the two investigations was likely due to the limited sample of data collected during the trial period (17 weekday hours and 82 weekend hours) in comparison to the baseline period (203 weekday hours and 471 weekend hours) and the collection of a limited sample of weekday data (203 hours) compared to weekend data (471 hours). A summary of these reported incidents is presented respectively in Figure 31 and Figure 32 for the weekday and weekend investigations.
Figure 31: Reported incidents on the weekday investigations

During the weekday investigation the number of reported incidents varied between the baseline and trial period at both the control and experimental locations. At the experimental location, where the speed restriction changed between monitoring periods, a total of two incidents were reported, both of which were during the baseline period. At the control location, where the speed restriction remained consistent across the investigation, the total number of reported incidents was seven, all of which were during the baseline period.

Looking specifically at road traffic collisions (RTCs), at the experimental location, the figures showed no RTCs during both the baseline period and trial period. At the control location there was one reported RTC during the baseline period.

Figure 32: Reported incidents on the weekend investigations
During the weekend investigation the number of reported incidents also varied between the baseline and trial period at both the control and experimental locations. At the experimental location, where the speed restriction changed between monitoring periods, the total number of reported incidents was 13 during the baseline period and none during the trial period. At the control location, where the speed restriction remained consistent across the investigation, the total number of reported incidents was 16 during the baseline and one during the trial period.

Looking specifically at RTCs, at the experimental location there was one RTC during the baseline period and none during the trial period. At the control location there were no reported RTCs during both the baseline period and trial period.

Given the small sample size, statistical tests were not carried out. The differences in the number of reported RTCs cannot be confidently attributed to the change in the speed restriction.

### 3.5 Journey time

Estimates of the average journey time were calculated for the baseline and trial monitoring periods on weekdays and weekends. This was based on the length of the speed restriction and a single aggregated free-flow average speed of vehicles using the radar data. Table 10 shows the estimated average journey time during the baseline and trial periods on weekdays and weekends by monitoring location.

<table>
<thead>
<tr>
<th>Monitoring location</th>
<th>Length (km)</th>
<th>Average vehicle speed (mph)</th>
<th>Journey time (seconds)</th>
<th>Difference (seconds)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Baseline</td>
<td>Trial</td>
<td>Baseline</td>
<td>Trial</td>
</tr>
<tr>
<td>Westbound carriageway (junction 11-12)</td>
<td>7.8</td>
<td>49</td>
<td>53</td>
<td>358.2</td>
</tr>
<tr>
<td>Experimental (weekday)</td>
<td>7.8</td>
<td>48</td>
<td>54</td>
<td>365.6</td>
</tr>
<tr>
<td>Westbound carriageway (junction 11-12)</td>
<td>8.5</td>
<td>48</td>
<td>49</td>
<td>398.4</td>
</tr>
<tr>
<td>Control (weekday)</td>
<td>8.5</td>
<td>47</td>
<td>50</td>
<td>406.9</td>
</tr>
</tbody>
</table>

The results suggest that changing the speed restriction from 50mph to 60mph decreased the average journey time by around 27.1 seconds on weekdays and 40.6 seconds on weekends. Relative to the journey time through the 7.8km scheme, this represents about an 8% and 11% reduction respectively for weekdays and weekends in the trial period compared with the baseline period. When considering the substantial volume of drivers who travelled through the scheme each day, the total time savings are notable.

A reduction in journey time was also observed at the control location, where the speed restriction remained consistent throughout both monitoring periods. The average journey
time decreased by around 8.1 and 24.4 seconds respectively for the monitored weekdays and weekends in the trial period compared with the baseline period. However, as previously noted, this location saw an increase in average speed as a result in a reduction in hourly vehicle flow, rather than due to a change in speed restriction. It is likely that the observed increase in average speeds at both monitoring locations may have been attributed by the COVID-19 restrictions and the resulting lower traffic flows.

3.6 Workforce survey
In total, 522 individuals completed the workforce survey during the investigation; 469 of these individuals reported on only the 50mph speed restriction, six reported on only the 60mph speed restriction and 47 reported on both speed restrictions. A summary of the responses is presented below. Due to the limited number of responses received on the 60mph speed restriction (53), caution should be taken when interpreting the results from any statistical analysis.

Participants from the workforce were asked to rate how they thought the speed restriction affected their safety. Responses are shown in Figure 33.

![Figure 33: Responses to question “How do you think the speed restriction affected your safety? Did it make you feel...?”](image)

Across the investigation:
- 127 out of 516 participants reported the 50mph speed restriction did not affect how safe they felt. 12 out of 53 participants reported the 60mph speed restriction did not affect how safe they felt.
- 114 out of 516 participants reported the 50mph speed restriction made them feel either slightly or very unsafe. 20 out of 53 participants reported the 60mph speed restriction made them feel either slightly or very unsafe.
275 out of 516 participants reported the 50mph speed restriction made them feel either slightly or very safe. 21 out of 53 participants reported the 60mph speed restriction made them feel either slightly or very safe.

Statistical tests showed that the difference in distribution of responses (unsafe, no change and safe) between 50mph and 60mph was statistically significant ($p < 0.05$), with a small effect size of 0.11. This finding indicates that a significantly higher proportion of participants who reported on the 50mph speed restriction said the speed restriction made them feel safe compared with participants who reported on the 60mph speed restriction. However, caution should be taken when interpreting these results due to the limited number of responses received on the 60mph speed restriction.

Participants were then asked to rate how appropriate they thought the speed restriction was in terms of their own safety. Responses are shown in Figure 34.

![Figure 34: Responses to question “In terms of your safety, do you think the speed restriction was...?”](image)

Across the investigation:

- 381 out of 516 participants reported the 50mph speed restriction was about right in terms of safety. 31 out of 53 participants reported the 60mph speed restriction was about right in terms of safety.
- 38 out of 516 participants reported the 50mph speed restriction was too slow in terms of safety. 3 out of 53 participants reported the 60mph speed restriction was too slow in terms of safety.
- 97 out of 516 participants reported the 50mph speed restriction was too high in terms of safety. 19 out of 53 participants reported the 60mph speed restriction was too high in terms of safety.

Due to the small number of responses for each response category (too slow, about right and too high), statistical tests could not be performed on these data.
In an open question, participants were asked to provide further comments on how the speed restriction affected their feelings of safety when they last worked on the scheme. Table 11 shows themes that represent general patterns observed in participants’ qualitative responses.

**Table 11: Themes from participants’ comments on the effects of the speed restrictions on their feelings of safety when they last worked on the scheme**

<table>
<thead>
<tr>
<th>Positive comments</th>
<th>50mph speed restriction</th>
<th>60mph speed restriction</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>The speed restriction was appropriate in terms of safety (including exiting the road works safely).</td>
<td>The speed restriction was appropriate in terms of safety.</td>
</tr>
<tr>
<td></td>
<td>The speed restriction ensured traffic flowed well.</td>
<td>The speed restriction ensured traffic flowed well.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Negative comments</th>
<th>50mph speed restriction</th>
<th>60mph speed restriction</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>The speed restriction reduced feelings of safety.</td>
<td>The speed restriction reduced feelings of safety.</td>
</tr>
<tr>
<td></td>
<td>The speed restriction was too high (particularly for poor weather conditions and at points where works vehicles enter and exit the road works).</td>
<td>The speed restriction was too high (particularly at peak times).</td>
</tr>
<tr>
<td></td>
<td>It was difficult for works vehicles to reach 50mph before exiting the road works.</td>
<td>Drivers exceeded the speed restriction.</td>
</tr>
<tr>
<td></td>
<td>The speed restriction made it difficult to overtake other vehicles.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>The speed restriction meant outcomes of collisions could be severe.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Drivers (particularly HGV drivers) exceeded the speed restriction.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>The speed restriction discouraged drivers from braking far enough in advance.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>The speed restriction considerably increased journey times.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Suggestions to improve safety</th>
<th>50mph speed restriction</th>
<th>60mph speed restriction</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Stricter enforcement of the speed restriction.</td>
<td>Increase the speed restriction to 70mph.</td>
</tr>
<tr>
<td></td>
<td>Reduce the speed restriction to 40mph (especially at night and if workers are working in the central reservation).</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Do not increase the speed restriction (especially when the workforce is present).</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Increase the speed restriction to 60mph or 70mph (especially when the workforce is absent).</td>
<td></td>
</tr>
<tr>
<td></td>
<td>If the speed restriction is increased, increase the distance between live traffic and the workforce.</td>
<td></td>
</tr>
</tbody>
</table>
Increase the length of the exit from the works to make it easier for works vehicles to exit.
Improve signage at points where works vehicles exit the road works.
Implement digital signs to display real-time speed restrictions.

As well as comments about the effects of the speed restriction on feelings of safety, participants who reported on the 50mph speed restriction also provided more general comments about their feelings of safety. These participants mentioned that they thought the barriers may not have been designed to withstand collisions with live traffic (especially collisions involving HGVs) and that works vehicles carried debris from the works site onto the carriageway.

3.7 Customer satisfaction

In total, 38 participants were identified from the customer satisfaction survey as eligible for inclusion in the investigation. Of those, 34 reported their last journey as being through the scheme during the baseline period when only a 50mph speed restriction was in place. The remaining four participants reported that their last journey was through the scheme during the trial period when either a 50mph or 60mph speed restriction was in place. Table 12 shows a breakdown of these responses by day of the week and location.

<table>
<thead>
<tr>
<th></th>
<th>Baseline period</th>
<th>Trial period</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Weekdays</td>
<td>Weekends</td>
</tr>
<tr>
<td>Control location only</td>
<td>3 responses</td>
<td>5 responses</td>
</tr>
<tr>
<td>Experimental location only</td>
<td>3 responses</td>
<td>3 responses</td>
</tr>
<tr>
<td>A combination of both locations</td>
<td>8 responses</td>
<td>12 responses</td>
</tr>
</tbody>
</table>

The difference in the number of responses between the baseline and trial period could be due to several reasons, including:

- The baseline period lasting longer than the trial period
- Fewer drivers travelling during the trial period due to UK COVID-19 pandemic restrictions (particularly in March and April 2020)

To answer the research question, all responses from individuals who last drove through the scheme during the baseline period were compared with all responses from individuals who last drove through the scheme during the trial period. A summary of their responses is presented in the following sections. Other survey responses were excluded for the following reasons:

- Participants reported that they did not regularly drive through the scheme
Participants reported that their most recent journey through the scheme was neither during the baseline period nor the trial period.

Participants reported that they did not drive through either the control or experimental location within the scheme. For some, it was not possible to determine whether they had driven through either location (based on their responses to the survey questions that ask where they joined and exited the motorway).

There were lane closures at the time participants reported they last drove through the scheme.

Participants reported that they did not clearly remember the journey.

Due to the limited number of responses, it was not possible to conduct any statistical analyses and caution should be taken when interpreting the results presented in the following sections.

3.7.1 Feelings of safety

Participants were asked to rate how they thought the speed restriction affected their safety. Responses are shown in Figure 35.

![Figure 35: Responses to question: “How do you think the speed restriction affected your safety? Did it make you feel...?”](image)

Across the investigation:

- During the baseline period, 23 out of 34 individuals reported the speed restriction did not affect how safe they felt. During the trial period, 3 out of 4 individuals reported the speed restriction did not affect how safe they felt.

- During the baseline period, 4 out of 34 individuals reported the speed restriction made them feel either slightly or very unsafe. During the trial period, 1 out of 4 individuals reported the speed restriction made them feel very unsafe.
During the baseline period, 7 out of 34 individuals reported the speed restriction made them feel either slightly or very safe. During the trial period, no individuals reported the speed restriction made them feel either slightly or very safe.

Participants were also asked to rate how appropriate they thought the speed restriction was, in terms of safety. Responses are shown in Figure 36.

![Figure 36: Responses to question “In terms of safety, do you think the speed restriction was...?”](image)

Across the investigation:

- During the baseline period, 20 out of 34 individuals reported the speed restriction was about right in terms of safety. During the trial period, 1 out of 4 individuals reported the speed restriction was about right in terms of safety.
- During the baseline period, 13 out of 34 individuals reported the speed restriction was too slow in terms of safety. During the trial period, 3 out of 4 individuals reported the speed restriction was too slow in terms of safety.
- During the baseline period, 1 out of 34 individuals reported the speed restriction was too high in terms of safety. During the trial period, no individuals reported the speed restriction was too high in terms of safety.

As well as the effect of the speed restriction on perceived safety, participants were asked to rate how the width of the running lanes within the scheme’s road works affected their feelings of safety. Responses are shown in Figure 37.
Across the investigation:

- During the baseline period, 16 out of 34 individuals reported the lane widths did not affect how safe they felt. During the trial period, 3 out of 4 individuals reported the lane widths did not affect how safe they felt.

- During the baseline period, 13 out of 34 individuals reported the lane widths made them feel either slightly or very unsafe. During the trial period, no individuals reported the lane widths made them feel either slightly or very unsafe.

- During the baseline period, 5 out of 34 individuals reported the lane widths made them feel either slightly or very safe. During the trial period, 1 out of 4 individuals reported the lane widths made them feel very safe.

Participants were also asked to rate how appropriate they thought the lane widths were in terms of safety. Responses are shown in Figure 38.
Across the investigation:

- During the baseline period, 16 out of 34 individuals reported the lane widths were about right in terms of safety. During the trial period, 3 out of 4 individuals reported the lane widths were about right in terms of safety.

- During the baseline period, 18 out of 34 individuals reported the lane widths were too narrow in terms of safety. During the trial period, 1 out of 4 individuals reported the lane widths were too narrow in terms of safety.

- During both the baseline and trial period, no individuals reported the lane widths were too wide in terms of safety.

In an open question, participants were asked to provide any further comments on their feelings of safety when they last drove through any part of the scheme (between junctions 3 and 12 of the M4). Table 13 shows themes that represent general patterns observed in participants’ qualitative responses.

**Table 13: Themes from participants’ comments in relation to their feelings of safety**

<table>
<thead>
<tr>
<th>Speed restrictions</th>
<th>Baseline period</th>
<th>Trial period</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive comments</td>
<td>The speed restriction was appropriate for the road works.</td>
<td>Other drivers drove well below the speed restriction.</td>
</tr>
<tr>
<td>Negative comments</td>
<td>The speed restriction was too slow. The speed restriction was unnecessary. The speed restriction covered too many miles of the motorway.</td>
<td></td>
</tr>
<tr>
<td>Width of lanes</td>
<td>Baseline period</td>
<td>Trial period</td>
</tr>
<tr>
<td>---------------</td>
<td>----------------</td>
<td>-------------</td>
</tr>
<tr>
<td>Negative comments</td>
<td>HGV drivers exceeded the speed restriction. Other drivers drove well below the speed restriction.</td>
<td>Increase the speed restriction to 70mph.</td>
</tr>
<tr>
<td>Suggestions to improve safety</td>
<td>Increase the speed restriction to 70mph.</td>
<td>Increase the speed restriction.</td>
</tr>
<tr>
<td>Negative comments</td>
<td>The lanes were too narrow. HGV drivers had poor lane discipline.</td>
<td>Implement two wider lanes rather than three narrowed lanes.</td>
</tr>
<tr>
<td>Suggestions to improve safety</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Other topics</th>
<th>Baseline period</th>
<th>Trial period</th>
</tr>
</thead>
<tbody>
<tr>
<td>Negative comments</td>
<td>The lack of hard shoulder reduced feelings of safety. The road surface was poor. Other drivers did not drive safely (e.g. they did not drive according to the weather conditions or ignored signs).</td>
<td>The road surface was poor. Other drivers hogged the middle lane.</td>
</tr>
<tr>
<td>Suggestions to improve safety</td>
<td>Road works should be completed in a series of smaller sections, rather than one long section. Educate drivers on how to use motorways correctly.</td>
<td></td>
</tr>
</tbody>
</table>

### 3.7.2 Journey satisfaction

Participants were asked to rate how they thought the speed restriction affected their journey satisfaction. Responses are shown in Figure 39.
Figure 39: Responses to question: “How satisfied or dissatisfied were you with the speed restriction?”

Across the investigation:

- During the baseline period, 20 out of 34 individuals reported the speed restriction did not affect their journey satisfaction. During the trial period, 1 out of 4 individuals reported the speed restriction did not affect their journey satisfaction.

- During the baseline period, 9 out of 34 individuals reported the speed restriction made them feel either somewhat or very dissatisfied. During the trial period, 3 out of 4 individuals reported the speed restriction made them feel either somewhat or very dissatisfied.

- During the baseline period, 5 out of 34 individuals reported the speed restriction made them feel either somewhat or very satisfied. During the trial period, no individuals reported the speed restriction made them feel either somewhat or very satisfied.

Participants were also asked to rate how appropriate they thought the speed restriction was, in terms of their own journey satisfaction. Responses are shown in Figure 40.
Figure 40: Responses to question: “In terms of journey satisfaction, do you think the speed restriction was...?”

Across the investigation:

- During the baseline period, 22 out of 34 individuals reported the speed restriction was about right in terms of journey satisfaction. During the trial period, 1 out of 4 individuals reported the speed restriction was about right in terms of journey satisfaction.

- During the baseline period, 11 out of 34 individuals reported the speed restriction was too slow in terms of journey satisfaction. During the trial period, 3 out of 4 individuals reported the speed restriction was too slow in terms of journey satisfaction.

- During the baseline period, 1 out of 34 individuals reported the speed restriction was too high in terms of journey satisfaction. During the trial period, no individuals reported the speed restriction was too high in terms of journey satisfaction.

Participants were asked to rate how they thought the lane widths affected their journey satisfaction. Responses are shown in Figure 41.
Figure 41: Responses to question: “How satisfied or dissatisfied were you with the lane widths?”

Across the investigation:

▪ During the baseline period, 16 out of 34 individuals reported the lane widths did not affect their journey satisfaction. During the trial period, 2 out of 4 individuals reported the lane widths did not affect their journey satisfaction.

▪ During the baseline period, 15 out of 34 individuals reported the lane widths made them feel somewhat dissatisfied. During the trial period, 1 out of 4 individuals reported the lane widths made them feel somewhat dissatisfied.

▪ During the baseline period, 3 out of 34 individuals reported the lane widths made them feel either somewhat or very satisfied. During the trial period, 1 out of 4 individuals reported the lane widths made them feel somewhat satisfied.

Participants were also asked to rate how appropriate they thought the lane widths were, in terms of their own journey satisfaction. Responses are shown in Figure 42.
Across the investigation:

- During the baseline period, 17 out of 34 individuals reported the lane widths were about right in terms of journey satisfaction. During the trial period, 3 out of 4 individuals reported the lane widths were about right in terms of journey satisfaction.

- During the baseline period, 17 out of 34 individuals reported the lane widths were too narrow in terms of journey satisfaction. During the trial period, 1 out of 4 individuals reported the lane widths were too narrow in terms of journey satisfaction.

- During both the baseline and trial periods, no individuals reported the lane widths were too wide in terms of journey satisfaction.

Finally, in an open question, participants were asked to comment on their journey satisfaction when they last drove through any part of the scheme (between junctions 3 and 12 of the M4). Table 14 shows themes that represent general patterns observed in participants’ qualitative responses. There were no comments in relation to the width of the lanes.

**Table 14: Themes from participants’ comments in relation to their journey satisfaction**

<table>
<thead>
<tr>
<th>Speed restrictions</th>
<th>Baseline period</th>
<th>Trial period</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive comments</td>
<td>The speed restriction was appropriate for the road works.</td>
<td></td>
</tr>
<tr>
<td>Negative comments</td>
<td>The speed restriction was too slow. The speed restriction was unnecessary. The speed restriction covered too many miles of the motorway.</td>
<td>The speed restriction was unnecessary, as there were no road workers present.</td>
</tr>
</tbody>
</table>
The speed restriction extended journey times, which requires additional planning in advance of the journey. HGV drivers exceeded the speed restriction.

Suggestions to improve journey satisfaction

<table>
<thead>
<tr>
<th>Baseline period</th>
<th>Trial period</th>
</tr>
</thead>
<tbody>
<tr>
<td>The speed restriction extended journey times, which requires additional planning in advance of the journey. HGV drivers exceeded the speed restriction.</td>
<td></td>
</tr>
</tbody>
</table>

Suggestions to improve journey satisfaction

<table>
<thead>
<tr>
<th>Positive comments</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>The motorway was open.</td>
<td></td>
</tr>
<tr>
<td>Traffic flowed well.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Negative comments</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>The lack of hard shoulder reduced levels of journey satisfaction. Other drivers did not drive well.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Suggestions to improve journey satisfaction</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Educate drivers on how to use motorways correctly.</td>
<td></td>
</tr>
<tr>
<td>Road works should be completed in a series of smaller sections, rather than one long section.</td>
<td></td>
</tr>
</tbody>
</table>

### 3.8 Scheme delivery and cost

#### 3.8.1 Delivery

During the lessons learned meeting, there was no mention of any impacts on the delivery of the work activities or scheme programme.

#### 3.8.2 Cost

To safely implement the 60mph speed restriction, several additional key mitigations and activities were required. These included:

- Acquiring different setbacks, upgrading crash cushions and upgrading IPVs
- Setting up SVD and acquiring p-VMS to alert drivers to potential obstructions
- Hiring additional staff, such as traffic management staff
4 Conclusions

These conclusions are based on the findings from a single investigation undertaken at a specific scheme. Both the design and implementation of the scheme’s traffic management and trial mitigations impact greatly on the behaviours identified. As such, caution should be taken when using these conclusions to inform decisions about implementing future 60mph speed restrictions on schemes with different designs.

The conclusions from this report will be brought together with those from other participating schemes to produce a toolkit to support the safe implementation of 60mph speed restrictions through road work. This toolkit has been outlined later in section 6.2.

4.1 Impact of change in speed restriction on driver behaviour

Analysis of driver behaviour during periods of free-flowing traffic showed that, on average, drivers appeared to respond to the increase in speed restriction from 50mph to 60mph by increasing their travelling speed (from about 49mph and 48mph in the baseline period to 53mph and 54mph in the trial period, on average respectively during the monitored weekdays and weekends). The increase in average vehicle speed was consistent across all three carriageway lanes with the offside lanes seeing the highest speeds. This increase in average vehicle speed resulted in an estimated average journey time reduction of around 27 and 41 seconds per driver on weekdays and weekends, respectively.

Whilst average speeds increased, overall compliance with the posted speed restriction was higher in periods with the 60mph speed restriction than the 50mph speed restriction. A higher proportion of the drivers were travelling above 50mph in the baseline period (22% weekday, 17% weekend), than the proportion who chose to travel above 60mph in the trial period (7% weekday, 9% weekend).

A similar trend was observed in the behaviours of HGV drivers; overall compliance with the posted speed restriction was higher in the periods with a 60mph speed restriction than the 50mph speed restriction. During the weekday investigation, around 29% of HGV drivers travelled above 50mph in the baseline period and the weekend investigation saw around 18% of HGVs travel above 50mph. A lower proportion (weekday 6%, weekend 5%) travelled above 60mph during the trial period.

The scheme in general experienced a reduction in the levels of close following between vehicles across the investigation. There was a minor change due to the change in speed restriction; around a 2% reduction during the weekday investigation but a more substantial reduction (16%) during the weekend investigation. The proportion of HGVs engaged in close following also dropped variably across the monitoring periods during the two investigations. The weekday investigation saw a drop from 10% in the baseline period to 6% in the trial period. The weekend investigation saw a more substantial drop from 29% to 8% between monitoring periods. This change was likely related to the difference in average vehicle speeds and compliance after the change of speed restriction.

The numbers of reported incidents decreased from 39 incidents during the baseline period to no incidents being reported during the trial period on both the weekday and weekend investigations. This is likely due to a limited sample of data collected during the trial period.
(17 weekday hours and 82 weekend hours) in comparison to the baseline period (203 weekday hours and 471 weekend hours). As no statistical tests were carried out, these differences cannot be confidently attributed to the change in the speed restriction. Further longer term investigations will be required to understand if the change in speed restriction impacts on the number of reported incidents.

4.2 Impact of change in speed restriction on workforce and customer satisfaction

Overall, responses to both the workforce survey and customer satisfaction survey were mixed. Most customers felt both speed restrictions were about right in terms of safety. Most workforce survey participants who reported on the 50mph speed restriction reported the speed restriction made them feel safe, whereas most participants who reported on the 60mph speed restriction reported the speed restriction made them feel unsafe. Statistical tests indicated that a significantly higher proportion of participants who reported on the 50mph speed restriction said the speed restriction made them feel safe compared with participants who reported on the 60mph speed restriction. However, most participants felt both speed restrictions were about right in terms of safety when asked how appropriate he speed restrictions were in terms of safety, suggesting that the change in speed restriction may not have been the only factor that affected the workforce’s feelings of safety. Due to the limited number of responses received on the 60mph speed restriction, caution should be taken when interpreting these results.

A very small number of responses were received on the customer satisfaction survey, including only four responses in the trial period. Due to the limited number of responses, it was not possible to conduct any statistical analyses and therefore no robust conclusions can be drawn with confidence.

4.3 Impact of change in speed restriction on scheme cost and delivery

There was no feedback from the scheme to suggest that the introduction and application of a 60mph speed restriction impacted the schedule and delivery of the works.

Several costs were also incurred to implement additional risk mitigations, such as acquiring different setbacks, upgrading crash cushions, upgrading IPVs, setting up SVD, acquiring p-VMS, and hiring additional staff.

This information will be used to inform future use of 60mph speed restrictions within road works and will be presented alongside future guidance material.
5 Other Investigations

On previous investigations into the use of 60mph speed restrictions, Highways England’s insight team investigated the impact of the change in speed restriction on customer satisfaction by undertaking customer audits of the scheme. For these customer audits, ‘Auditors’ (members of the public) who lived in the vicinity of the scheme were recruited. These Auditors were given a full written brief detailing where they needed to go, what they needed to look out for and a preview of the survey questionnaire. Auditors would normally be instructed to drive through the scheme and undertake a survey within 24 hours of the drive. The survey would seek to identify the impact of the speed restriction change on both customer safety and customer satisfaction.

Similarly, on previous investigations, Highways England’s insight team also monitored social media postings using a ‘TalkWalker’; a specialist social listening tool to further investigate the impact of the change in speed restriction on customer satisfaction.

As a result of the COVID-19 pandemic restrictions, neither of these additional investigations were undertaken on the M4 J3-12 scheme.
6  Next steps

6.1  Continued use of 60mph at the M4 junction 3-12 scheme

Upon completion of the trial of 60mph between junctions 11 and 12, a review and validation exercise was undertaken by the scheme to determine if the 60mph speed restriction could be further implemented.

In line with the agreed monitoring process detailed in the scheme-specific risk assessment, available data were reviewed to determine if the safety objectives had been met during the trial. Based on this review the schemes PSCRG reviewed and accepted the recommendation to continue dynamically using the 60mph speed restriction between junctions 11 and 12 on the westbound carriageway, in addition to extending its use at the same location on the eastbound carriageway for duration of narrow lane verge works.

6.2  Implementation of 60mph at other schemes

This is the eighth and final investigation of a 60mph speed restriction within road works as part of this project. Several additional lessons learned were captured as part of this investigation; these have been outlined in Appendix B and should be considered when implementing a 60mph speed restriction on other schemes in the future.

The results from this and previous investigations will be collated together (in a toolkit) and will enable robust recommendations to be made based on a large and substantial evidence base, with findings being used to inform guidance material into the use of appropriate speed restrictions within road works.
Acknowledgements

The following individuals (or organisations) contributed directly to the investigation of a 60mph speed restriction within the M4 junction 3-12 road works:

- Chris Sedman, Mark Neville and Glenn Boyd – Balfour Beatty Vinci
- Steve Foxley, Lynne Stinson, Nick Simmonds-Screech – Highways England
- Mark Fell, Ryan Bridger and Simon Wickenden – WSP
- Paul Spreadbury – Virtus
- Nick Barnett – Highway Resource
- David Pilsworth – Arcadis Jacobs

References


Appendix A  PSCRG members

Principal members:

- A senior Highways England Project Manager and/or Senior Responsible Owner
- Lead consultancy support, with relevant risk assessment knowledge, competence, design understanding and experience with Highways England safety governance procedures
- Network Delivery and Development Senior User
- Customer Operations Senior User
- Competent Designer Safety / Operations Expert
- Project Construction, Design and Management Coordinator
- Contractor representative (when appointed)
- Professional and Technical Solutions Safety Risk and Governance representative

Specialist members:

- Additional technical support (Professional and Technical Solutions specialists or external subject matter experts, as required)
- The Design Team Project Manager
- Asset Support Contract representative
- Maintenance representative, including technology
- Stakeholder representative (for instance, other RCC/Traffic Officer Service representatives)
Appendix B  Lessons learned

To understand the impact of the change in speed restriction on the scheme’s delivery and costs, a lessons-learned online meeting was held after the trial had ended. This session sought to capture details on any impacts to the scheme associated with implementing the change in speed restriction. Attendees included the scheme’s Highways England Project Manager, Principal Contractor, Traffic Management Supplier and Risk Contractor. This appendix reports the key points identified during the meeting and may not be reflective of the views from all industry stakeholders. The following questions were posed to attendees.

**Question: How do you feel the trial went on a general level; what worked well, what didn’t and why?**

Summary of key points made:

- Generally, everyone felt the trial went well.
- The Temporary Traffic Regulation Order (TTRO) accommodated the change in speed restriction, so a second TTRO application was not required.
- Originally, permanent implementation of the 60mph speed restriction was considered, but was only suitable for road works on the verge and not for road works on the central reservation. Therefore, dynamic implementation of the 60mph speed restriction was chosen for this scheme. It was beneficial to have several options to choose from to ensure the best conditions were selected for the scheme. However, construction was already in progress before the investigation was planned, which limited the available options.
- There were some frustrations that the whole trial process took a long time, but the outcomes of the trial were positive and safety was thoroughly considered. Additionally, comparisons with other schemes were made and options for the scheme’s layout were thoroughly considered.
- As it was decided not to implement the 60mph speed restrictions in areas where the workforce was working, the workforce consultation for this scheme was relatively straightforward. Ultimately, this saved time and effort.
- Generally, the stakeholder consultation process worked well. Attendance at the safety control review groups was high, which meant a variety of views could be considered. In future, schemes should adopt a similar stakeholder consultation process.
- Communication between various parties and multi-industry collaboration also worked well, which made it possible to foresee some potential issues and deal with them in an efficient and timely manner. Industries were able to share what worked well and brainstorm solutions to any challenges that occurred; for example, several police forces worked together to mitigate against potential compliance issues. Members of the scheme’s team remained fairly consistent during the trial, which helped to ensure invested knowledge was not lost and helped the trial to run smoothly.

**Question: During early discussions, did you have concerns relating to changing the speed restriction for this scheme? Were any of these concerns realised and, if so, how?**

Summary of key points made:
There were concerns that productivity of the workforce would have been negatively impacted by implementing a contraflow layout, so this layout was not selected for this scheme.

There were concerns about reducing the working space to accommodate wider running lanes for use with the 60mph speed restriction, but this did not cause any issues.

The workforce was concerned about risks from live traffic, but the traffic management workforce usually operates on the extremities of the works area with a 70mph speed restriction in place, so members of this workforce did not have many concerns. However, these concerns were not realised.

There were initial concerns about risks to the workforce posed by incursions from live traffic due to implementing frequent works access and exit points. These concerns were worsened by the fact that there had been previous incursions, which each took a long time to resolve and had caused a collision, therefore impacting productivity and safety. Positioning the access and exit points in a different way was not an option, as this would have delayed the programme by several months and could have negatively impacted customer satisfaction. However, the concerns around incursions impacting workforce safety were not realised because the 60mph speed restriction was only implemented at times when the workforce were absent.

There was only one recovery event for which the speed restriction was reduced to 50mph, so there was no negative feedback regarding recoveries. In future, there should be an option to reduce the speed restriction to 40mph or 50mph in the event of an incident or breakdown.

Question: What could have helped you overcome those concerns? What would you have liked to have done?

Summary of key points made:

If planning had started further in advance for the implementation of a 60mph speed restriction in the schemes program, a contraflow layout with a permanent 60mph speed restriction could have been selected. This layout would have been easier to implement and could have helped to prevent incursions. However, changing the layout could have been time-consuming and costly.

Question: Was any additional traffic management equipment required to make the scheme suitable for a 60mph speed restriction? If so, what?

Summary of key points made:

The implementation of the 60mph speed restriction originally required different setbacks and departures. However, departures were not required because crash cushions were upgraded, the original setbacks were already suitable and IPVs (used in the event of a breakdown) were upgraded to support the trial of the 60mph speed restriction.

P-VMS were also required to warn drivers of obstructions in running lanes. Feeds from existing CCTV cameras were used for SVD: events such as ‘stationary vehicle’ were
detected, which triggered the P-VMS to show messages alerting drivers to potential obstructions. Stormy weather conditions slightly altered the position of the CCTV cameras which led to detection difficulties, but this issue was easily rectified.

- Equipment required for trialling a 60mph speed restriction through road works is becoming more widely used, readily available and cheaper. It is important that equipment conforms to traffic regulations to mitigate against issues with compliance and enforcement.

**Question:** Were any additional maintenance activities undertaken during the trial of the 60mph speed restriction? If so, what were they?

No additional maintenance activities were undertaken.

**Question:** Were any modifications to risk assessments and method statements required?

Summary of key points made:

- The safety review group forum was consulted, which was essential for this scheme based on evidence and restrictions.

- The risk assessment was continually updated as the scheme evolved, and method statements were updated to accommodate the change in speed restriction.

**Question:** Were additional staff required to implement the use of a 60mph speed restriction? If so, what was the impact of this on budget compared to if the scheme has not been running at 60mph?

Additional work and staff were required, such as traffic management staff.

**Question:** In summary, what were your feelings on the impact of using a speed restriction of 60mph, rather than 50mph, within the scheme on: the safety of both road users and road workers, the satisfaction of customers, the cost of the scheme’s road works and the delivery schedule of the scheme?

Summary of key points made:

- As the volume of live traffic reduced during the trial period due to the UK COVID-19 pandemic restrictions, effects of the trial may not have been as prominent as they could have been. However, it is expected that potential benefits of a 60mph speed restriction will be realised in future.

All those who were unable to attend were offered the opportunity to provide comments via email.
Monitoring and evaluation of the 60mph trials

The purpose of this trial was to understand the impact of changing the speed restriction within the M4 J3-12 scheme from 50mph to 60mph on driver behaviour, workforce and customer satisfaction, and the scheme’s cost and delivery. The findings from this investigation will be used, along with other investigations, to inform the development of guidance material for future road works design.

The investigation involved monitoring of data from ‘control’ and ‘experimental’ locations positioned within the road works scheme. Several different data sources were used for both locations across a ‘baseline period’ (when both locations were subject to a 50mph speed restriction) and a ‘trial period’ (when the control location was subject to a 50mph speed restriction and the experimental location was subject to a 60mph speed restriction). These data sources included roadside radar data, scheme incident logs, and online surveys from both customers and the scheme workforce. Feedback from the workforce was also gathered during workshops with scheme representatives.

The change in speed restriction resulted in increased average speeds, reduced average journey times, and reductions in the proportion of drivers travelling over the speed restriction.

In terms of workforce and customer satisfaction, the findings from this study suggest that the change in speed restriction may not have been the only factor that affected the workforce’s feelings of safety. Due to a limited number of survey responses, it was not possible to draw firm conclusions regarding the impact of the speed restriction change on customer satisfaction.

Further findings are detailed within the report.