

## **PROJECT REPORT MIS9**

# Monitoring and evaluation of the 60mph trials

Report for the on-road trials of 60mph on the M5 Willand

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## Executive Summary

The application of temporary mandatory speed restrictions are considered for road works on high-speed roads in order to limit the risks posed to road users from specific traffic management features. Current guidance recommends a speed reduction of 20mph for many traffic management features, resulting in a 50mph speed restriction. 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 M5 Junction 27 Willand scheme. A 60mph speed restriction was implemented across a single carriageway within the road works. The impact of this change on driver behaviour, customer satisfaction and scheme costs and delivery was monitored over a 10 week period.

Analysis of the data collected during this monitoring period suggested that the change from a 50mph to a 60mph speed restriction had the following impacts:

- Road users responded to the change in speed restriction by increasing their speed; one-minute averaged speeds at the trial location increased from about 52mph before the speed limit change, to 59mph after the speed limit change. This resulted in an estimated journey time reduction of approximately 11 seconds per road user.
- This increase in average speed had a positive effect on the levels of speed compliance shown by road users, compliance observed with the 60mph restriction was higher than with the 50mph speed restriction.
- The distribution of vehicles across the two running lanes was not greatly affected by the change in speed restriction; whilst overall numbers were small, the proportion of HGVs travelling in the offside lane remained similar in 50mph and 60mph conditions.
- A sample of the scheme's workforce (8 individuals who responded to surveys) indicated that the change in speed restriction and resulting changes in driver behaviour was considered to have no impact on their feelings of safety.
- Drivers' feelings of safety and satisfaction with the posted speed restriction remained unchanged. Overall drivers indicated the speed restriction had no effect on their feelings of safety and satisfaction. In both cases, in terms of safety and satisfaction, drivers specified the speed restriction was 'about right'.

Technical issues with traffic monitoring radar resulted in a loss of individual vehicle data. This limitation meant that the impact of the change in speed restriction on driver behaviour (in particular, close following) could not be robustly assessed.

At the time of writing, further investigations into the use of 60mph speed restrictions are underway. Findings from these additional investigations will be collated with the current findings in a Final Project Report.

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In addition, other investigations, summarised later in this report, were undertaken by Highways England at the scheme, they indicated:

- Customer audits: all Auditors stated they felt safe when travelling through both speed restrictions, and that both restrictions felt appropriate for the conditions.
- A review of social media ‘conversations’: insufficient evidence to assess whether there was a change in customer satisfaction as a result of the change in speed restriction.

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# 1 Introduction

## 1.1 Background

The safe implementation of appropriate speed restrictions, minimising disruptions to road users, forms an important part of Highways England's future state. Following on from previous investigations into varying speed restrictions within road works, and consultation with stakeholders from across Highways England and the Supply Chain, this project was established to support the safe implementation and monitoring of 60mph speed restrictions within particular road works scenarios.

## 1.2 Contents of this report

This report summarises the findings from the on-road trial of a 60mph speed restriction on the M5 Junction 27 Willand scheme during early 2019.

This trial investigated the use of a 60mph speed restriction on the southbound carriageway of the M5, across the entire length of the scheme's traffic management. 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 limit 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 M5 Junction 27 Willand 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

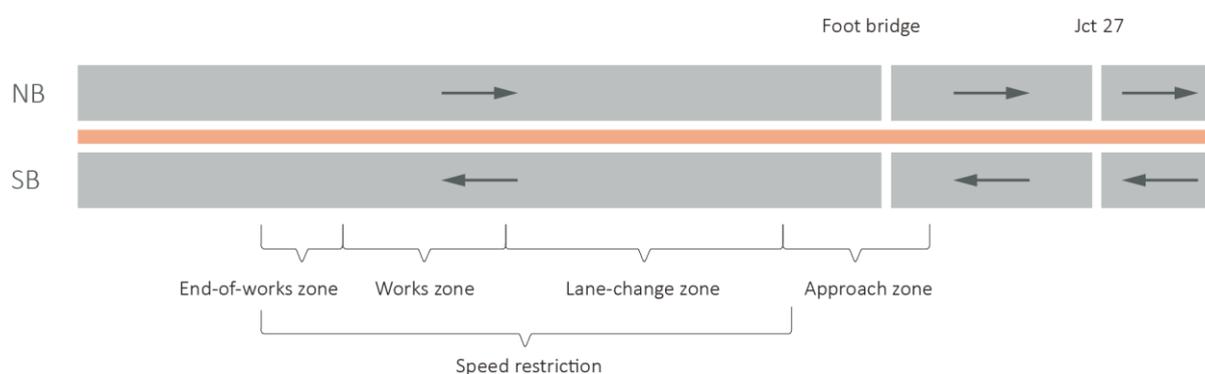
### 2.1 Overview of the scheme

Work on the scheme began in January 2019, running until March 2019. The purpose of the works was to remove and replace existing fencing with a 3m high soundproof fence.

Due to the traffic management design of the scheme, a single phase of traffic management situated off the nearside of the carriageway, an opportunity to change the speed restriction from 50mph to 60mph was investigated. The speed restriction on the southbound carriageway was changed to 60mph as part of this study.

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

#### M5



**Figure 1: Overview of M5 Junction 27 Willand scheme**

### 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 21<sup>st</sup> January 2019 and 27<sup>th</sup> March 2019, with speed restrictions in place as shown in Table 1. The scheme’s traffic management was only present on the southbound carriageway. As such, a control location was selected upstream, outside of the road works near Junction 27, on the southbound carriageway. This approach does however have important limitations. Driver behaviour will differ between both the control and experimental locations. This is due to the fact that drivers in the latter were subject to road works restrictions and drivers in the former were not.

**Table 1: Timelines for monitoring**

Dates	Description of activity	Control location	Experimental location
21 <sup>st</sup> Jan 2019 18 <sup>th</sup> Feb 2018	Baseline monitoring period		
18 <sup>th</sup> Feb 2019 27 <sup>th</sup> Mar 2019	Trial monitoring period		

Throughout the baseline and experimental monitoring periods the traffic management in the experimental location remained the same. The number of lanes open to traffic and the width of those lanes remained constant. The traffic management was comprised of two full width

running lanes, 3.65m each. Delineation between the work zone and the carriageway was provided by a mixture of cones and temporary vehicle restraint systems. The set-back between the restraint system and the nearside traffic lanes was 600mm.

The lane change zone included the use of an offside lane closure (moving traffic into the two remaining nearside lanes) and a switch (moving the two lanes of traffic into the two offside lanes). Due to the short length of the scheme, access and egress to the work zone was limited to a single access point and a single egress point. The former was positioned at the start of the work zone, after the lane change zone. The latter was provided by a single end-of-works merge.

## 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 the associated GG 104 standard (formerly GD04/12). The programme-level risk assessment was used to feed into the scheme-specific risk assessments carried out by participating schemes (Fordham and Glaze, 2019).

Prior to implementing the change in speed restriction, WSP 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 (WSP, 2018). The assessment also detailed the required mitigation measures needed to address the potential increase in risks posed from the anticipated increase in vehicle speed, these have been summarised later in this report (Section 2.3.1).

Safety objectives were set; they outlined that the risk posed for all populations within road works must be reduced as low as reasonably practicable. The assessment concluded that this requirement would be met so long as there is at least a perception of speed enforcement on the scheme; see section 2.3.1.2.

In accordance with the safety governance requirements outlined within GG 104, a project safety control review group (PSCRG) was established to review the scheme-specific assessment. 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.

The PSCRG determined that, from a safety perspective, the trial application of a 60mph speed restriction through the scheme's road works could proceed.

### 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 *Portable variable message signs*

Portable variable message signs (VMS) were deployed by the scheme upstream of the works to provide warning of stranded vehicles in live lanes. Responsibility for activation of these signs was given to the scheme's Traffic Safety and Control Officers (TSCOs). The scheme's TSCOs had the ability to remotely activate the signs for the purpose of incident management.

It was anticipated that by providing advanced warning of incidents to approaching drivers a reduction in risks posed to road users from collisions between a stopped and moving vehicle would be seen.

### 2.3.1.2 *Speed enforcement*

The number of drivers travelling in excess of the 60mph speed restriction needed to be minimised. The scheme-specific risk assessment concluded this would be best achieved by a speed enforcement regime. Fixed speed enforcement systems were not practicable for the scheme. Instead a combination of Police mobile speed enforcement and appropriate speed enforcement area signage was implemented.

Agreement was sought with Devon and Cornwall Police to increase the number of patrols through the scheme during the time of the trial. The presence of speed enforcement area signage (diagram 829.5 shown in Figure 2 below) would enhance the perception of enforcement, as required by the safety risk assessment.



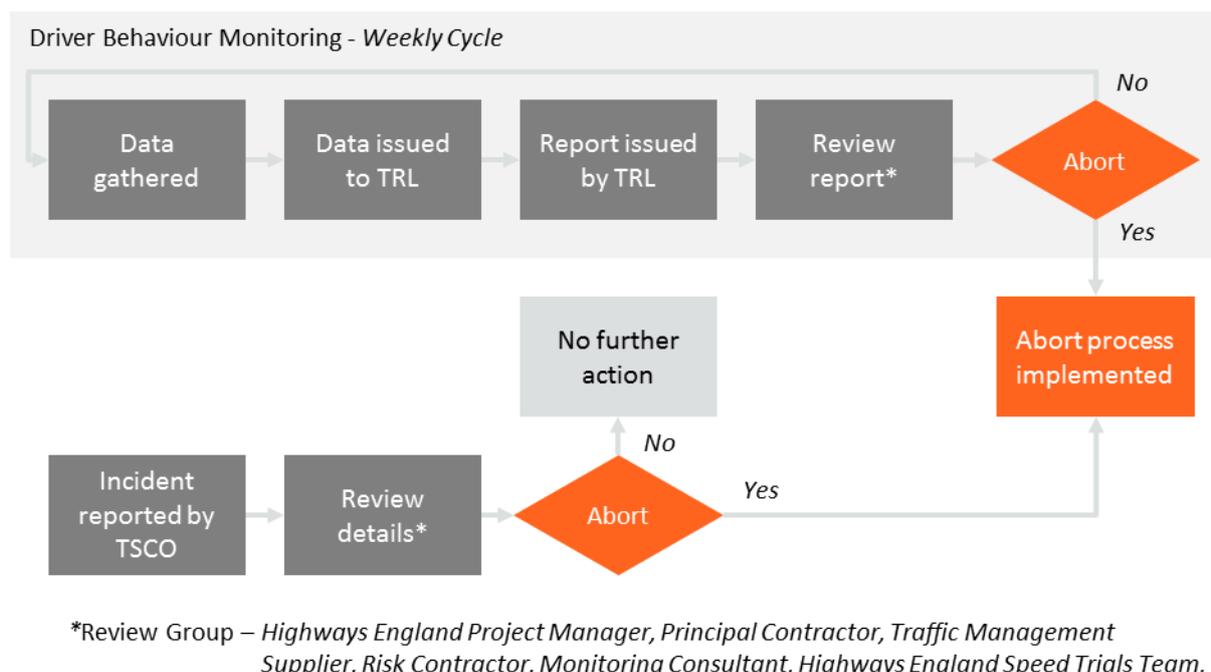
**Figure 2: Diagram 829.5**

## 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<sup>1</sup> periods, the proportion of vehicles over the posted speed limit 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 were outlined in the scheme-specific safety risk assessment; Figure 3 below provides a summary.

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<sup>1</sup> '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.



**Figure 3: Abort process summary**

One-minute averaged data from the radar units (outlined later in Section 2.5.1) were issued weekly to TRL (Thursdays mornings) and the Safety Reports were created and issued by TRL before end of the working day. A scheduled review call was carried out the following day (Fridays) 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 3 above. An emphasis was placed on any feedback from the Traffic Management Supplier and work crews.

During the six-week trial monitoring period, when the speed restriction was 60mph within the road works, the abort process was not implemented at any point.

## 2.5 Data collection and statistical comparisons

To achieve the objectives of this research, a number of different data sources were used:

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

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

### 2.5.1 Radar data

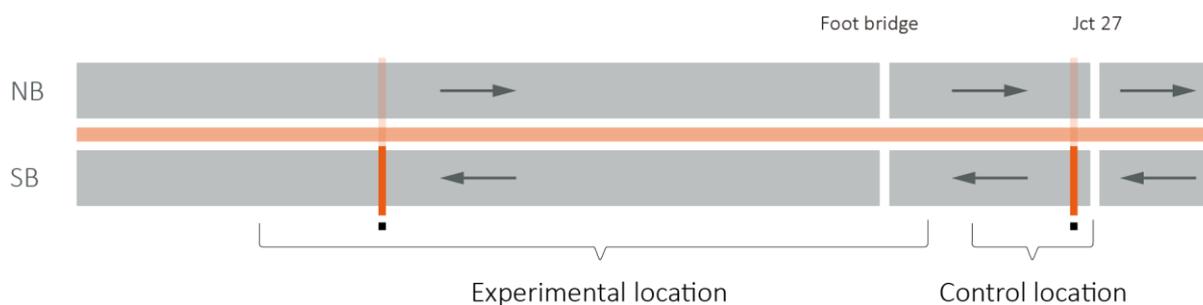
In order to monitor speed, flow, headway and lane choice during the baseline and trial phases, two temporary radar installations were installed at the scheme. Each radar installation was capable of monitoring traffic on a single carriageway, down to the level of individual vehicles.

For this investigation two separate installations were used to monitor the control and experimental locations.

### 2.5.1.1 Location of radar installations

Both radar installations were situated on the nearside of the southbound carriageway. These positions are depicted in Figure 4 below.

## M5



**Figure 4: Location of radar installations**

Placement of the radar installation within the experimental location was limited due to the short nature of the scheme. The experimental radar site was chosen to be at least 2km from the start of the speed restriction. This ensured that drivers' choice of speed and following distances would not be overly influenced by the start of the traffic management, allowing the study of the behaviour of drivers in response to the changes in speed limit.

### 2.5.1.2 Data collected

The radar installations provided data on vehicle flow, average speed and average headway<sup>2</sup> for each carriageway and lane. These metrics were recorded and averaged across one-minute intervals.

Vehicle flow data were split by vehicle class:

- Class 1 ( $\leq 18$ ft)
- Class 2 ( $>18 - 22$ ft)
- Class 3 ( $>22 - 38$ ft)
- Class 4 ( $>38 - 120$ ft)

HGVs were defined as all vehicles in Class 4 plus half of those in Class 3.

In addition to one-minute average speed, the radars provided a count of vehicles in each of the following speed bins:

- 0 - 40mph
- $>40 - <45$ mph
- $\geq 45 - <50$ mph

<sup>2</sup> Average 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.

- $\geq 50$  -  $\leq 56$ mph
- $> 56$  -  $< 60$ mph
- $\geq 60$  -  $< 68$ mph
- $\geq 68$  -  $< 70$ mph
- $\geq 70$  -  $< 79$ mph
- $\geq 79$  - 145mph

These bins were used to identify the number of drivers who were driving over the speed limit and those who were non-compliant with enforcement guidelines (i.e. 10% + 2mph above the speed limit<sup>3</sup>). The enforcement thresholds were therefore 57mph in the 50mph speed limit and 68mph in the 60mph speed limit.

### 2.5.1.3 *Data processing*

In order to understand the potential impact of the speed restriction change on vehicle speeds, driver behaviour was investigated when drivers were free to choose their own speed. This required conditions with free-flowing traffic; congested traffic was defined as periods when the average speed of vehicles was lower than 40mph. This resulted in the removal of less than 1% of the available data.

Many of the statistical tests used require the assumption of independence to hold, meaning the value of one observation does not influence or affect the value of other observations. However, data collected from the radar could not be assumed to be independent, since average flow or speed data collected during one minute are likely to be correlated with that collected in the next minute. As such, to avoid the problem of dependence between measurements, data from each radar unit were randomly sampled by selecting one minute's worth of data from each ten minute period. This process produced a dataset consisting of six randomly sampled one-minute periods within each hour, per radar unit. The duration of the monitoring periods ensured that the sample of data was sufficient for analysis even after this sampling had been undertaken. In total, around 153 hours of data were used from each of the monitoring locations.

### 2.5.1.4 *Issues with data collection*

Due to technical issues with the supplied radar installations, Individual Vehicle Data (IVD) could not be extracted and used in this investigation. Instead, the analysis was dependent on the one-minute averaged data only.

When headway data is averaged across a minute, it removes the ability to identify and explore the individual following distances between vehicles. For this reason, comparisons of headway

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<sup>3</sup> This is based on the National Police Chiefs Council/Association of Chief Police Officers (ACPO) Speed Enforcement Policy Guidelines 2011-2015 (ACPO, 2013) which suggest that a Fixed Penalty or speed awareness education may be appropriate when the speed is 10% +2mph above the speed limit (see paragraph 9.6). These are only guidelines and a police officer/ force can decide to enforce at a speed lower than this limit assuming they have considered the tolerance of the measurement equipment (paragraph 9.7).

across both monitoring periods and locations was not possible in the absence of IVD. The following comparisons could be made.

#### 2.5.1.5 *Comparison of flow*

As changes in vehicle flow can affect the behaviour of road users and impact their speed, it was essential to understand how vehicle flow changed between the baseline and trial periods. 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.
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 Section 3.1.1.

#### 2.5.1.6 *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.
2. Comparison of average speed by lane between the baseline and trial periods at the experimental location.
3. A comparison of compliance with the posted speed limit between the baseline and trial periods by monitoring location.

The results of these comparisons are presented in Section 3.1.2.

#### 2.5.1.7 *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. The following comparison was therefore made. 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 Section 3.1.3.

#### 2.5.1.8 *Statistical comparisons*

Appropriate statistical tests were used to test for significant differences between data recorded during the baseline and trial periods (i.e. to determine if driver behaviour changed

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following the implementation of the increased speed limit). Three types of statistical tests were used, depending on the type of data available:

- **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.
- **Two-proportion z-tests** were used to test for a difference in the distribution of categorical data using proportions, for example, to test the proportion of total flow that was HGVs 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.

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 there was a less than 5% probability of any differences identified between the groups being due to chance.

### **2.5.2**     *Incident data*

Throughout both the baseline and trial phases, 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 (traffic management activities or cone strikes) along with the location of the incident and the date it took place.

Comparisons of the number of incidents between the baseline and trial phase were made and a summary of these data is presented in Section 3.2.

### **2.5.3**     *Workforce survey data*

In order to provide further insight into the potential impact of changing the speed limit at the scheme from 50mph to 60mph, a workforce survey was conducted during the trial monitoring period. The survey focused on capturing insight from project managers, site workers and members of the workforce who operate within the carriageway environment.

A summary of the responses to this survey are presented in Section 3.3.

### **2.5.4**     *Customer satisfaction survey data*

#### **2.5.4.1**     *Online survey*

During the monitoring period, surveys were used to collect information on the impact of increasing the speed limit 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 through the use of a social media advertising campaign, with individuals within a 40km radius of Willand targeted to take part in the study.

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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 customer's feelings of safety affected by both the posted speed restriction and the width of the 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 3.5.

#### **2.5.5**      *Delivery and cost impacts*

In order 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, Traffic Management Supplier and Risk Contractor.

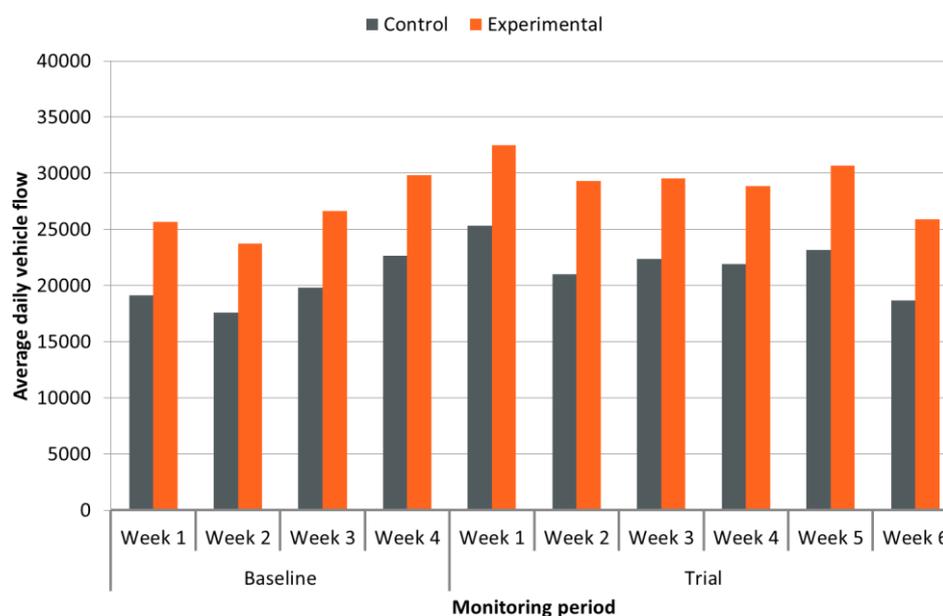
A summary of the findings of this workshop is presented in Section 3.6.

## 3 Results

### 3.1 Driver behaviour

#### 3.1.1 Vehicle flow

Figure 5 shows the average daily vehicle flow for the baseline and trial monitoring periods between the control and experimental monitoring locations.



**Figure 5: Average daily vehicle flow by location and monitoring period**

The average daily vehicle flow between the baseline and trial monitoring periods, at both the control and experimental locations, varied over the course of the study. The control location had an average daily flow of around 20,000 during the baseline period. This then increased during the trial period, varying between 20,000 and 25,000. The experimental location had an overall higher average daily flow than the control location. The experimental location experienced flows of around 25,000 during the baseline period and around 30,000 during the trial period.

The difference in flows at each location can be explained by the placement of the control location radar installation, outlined in Section 2.5.1.1. The control radar installation was placed upstream of the Junction 27 southbound on-slip. This location was chosen as the only suitable location on the nearside of the southbound carriageway upstream of the road works. As a result, vehicles joining the carriageway at Junction 27 will not have been captured by the control location radar.

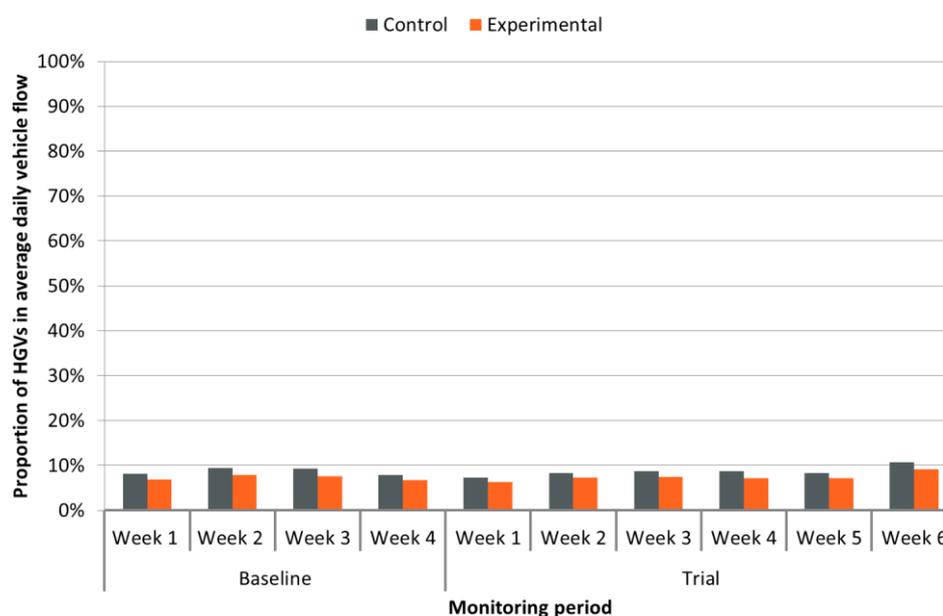
The difference in the average daily vehicle flow at the control location and the experimental location each week varied. The experimental location experienced on average around 37% more traffic than the control location, however week-on-week this ranged from 28% to 63%.

A Chi-square test was conducted to test for statistical significance between the average daily vehicle flow by monitoring period and location. This test (and all others discussed in Section

3.1) used only data from weeks 1 to 4 from both the baseline and trial monitoring periods; data for weeks 5 and 6 was excluded as it was only available during the trial period. Having disproportionate samples between the baseline and trial monitoring periods can unduly bias the results of each test.

The distribution of flow between the control and experimental locations was found to be significantly different between the baseline and trial periods ( $p < 0.01$ ). This suggests that any changes in average speed or compliance with the posted speed restriction between the monitoring locations and periods may have been influenced by differences in vehicle flow.

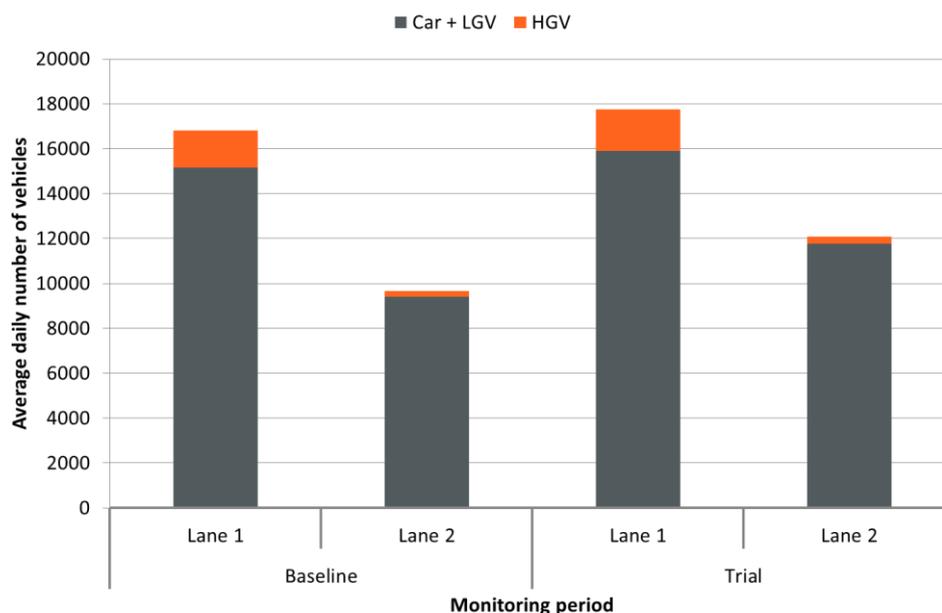
A comparison of the proportion of HGVs by monitoring location and period is presented in Figure 6. The proportion of HGVs remained reasonably consistent across both monitoring periods over the course of the investigation. At the control location, the average proportion of HGVs was 9% during the baseline period and 8% during the trial period. At the experimental location, the proportion of HGVs remained constant at 7% across the baseline period and the trial periods.



**Figure 6: Proportion of HGVs by week and location**

A two-proportion z-test indicated that the relatively small difference in the HGV proportions at the experimental location between the baseline and trial periods (less than 1%) was statistically significant ( $p < 0.01$ ). This small difference is unlikely to have any real impact on driver behaviour between the baseline and trial phases.

The distribution of vehicles between Lane 1 and Lane 2 within the experimental location is shown in Figure 7.



**Figure 7: Distribution of vehicle by lane and monitoring period at the experimental location**

As outlined previously, the average daily flow across the scheme increased during the trial period. As a result the total number of vehicles across both Lane 1 and 2 increased from the baseline to trial monitoring periods. However, the composition of vehicles in Lane 1 remained stable between the baseline and trial monitoring periods, at about 10% HGVs and 90% cars and LGVs. The composition of vehicles in Lane 2 remained stable between the baseline and trial monitoring periods as well, at about 2% HGVs and 98% cars and LGVs.

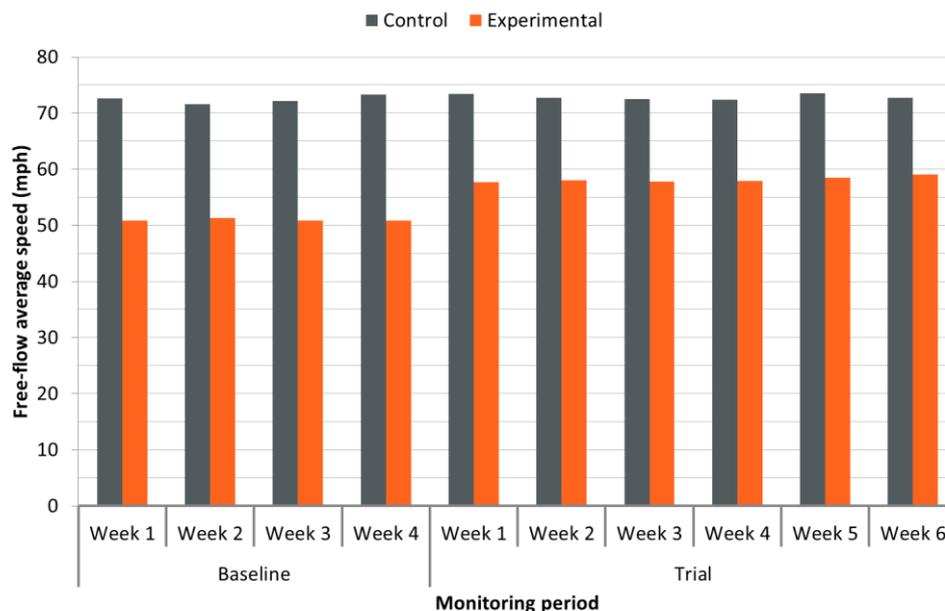
A chi-square test confirmed this finding, with no significant difference ( $p = 0.26$ ) in vehicle composition in Lane 1 or Lane 2 between the monitoring periods. These data therefore indicate that the 60mph speed restriction did not appear to have a significant effect on vehicle composition across the two lanes.

### 3.1.2 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 8 shows the free-flow average speeds on the control and experimental locations across the two monitoring periods.



**Figure 8: Free-flow average speed during the monitoring period by location**

Free-flow average speed remained fairly stable at the control location, at around 72mph. At the experimental location, however, an increase in free-flow average speed was observed from approximately 51mph in the baseline period to 58mph 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, but the difference between periods at the control location was not significant ( $p = 0.353$ ).

Since the difference in flow between monitoring periods and monitoring locations has been shown to be significant, changes in speed may not be wholly attributed to the change in the speed restriction; the changes in flow outlined in the previous section may have also had an effect on speed. However, a statistically significant increase in speed after the implementation of the 60mph speed restriction mirrors findings in a separate investigation on the M49, where flows remained consistent (Glaze *et al.*, 2019).

Free-flow average speeds by lane are shown in Table 2.

**Table 2: Free-flow average speed (mph) by monitoring period and lane at the experimental location**

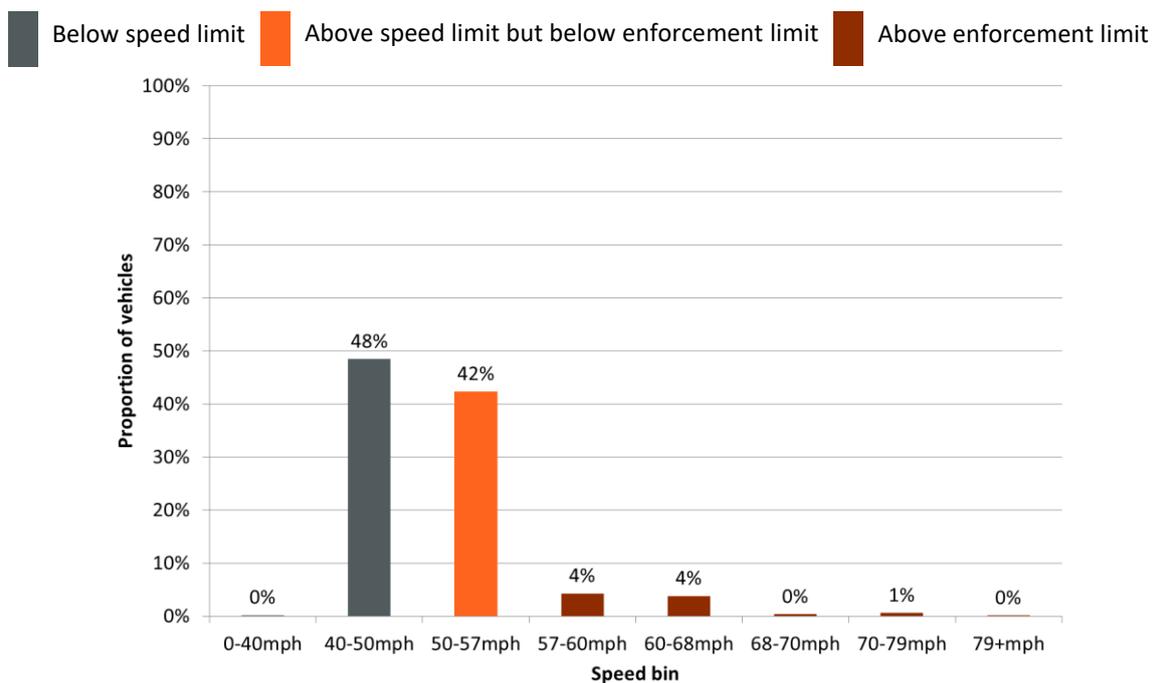
Monitoring period	Lane 1	Lane 2
Baseline period	50.0	52.5
Trial period	56.8	59.9

In both periods, speeds were slightly higher in Lane 2 than in Lane 1. Comparison between the monitoring periods indicates that average speeds increased in both lanes between the baseline and trial periods. Lane 1 increased by 6.8mph while Lane 2 increased by 7.4mph, on average. Although not shown here, there was little change in the average speeds by lane at the control location.

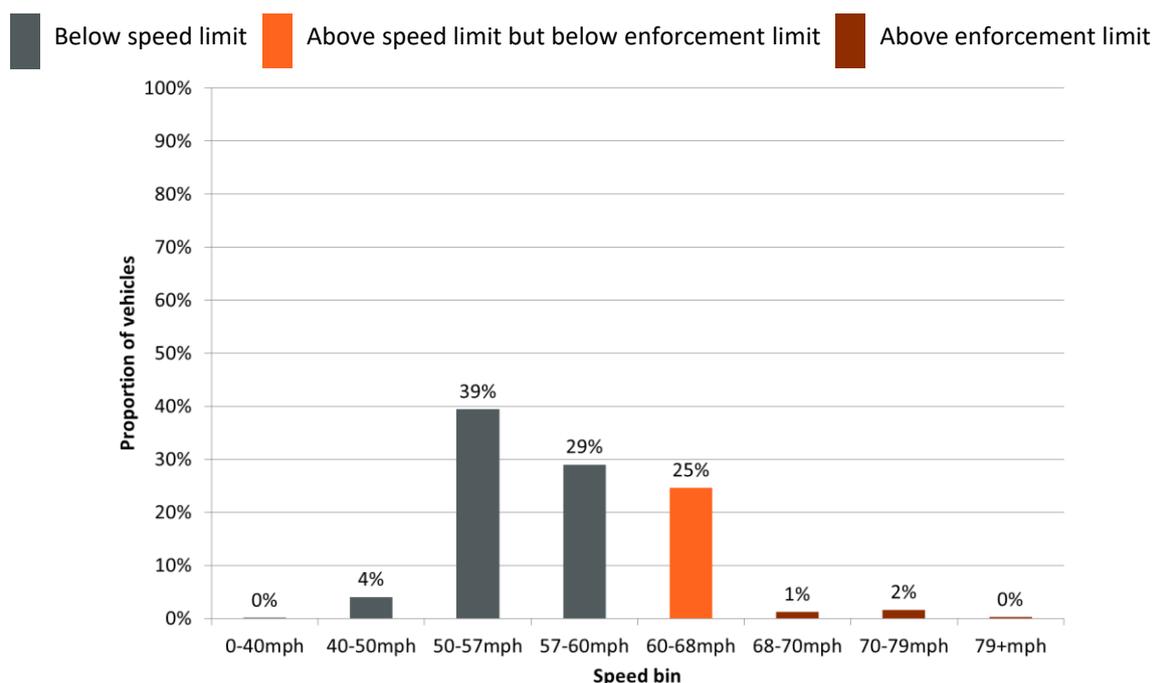
In order to understand the compliance of road users with the posted speed restriction, the data were separated into speed bins. These speed bins (0-39, 40-49, 50-56, 57-59, 60-67, 68-69, 70-78, 79+mph) allowed for vehicles to be identified as travelling below the speed limit, above the speed limit but below the enforcement limit, or above the enforcement limit (10% of speed limit +2mph).

Figure 9 and Figure 10 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 limit; the dark orange bars show the proportion of vehicles travelling above the speed limit but below the enforcement threshold (10% of speed limit+2 mph); and the dark red bars show vehicles travelling above the enforcement threshold.



**Figure 9: Proportion of vehicles in each speed bin during the baseline period at the experimental location**



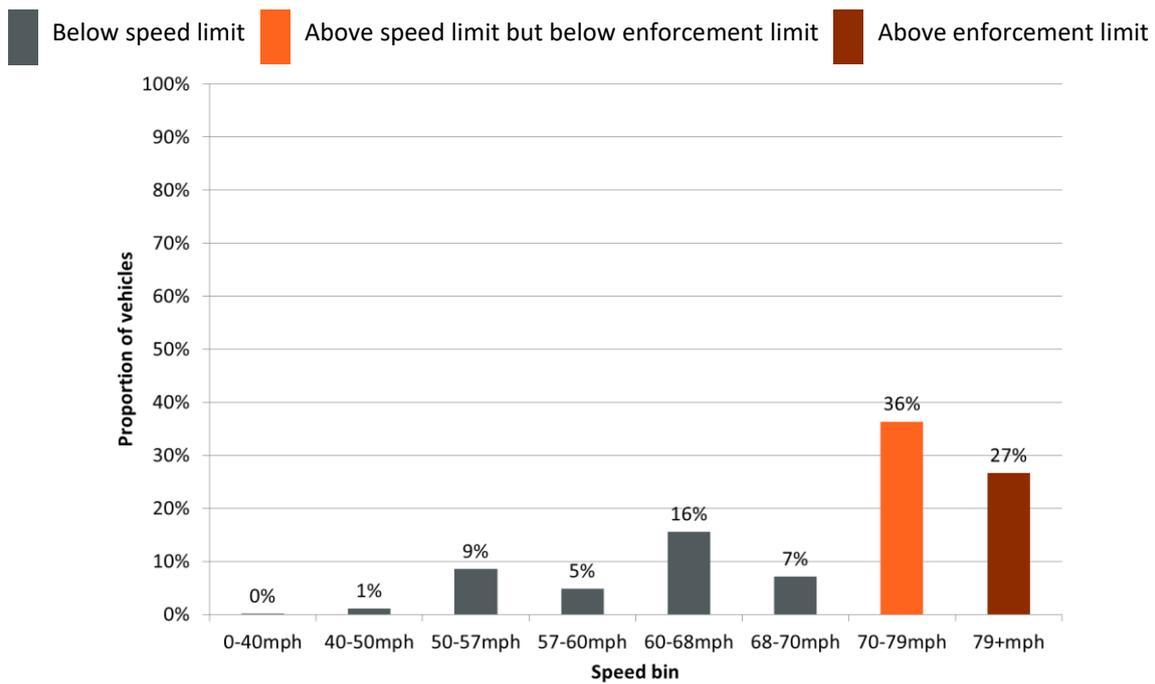
**Figure 10: Proportion of vehicles in each speed bin during the trial period at the experimental location**

The proportion of vehicles travelling above the posted speed limit changed considerably between the baseline and trial periods, decreasing from 51% to 28%. A similar trend can be seen with the proportion of vehicles travelling above the enforcement limit, decreasing between the two monitoring periods from 9% to 3%.

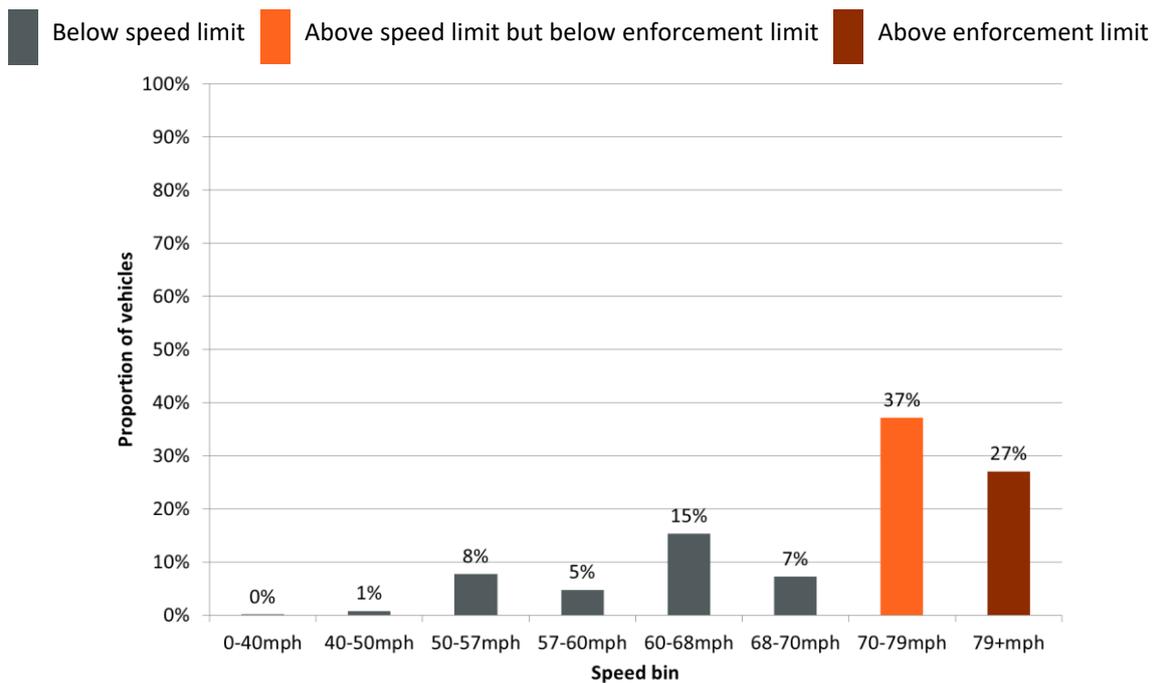
A Chi-square test showed that the difference in the number of vehicles in each speed bin at the experimental location between the baseline and trial periods was significant ( $p < 0.01$ ).

When looking at the differences in the proportion of vehicles in each category (below speed limit, above speed limit 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.

Figure 11 and Figure 12 show the proportion of vehicles recorded in each speed bin across the two monitoring periods at the control location.



**Figure 11: Proportion of vehicles in each speed bin during the baseline period at the control location**



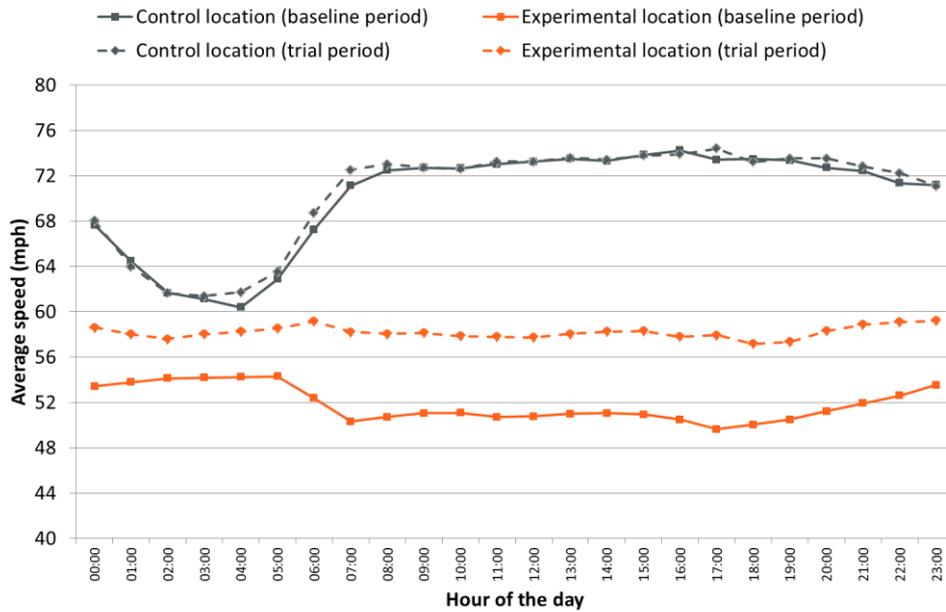
**Figure 12: Proportion of vehicles in each speed bin during the trial period at the control location**

There appears to be little change in the proportions of vehicles travelling over the posted speed restriction and enforcement limits at the control location. This is expected as the speed restriction at this location remained consistent across the two monitoring periods. It is worth noting that the majority of vehicles (64% of vehicles) were travelling over the speed limit during both monitoring periods.

### 3.1.3 Congestion

A check was conducted on the total duration of congestion observed during the study. In total less than 0.1% of the total time monitored was classified as congested (any period where the one-minute averaged speed of all vehicles across the carriageway was less than 40mph).

Figure 13 outlines the average speeds per hour of the day, by monitoring period and location.



**Figure 13: Average hourly vehicle speed by location and monitoring period**

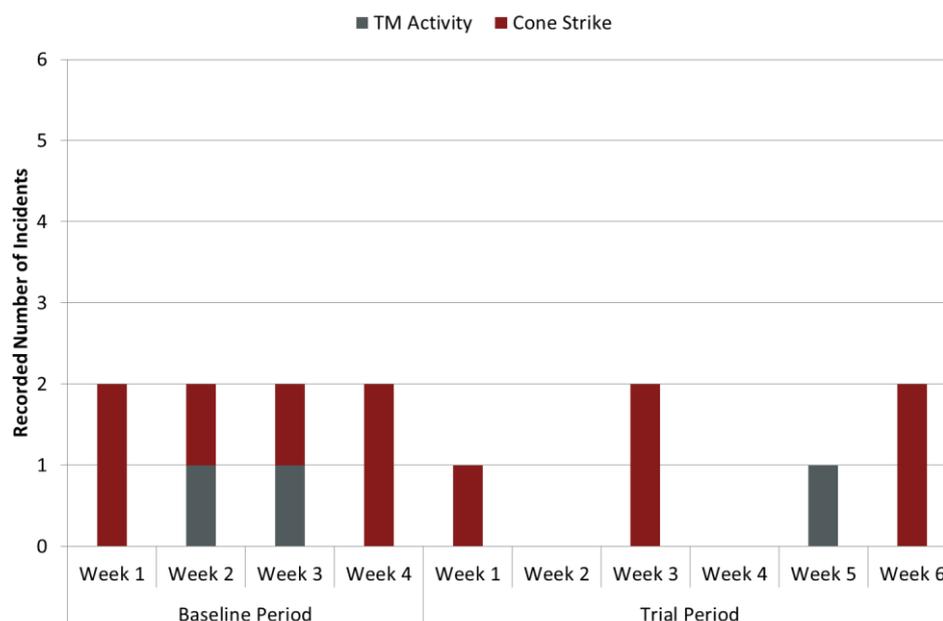
At the control location, patterns in hourly average speed remain consistent between both monitoring periods. The location experienced lower average speed between 00:00 and 06:00 than later in the day; likely because HGVs (which are speed limited to 56mph) made up a bigger proportion of vehicles during these hours.

The hourly average speed at the experimental location remained relatively consistent across the day. Overall average speeds increased in the trial period, compared to the baseline, however hourly fluctuations remained minimal.

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, no comparisons were undertaken to assess the impact of the change in speed restriction on the levels of congestion seen at the scheme.

### 3.2 Reported incidents

In total, 14 incidents were reported by the schemes traffic management contractor, 8 of which were in the baseline phase and 6 in the trial phase. A summary of these reported incidents is presented in Figure 14.



**Figure 14: Reported incidents at the experimental location**

As previously outlined in Section 2.2, the traffic management at the scheme only encompassed a single carriageway. No incident data were collected from the control location as it was situated upstream of the scheme's traffic management.

The number of reported traffic management activities<sup>4</sup> and cone strikes across both monitoring periods varied only slightly. Due to the limited number of reported instances, no statistical analysis could be undertaken. The short length of the scheme (around 2.4km) and the limited duration of the monitoring period (10 weeks) may have contributed to the low number of reported incidents.

During the trial no safety concerns were raised (by the contractor, the scheme and any adjacent schemes) around the number of reported incidents. As no further detail was provided concerning contributory factors, it was therefore not possible to determine whether the change in speed limit may have been a contributory factor in any of the incidents reported by the scheme.

### 3.3 Journey time

Estimates of the average journey time were calculated based on the length of the road works and a single aggregated free-flow average speed of vehicles, for each four week monitoring

<sup>4</sup> Included emergency activities and unplanned lane or carriageway closures. Excluded any planned lane or carriageway closures for general works activities.

period, from the radar data. Table 3 shows the estimated average journey time during the baseline and trial periods.

**Table 3: Journey time estimate**

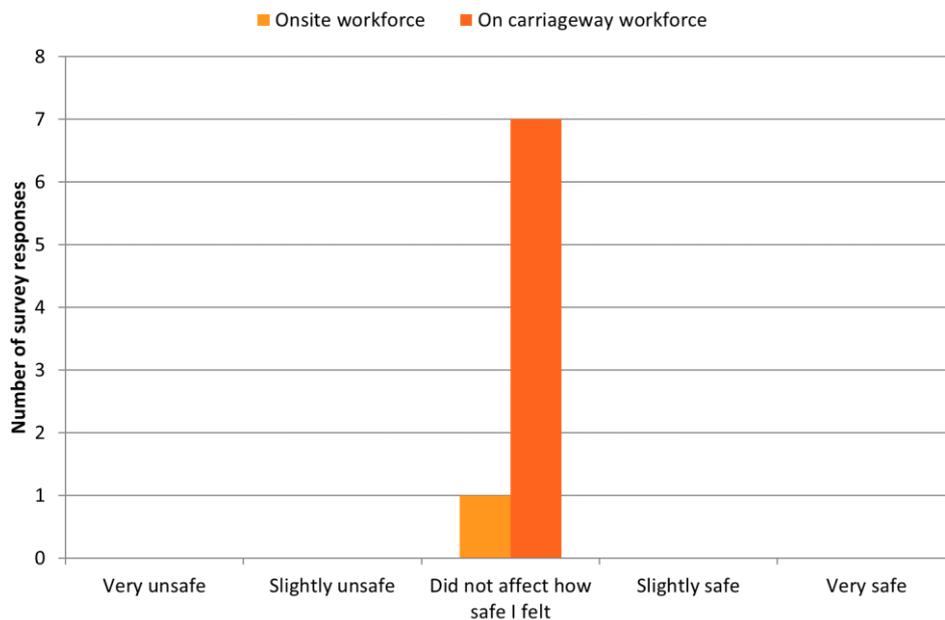
Monitoring location	Length (km)	Average vehicle speed (mph)		Journey time (seconds)		Difference (seconds)
		Baseline	Trial	Baseline	Trial	
Experimental	2.45	52.6	58.6	104.3	93.5	10.8 (-10%)

The results suggest that changing the speed restriction from 50mph to 60mph decreased the estimated average journey time by approximately 11 seconds. As the scheme was only in place over a single carriageway, no estimates have been made from the control location as no road works were in place.

### 3.4 Workforce surveys

In total, 8 individuals completed the workforce survey. A summary of their responses is presented below. Due to the limited number of responses, caution should be taken when interpreting these results.

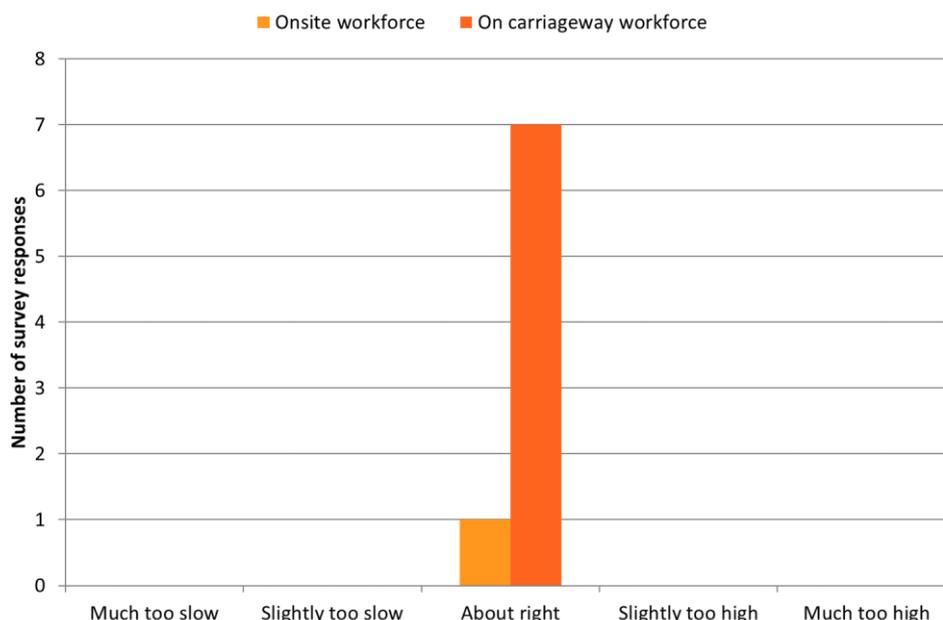
Participants were asked to rate how they thought the change in speed restriction affected their safety. Responses are shown in Figure 15.



**Figure 15: Responses to question "How do you think the change in speed restriction affected your safety? Did it make you feel..." (split by workforce role)**

The change in speed restriction had no impact on participants' feelings of safety, with all respondents indicating the change in speed restriction did not affect how safe they felt.

Participants were asked to rate how appropriate they thought the speed restriction was in terms of their own safety. Responses are shown in Figure 16.



**Figure 16: Responses to question “In terms of your safety, do you think the speed restriction was...” (split by workforce role)**

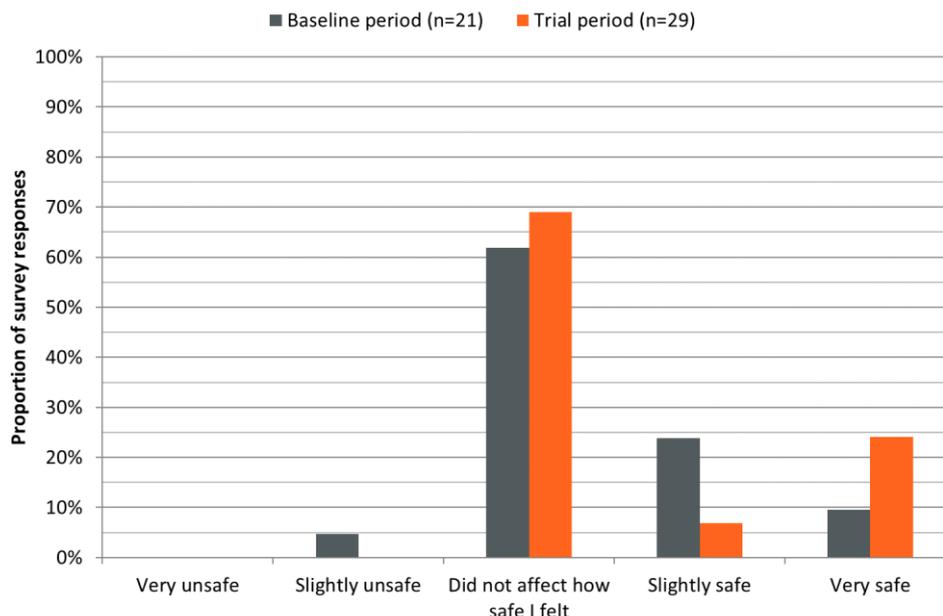
The change in speed restriction was perceived by all respondents as appropriate, with all 8 respondents outlining they felt the speed restriction was about right.

### 3.5 Customer satisfaction

In total, 50 respondents were identified from the customer satisfaction survey as eligible for inclusion in the investigation. These individuals indicated that they travelled through the trial scheme during the investigation. Of those 50 respondents, 21 indicated that their last journey through the scheme was during the baseline period. The remaining 29 indicated that their last journey through the scheme was during the trial period. A summary of their responses is presented below. Other survey respondents were not deemed to be eligible for the analysis and so their responses were excluded. These individuals were excluded as they indicated that they travelled through the site of the investigation prior to the road works being present.

#### 3.5.1 Feelings of safety

Participants were asked to rate how they thought the speed restriction affected their safety. Responses are shown in Figure 17.

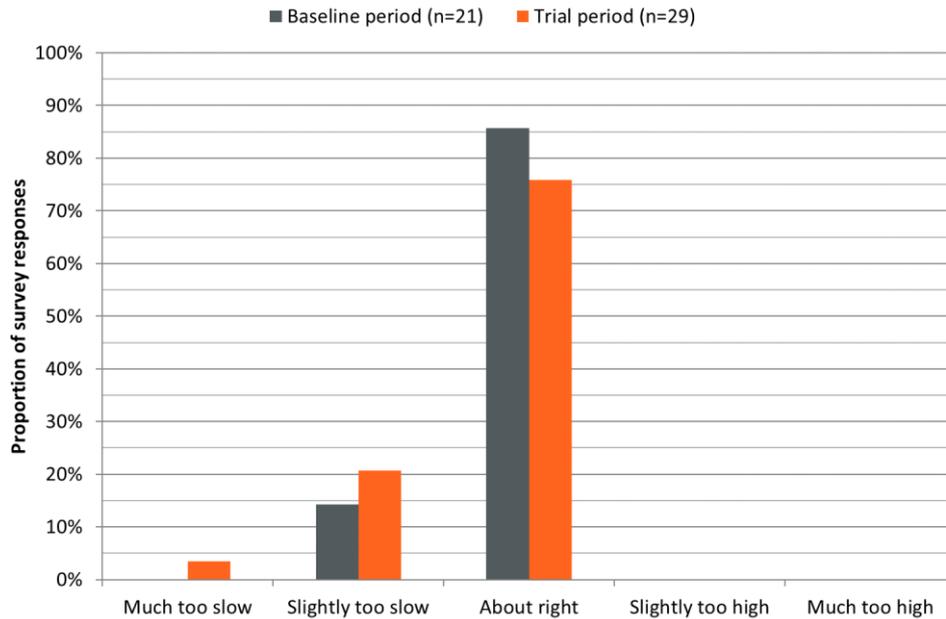


**Figure 17: Responses to question: “How do you think the speed restriction affected your safety? Did it make you feel...” (split by monitoring period)**

The 60mph speed restriction was generally considered to have no impact on drivers’ feelings of safety. During the trial period, 20 out of the 29 drivers indicated the speed limit did not affect how safe they felt. The remaining 9 participants reported that they felt either slightly or very safe.

In order to understand if the changes seen between the baseline and trial periods were significant a chi-square test was performed. Only responses from participants that said that the speed restriction either did not affect how safe they felt or made them feel safe were included in the test. There were insufficient responses from those who reported they felt unsafe to include in this type of test. The test showed that there was no significant difference ( $p = 1.00$ ) in the distribution of these responses between the baseline and trial periods.

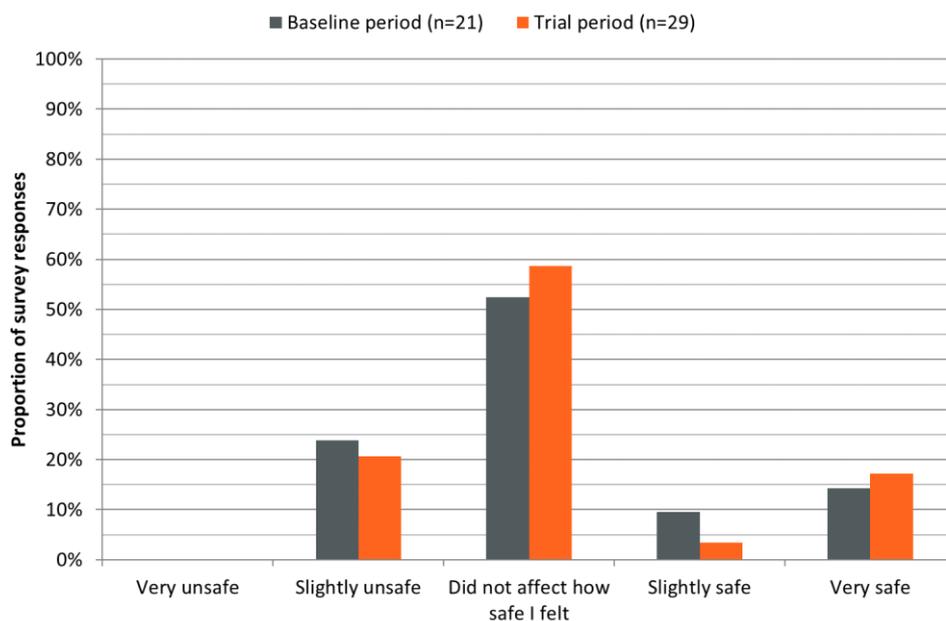
Participants were also asked to rate how appropriate they thought the speed restriction was, in terms of their own safety. Responses are shown in Figure 18.



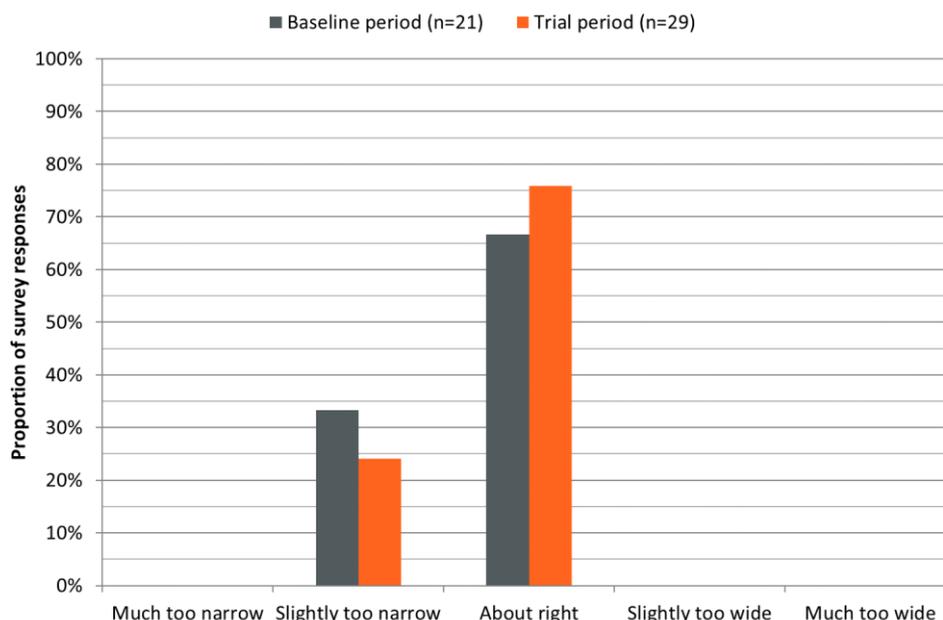
**Figure 18: Responses to question “In terms of safety, do you think the speed restriction was...” (split by monitoring period)**

Overall most respondents indicated that they felt the speed restrictions were appropriate (‘about right’) during both baseline and trial periods. No individual reported that they felt the speed restriction was ‘too high’. No statistical tests could be performed because there were insufficient numbers of responses in some of the categories.

As well as the effect of the speed restriction on perceived safety, participants were asked to comment on how the width of the running lanes within the scheme’s road works affected their feelings of safety. Responses are shown in Figure 19 and Figure 20.



**Figure 19: Responses to question: “How do you think the lane widths affected your safety? Did it make you feel...” (split by monitoring period)**



**Figure 20: Responses to question: “In terms of safety, do you think the width of the lanes was...” (split by monitoring period and location)**

Overall, the lane widths in both the monitoring periods were perceived by most participants as appropriate (‘about right’). Some individuals reported that the lane widths were ‘slightly too narrow’. A chi-square test was performed on the responses shown in Figure 19 which were grouped into three groups: “more unsafe”, “did not affect how safe I felt” and “safer”. However, the test showed that there was no significant difference ( $p=0.91$ ) in the distribution of responses between the baseline and trial periods.

Finally, participants were asked to comment on their feelings of safety when they last drove between Junctions 27 and 28 of the M5.

Two participants that drove through the scheme during the baseline period made general comments about road works and safety: one participant felt that road works are necessary for keeping road networks safe, whereas another suggested that better planning of road works would improve driver safety.

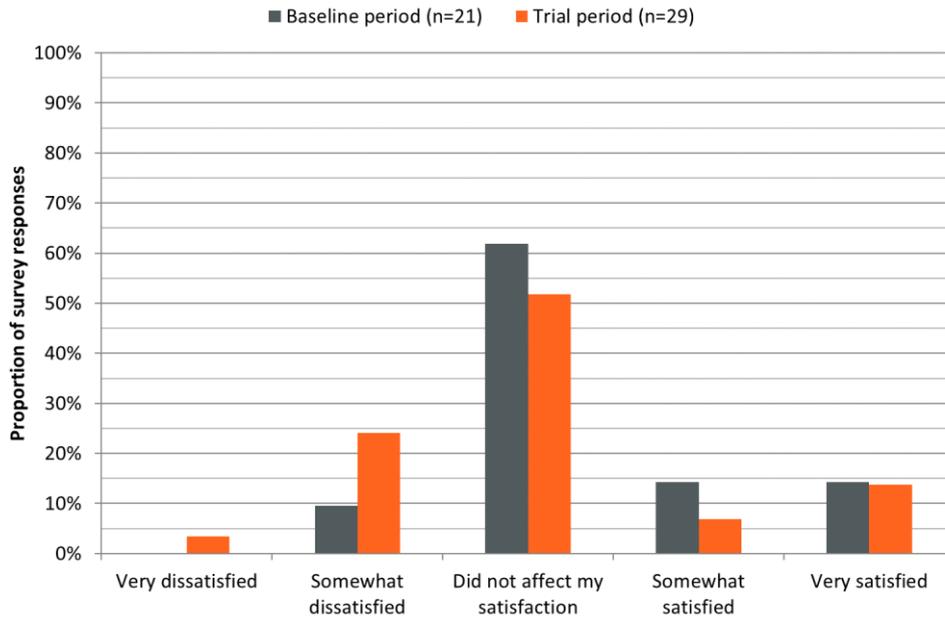
Table 4 shows other themes that emerged from participants’ comments in relation to the interaction between their feelings of safety and the road works speed limits or width of the lanes.

**Table 4: Themes from participants' comments in relation to their feelings of safety**

		Baseline period	Trial period	Both periods
Speed limits	Positive comments	The speed limit helped to keep road workers safe.		
	Negative comments		The speed limit made driving monotonous, which could have led to safety issues regarding driver fatigue.	Other drivers did not obey the speed limits. The speed limits caused other drivers to tailgate.
	Suggestions to improve safety			The speed limits should be enforced (e.g. via average speed cameras) to combat other drivers' non-compliance.
Width of lanes	Positive comments	The width of the lanes helped to keep road workers safe.		
	Negative comments	The lanes were too narrow.		

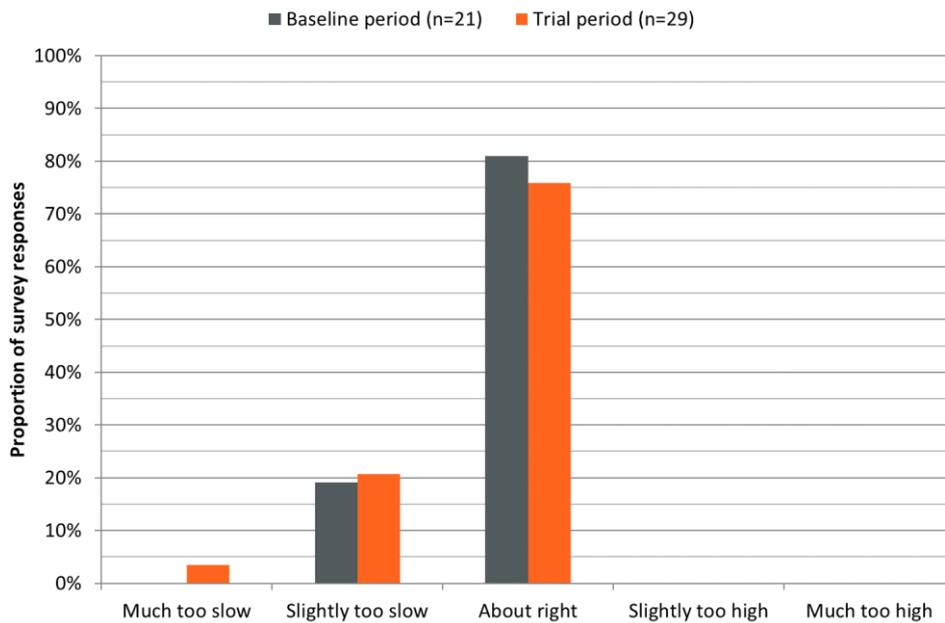
### 3.5.2 Journey satisfaction

Participants were asked to rate how they thought the speed restriction affected their journey satisfaction. Most participants indicated that the speed restriction did not affect their levels of satisfaction. A chi-square test was performed on the responses from participants that said that the speed restriction did not affect their satisfaction or made them feel satisfied (there were insufficient responses from those who felt dissatisfied to include this category in the test). The test showed that there was no significant difference ( $p = 1.00$ ) in the distribution of these responses between the baseline and trial periods. Responses are shown in Figure 21.



**Figure 21: Responses to question: "How satisfied or dissatisfied were you with the speed restriction?" (split by monitoring period)**

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 22.

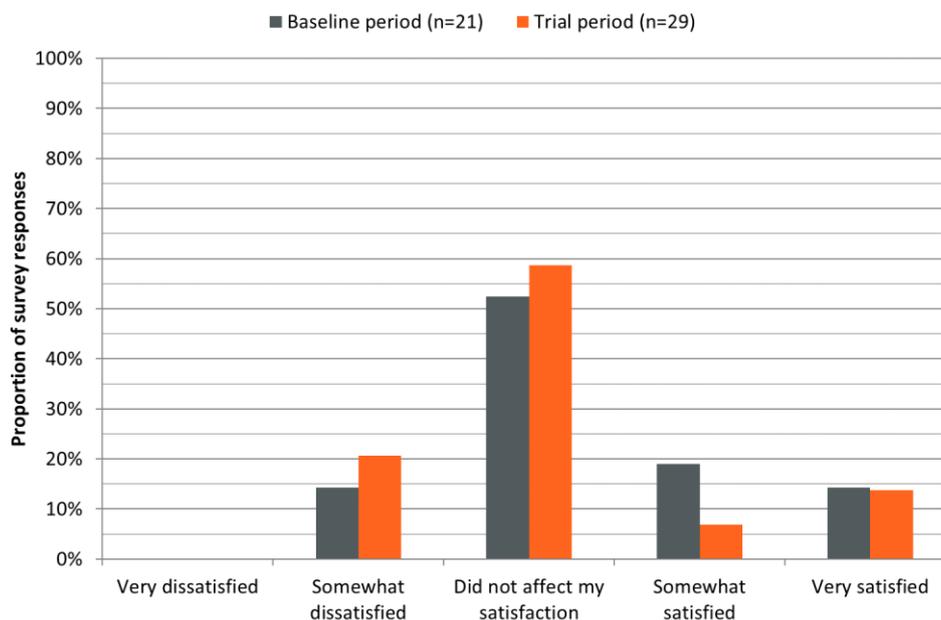


**Figure 22: Responses to question: "In terms of journey satisfaction, do you think the speed restriction was..." (split by monitoring period)**

Overall the 50mph and 60mph speed restrictions were perceived by most participants as appropriate ('about right') during the appropriate monitoring period. No individual reported that they felt the speed restriction was 'too high'; however several individuals indicated that they felt the speed restriction was 'too slow'. No statistical tests could be performed on the

responses to this question because there were insufficient numbers of responses in some of the categories.

Participants were asked to rate how they thought the lane widths affected their satisfaction. Responses are shown in Figure 23.

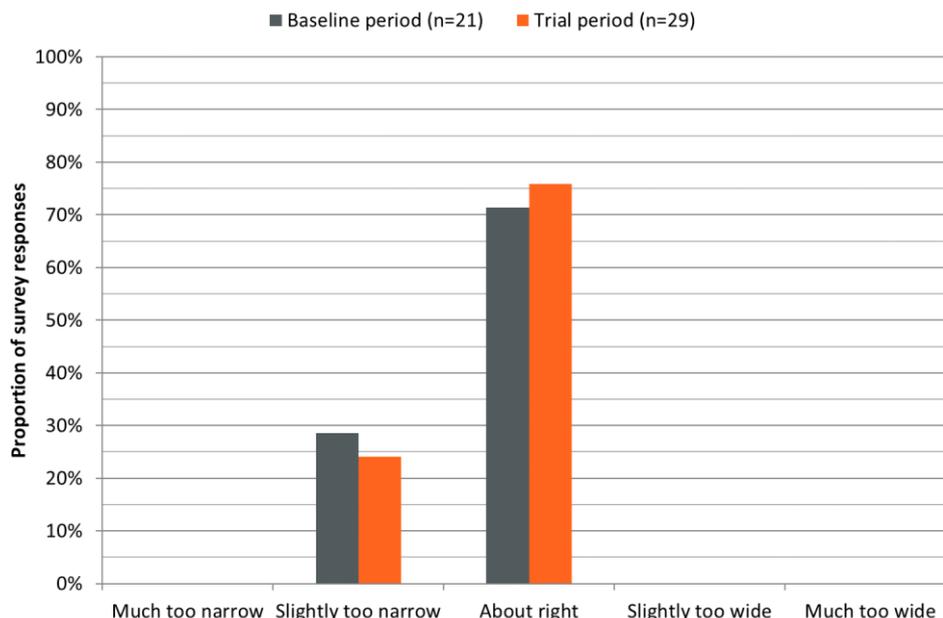


**Figure 23: Responses to question: “How satisfied or dissatisfied were you with the lane widths?” (split by monitoring period)**

As with previous responses, the majority of drivers indicated that the lane widths used within the scheme did not have an effect on their levels of satisfaction.

A chi-square test was performed on the responses from participants that said that the width of the lanes did not affect their satisfaction or made them feel satisfied (there were insufficient responses from those who felt dissatisfied to include this category in the test). The test showed that there was no significant difference ( $p=0.59$ ) in the distribution of these responses between the baseline and trial periods.

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 24.



**Figure 24: In terms of journey satisfaction, do you think the lane widths were...**

The lane widths in both the 50mph and 60mph speed restrictions were perceived by most participants as appropriate ('about right'). Two individuals reported that the lane widths were 'slightly too narrow'; no further comments were provided however.

Finally, participants were asked to comment on their journey satisfaction when they last drove between Junctions 27 and 28 of the M5.

One participant who drove through the scheme during the baseline period thought that their journey was easy. However, one participant who drove through the scheme during the trial period expressed dissatisfaction with their journey, as they did not see anyone working on the road works.

Table 5 shows other themes that emerged from participants' comments in relation to the interaction between their journey satisfaction and the road works speed limits or width of the lanes.

**Table 5: Themes from participants' comments in relation to their journey satisfaction**

		Baseline period	Trial period	Both periods
Speed limits	Positive comments	The speed limit did not impact journey satisfaction.		
	Negative comments		<p>The speed limit made driving monotonous.</p> <p>The speed limit was unnecessary because there were no road workers.</p> <p>The speed limit was meaningless because it was not being enforced.</p>	
	Suggestions to improve journey satisfaction	Customers should be given information about the need for restricted speed limits through road works.		The speed limits should be enforced (e.g. via average speed cameras) to combat other drivers' noncompliance.
Width of lanes	Positive comments	The width of the lanes did not impact journey satisfaction.		
	Suggestions to improve journey satisfaction	Customers should be given information about the need for narrowed lanes through road works.		

### 3.6 Scheme delivery and cost

#### 3.6.1 Delivery

Overall, results from the lessons learned workshop indicated that the scheme felt the delivery of the works activities was not impacted by the implementation of the 60mph speed restriction.

#### 3.6.2 Cost

In order to safely implement the 60mph speed restriction several additional key mitigations and activities were required. All of these additional mitigations were outlined and implemented when the scheme first began its activities on-road, and included:

- Higher containment vehicle restraint systems and end terminals
- Mobile VMS used for incident management

- Additional static signing (speed limits signs, speed check area signs)
- Increased TSO site patrols and tool box training and talks

Along with the costs of these additional mitigations, several other costs were incurred by the scheme and area teams in order to implement the 60mph speed restriction. These included:

- Consultancy of technical experts to undertake scheme specific safety risk assessment
- Radar installations used for the investigations monitoring

## 4 Conclusions

This section summarises the conclusions which can be drawn from the data summarised in this report. As previously mentioned in section 2.5.1.4, the radar data collected on-road in this investigation were limited due to the loss of individual vehicle data. As such, the impact of the change in speed restriction on levels of close following could not be identified.

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.

As part of the Final Project Report, the conclusions from separate scheme reports will be brought together (see Section 6.1).

### 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 speed (from around 52mph in the baseline period to 59mph in the trial period, on average). The increase in average vehicle speed was consistent across both carriageway lanes. This increase in average vehicle speed resulted in an estimated average journey time reduction of approximately 11 seconds per driver.

Whilst average speeds increased, they did not negatively impact on drivers' compliance with the posted speed restriction. In fact, overall compliance with the posted speed restriction was significantly higher in the 60mph condition than the 50mph condition. This suggests that a proportion of drivers were travelling above 50mph in the baseline period, but a lower proportion chose to travel above 60mph in the trial period.

Unfortunately, due to issues with the radar installations preventing capture of Individual Vehicle Data, it was not possible to assess compliance or changes in speeding behaviour between vehicle types, nor was it possible to assess the impact on headway (or close following).

The distribution of cars and HGVs across the two running lanes was not greatly affected by the change in speed restriction. This suggests that the change in speed restriction did not alter the number of HGVs travelling in the offside lanes (albeit only a small number were observed in the data).

Due to a small sample size, the impact of the speed restriction change on the number of incidents and breakdowns could not be determined. The scheme reported no issues with incidents or near misses during the course of the investigation.

This change in driver behaviour had no report impact on the workforces feelings of safety, with all of the 8 individuals who responded to the surveys used, indicating that the change in driver speed restriction and driver behaviour was considered to have no impact on their feelings of safety.

## **4.2 Impact of change in speed restriction on customer satisfaction**

Drivers outlined that overall the speed restriction had no effect on their levels of satisfaction. Irrespective of whether it was 50mph or 60mph, drivers generally indicated that the speed restriction did not affect their feelings of safety. No statistically significant differences were identified when comparing responses between baseline and trial periods. Similarly drivers indicated that both speed restrictions felt 'about right' in terms of safety.

The scheme utilised the original carriageway lane widths throughout the investigation. These lanes were not narrowed for the purpose of the traffic management. Drivers perceived them as appropriate ('about right') in terms of safety. As a result most drivers also indicated that the lane widths had no effect on their satisfaction.

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

Feedback from the scheme indicated that the introduction and application of a 60mph speed restriction had no negative impact on the schedule and delivery of the works. Several fixed costs were incurred in order to implement additional risk mitigations, such as higher containment vehicle restraint systems and VMS.

This information will be used to inform future use of a 60mph speed restriction within road works and will be presented alongside future guidance material.

# **5 Other investigations**

## **5.1 Ipsos customer audits**

Separate to this investigation, 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 ease of reference, and with permission from Highways England, a copy of the report can be seen in Appendix C.

These customer audits, undertaken by Ipsos and Pell Frischmann, utilised 'Auditors' (i.e. members of the public) who lived in the vicinity of the scheme. 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 were instructed to drive through the scheme and undertake a survey within 24 hours. These surveys sought to identify the impact of the speed restriction change on both customer safety and customer satisfaction. In total 50

surveys were completed by separate Auditors; 25 whilst the scheme was in the baseline phase and 25 during the trial phase.

Survey responses were then reviewed via a quality control process implemented by a validation team. This team looked for contradictions and irregularities within the responses of each survey. If completed surveys were deemed to be of poor quality, they were removed from the sample. Four surveys were reported to have failed this quality control process for the investigations on the M5 and were excluded from the dataset prior to review. This resulted in 21 audits being used from the baseline phase and 25 from the trial phase.

The headline findings from these customer audits are summarised below. Some caution is advised in the extrapolation of these results since a small sample of Auditors was used (21 in the control phase and 25 in the trial phase). In addition, no details are provided in the “Top Line Results” report with regard to whether statistically significant differences were identified between the 50mph and 60mph phases; therefore it is not possible to draw robust conclusions from these data regarding the impact of the increase speed restriction.

Key points noted in the “Top Line Results” report (Appendix C) are as follows:

- 21/21 Auditors (100%) felt 50mph was appropriate for the conditions, and 25/25 Auditors (100%) felt 60mph was appropriate.
- 21/21 Auditors (100%) reported that the signage was easy to see in the control (50mph) phase, and 25/25 (100%) reported it was easy to see in the trial (60mph) phase.
- 21/21 Auditors (100%) indicated that they felt safe in 50mph, and 25/25 (100%) said they felt safe in 60mph.
- 16/21 Auditors (76%) were very satisfied with the 50mph speed limit, and 17/25 (68%) were very satisfied with 60mph.
- 19/21 Auditors (90%) felt 50mph was about right, and 2 Auditors (10%) felt it was too slow. 25/25 Auditors (100%) felt 60mph was about right.

## 5.2 Highways England social media listening

Separate to this investigation, Highways England’s insight team investigated the impact of the change in speed restriction on customer satisfaction by monitoring social media postings.

No individuals who discussed the change in speed limits were identified (Highways England, 2019). The social media listening report outlined that all conversations identified from social media, press, and other online sources, were focussed on day-to-day occurrences and abnormal activities at the scheme.

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## 6 Next steps

### 6.1 Continued use of 60mph at the M5 scheme

The overall programme of works outlined previously in Section 2.1, finished at the same point as this investigation. As such the traffic management on the southbound carriageway was removed, along with the 60mph speed restriction.

### 6.2 Implementation of 60mph at other schemes

This is the second report produced in this project which has investigated use of a 60mph speed restriction within road works. The first report summarised data from the M49 Avonmouth scheme. TRL is working closely with Highways England to implement 60mph speed restrictions at other schemes on the SRN; the results from these schemes will be reported separately. Lessons learned, which were captured as part of this investigation, are outlined in Appendix B; these will be considered when implementing the 60mph speed restriction on other schemes in the future.

The results from future investigations (each to be presented in their own Interim Report) will be collated together (in a Final Report) once the monitoring programme is complete.

The Final Report 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.

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## Acknowledgements

The following individuals (or organisations) contributed directly to the investigation of a 60mph speed restriction on the M5 Willand road works:

- Steve Smiley – HW Martin (Fencing) Limited
- Tom Jewell – HW Martin (Traffic Management) Limited
- Mark MacGarty and Simon Wickenden – WSP
- Hannah Brierley and Will Miller - Highways England

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**Glaze S, Chowdhury S, Fleetwood R and Lodge C (2018).** *Narrow Lanes Simulations 55mph and 60mph.*

**Glaze S, Chowdhury S and Ramnath R (2019).** *Monitoring and evaluation of the 60mph trials - Interim report for the on-road trials of 60mph on the M49 Avonmouth.*

**Highways England (2015).** *NSCRG and PSCRG Remit for Organisation and Governance.*

**Highways England (2018).** *Design Manual for Roads and Bridges GG 104 Requirements for safety risk assessment.*

**Highways England (2019).** *M5 J27 Tiverton 50/60mph speed trials - Soical media listening.*

**Ipsos (2019).** *Customer audits - speed trials - M5 top line results.*

**WSP (2018).** *Safety Risk Assessment M5 Junction 27-28.*

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## 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 (e.g. other RCC/Traffic Officer Service representatives)

## Appendix B Lessons learned

In order 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, Traffic Management Supplier and Risk Contractor along with a representative from Highways England's Operations Customer Service Division.

As part of the investigation into the impact of the change in speed restriction at the M5 Junction 27 Willand road works scheme, a 'lessons learned' session was undertaken. The following questions were posed to attendees.

### **Question: How do you feel that the investigation went on a general level? What worked well? What didn't? Why?**

Summary of key points made:

- The 60mph speed restriction seemed like it was right for the scheme.
- Overall individuals were comfortable with the 60mph speed restriction.
- Fixing a start date to coincide with the scheme's installation on-road was critical to ensuring activities were undertaken and completed on time.
- Gaining early agreement on roles and responsibilities for individuals involved would have made things easier.
- The weekly catch up calls kept the core team up to date with everything that was going on.
- Weekly safety reporting during the trial phase of the investigation was good. It allowed for intelligence-led decision making.
- Involvement in PSCRGs was new to the Operations team; it was seen as a learning experience but all challenges were overcome.
- In the future a clear trials process needs to be outlined. A need for activities such as securing risk consultancy and paying for it may put people off being involved in such investigations. Initial procurement process of a risk consultant was seen as 'painful'.

### **Question: Early on some potential concerns in relation to changing the speed restriction for this scheme were raised. Were any of them realised? If so, how?**

Summary of key points made:

- No enforcement was planned for the scheme originally (no TASCAR); agreement with Police ensured increased patrols and the use of 'Police Speed Check Area' signs.
- Police involvement and the use of speed check signs appeared to result in better compliance; this could be an option going forward as schemes with short durations may not have fixed enforcement in place.
- No recovery was planned for the scheme and no breakdowns were reported within the works area.

- The site only had a single access point at the start of the works and a single works exit at the end. The site team provided feedback on issues with entering the site at a higher speed. No near misses were reported but a briefing note was shared by the TTM contractor on access/egress at higher speeds.
- Overall concerns with causing queuing upstream of the works; but monitoring showed no increase in congestion within the works. No fixed police camera van was used during the investigation so no risk of it causing sudden braking/queues.

**Question: What could have helped you overcome those challenges? What would you have liked to do? (Prompts given: financial/ publicity/ support)**

Summary of key points made:

- Challenges never materialised.

**Question: Was any additional traffic management equipment required to make scheme suitable for 60mph speed restrictions? If so, what? E.g. new signage, changes to barrier and crash cushions, variable message signs etc.**

Summary of key points made:

- Portable variable message signs used to indicate incidents ahead.
- VRS was upgraded prior to installation.
- New speed signs and speed check area signs.

**Question: Were any additional maintenance activities undertaken during the use of a 60mph speed restriction? What were they? How much time/effort/additional cost did these activities take?**

Summary of key points made:

- The speed limit signs were switched after four weeks, requiring lane closures.
- The temporary road studs around the scheme chicane were reinstated prior to the change of speed restriction. This work was undertaken without the requirement for additional carriageway or lane closures.

**Question: Did you have to make any modifications to risk assessments or method statements? What about equipment?**

Summary of key points made:

- The site team's access and egress method statements were updated after a briefing note was supplied by the traffic management contractor.

**Question: Were there any additional enforcement requirements for enforcing the use of a 60mph speed restriction on your scheme? If so, what?**

Summary of key points made:

- No fixed enforcement systems were used on the scheme, instead police agreed to increasing active patrols in through the scheme.
- No fixed police camera vans were used; however patrols did undertake a number of enforcement runs during the course of the investigation.

- 
- The inclusion of a fixed enforcement system would have increased the workload on the TSCOs, requiring additional paper work.

**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 had not been running at 60mph?**

Summary of key points made:

- No additional staff required, above procurement of risk consultants to undertake scheme specific safety risk assessment.

**Question: In summary, what were your feelings on the impact of using a speed limit of 60mph, rather than 50mph, within scheme on: the safety of both road users and road worker? The satisfaction of customers? The delivery schedule of the scheme?**

Summary of key points made:

- Participation in the investigation was really about changing the mind-set of the workforce through training and education, including engagement about the suitability of the temporary traffic management design and additional mitigations which were implemented.

## Appendix C Ipsos customer audit



# Highways England

## Customer Audits – Speed Trials – M5 J27

### Top Line Results

April 2019

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 Ipsos  Pell Frischmann

17-041629-01\_HE\_M5 Speed audits report March 2019\_Report\_Internal Client Use Only

# Contents

- Introduction & Methodology
- Results
- Conclusions & Recommendations



17-041629-01\_HE\_M5Speed audits March 2019\_Report\_Internal Client Use Only

# Research Methodology



## Schemes

### Customer Audits conducted across the following schemes:

- M5 J27 over the February/March Period
- Highways England have been trailing a new 60mph speed limits whilst going through the M5 J27 scheme. Auditors were specifically briefed to undertake the usual customer audit but also look out for/observe the speed limit and provide their perception on the limits.



## Measurement

### Scheme audits assessing:

- The auditors perception of the 50mph/60mph speed limit that was in place.
- The audits were split evenly to gain an understanding of a customers perception of both speed limits



## Sample Base

M49 n=46

**50mph Tests n=21 – this is reduced from 25 due to 4 results not passing quality control.**  
**60mph Tests n=25**



This work was carried out in accordance with the requirements of the international quality standard for market research, ISO 20252 and with the Ipsos MORI Terms and Conditions.

# Results



17-041629-01\_HE\_M5Speed audits March 2019\_Report\_Internal Client Use Only

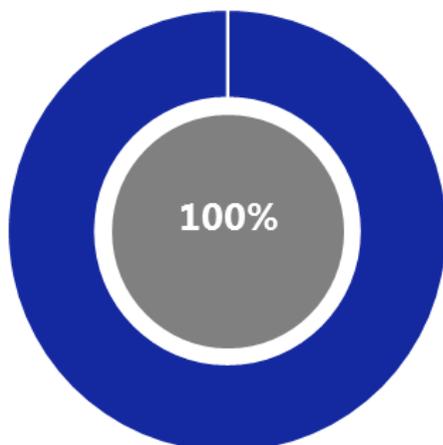
4

## Auditors stated that both the 50mph and 60mph speed were suitable

Did you feel the speed limit in place was appropriate for the conditions?

### 50 MPH

% Yes



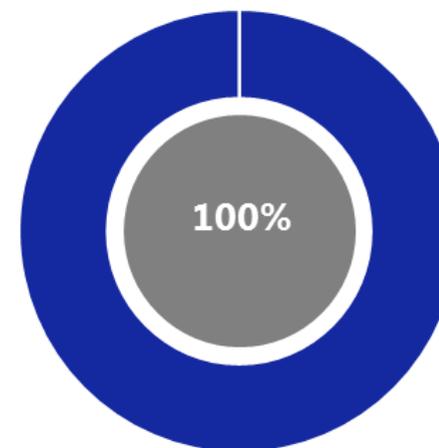
"The speed limit was slowed due to the work but appeared suitable."



Base: n=21

### 60 MPH

% Yes



"This did not reduce much from the national speed limit, therefore, not a lot of impact to drivers."

Base: n=25



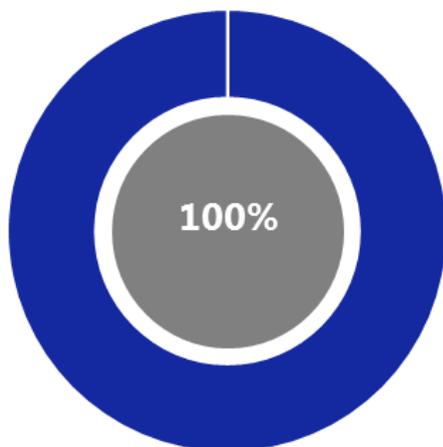
## In addition, the signage was easy to see



Was the signage displaying the speed limit easy to see?

### 50 MPH

% Yes



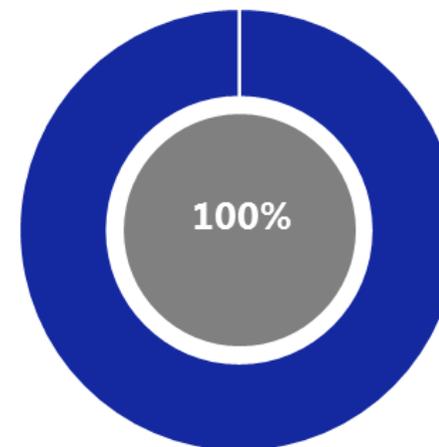
*"The 50mph signs were very clearly placed."*



Base: n=21

### 60 MPH

% Yes



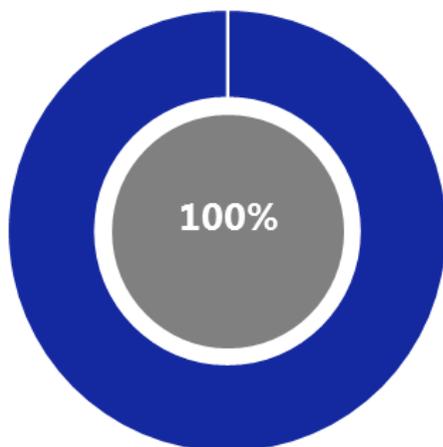
*"Speed limit signs throughout works."*

Base: n=25

# The higher speed limit felt as safe as the lower limit

Did you feel safe travelling at the speed limit through the scheme?

## 50 MPH

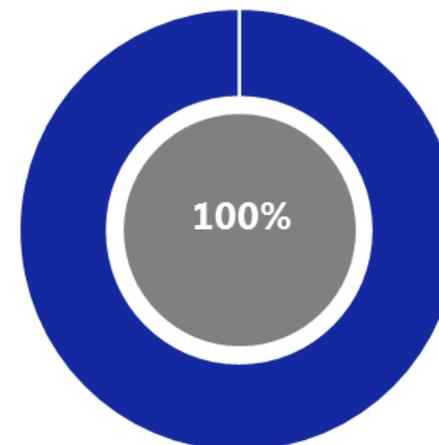


Average speed recorded by the auditor = 48 mph



Base: n=21

## 60 MPH



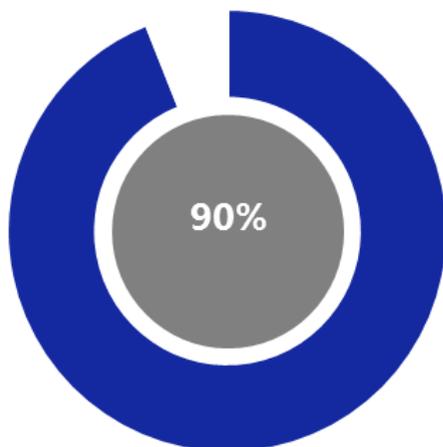
Average speed recorded by the auditor = 55 mph

Base: n=25

Auditors stated that both the 50mph and 60mph speed limits were suitable

Did you think the speed limit was too high / too low / about right? % **About right**

### 50 MPH



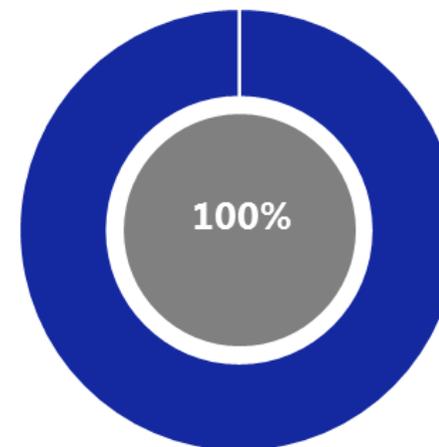
**10% stated the speed limit was too slow**

*"Possibly a higher limit would have improved it as I would have got through quicker and just as safely."*



Base: n=21

### 60 MPH



*"No concerns over speed limit, as you felt safe and uncrowded."*

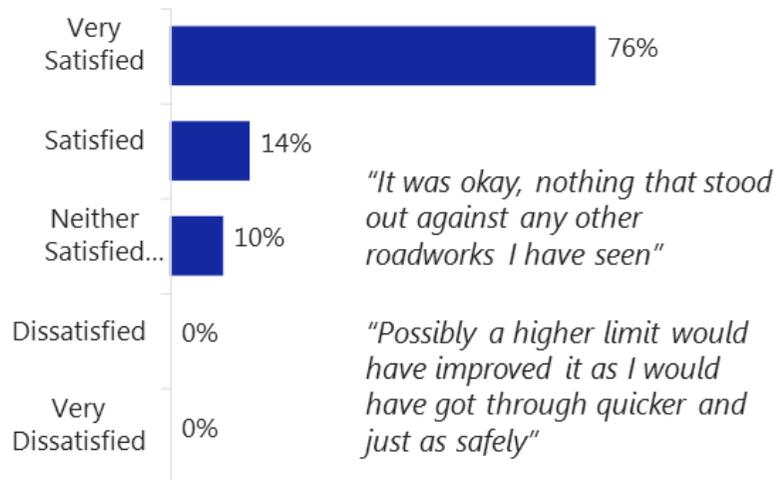
Base: n=25



Overall neither speed received a dissatisfied response. There was little difference between the 50mph limit and 60mph limit in satisfaction responses.

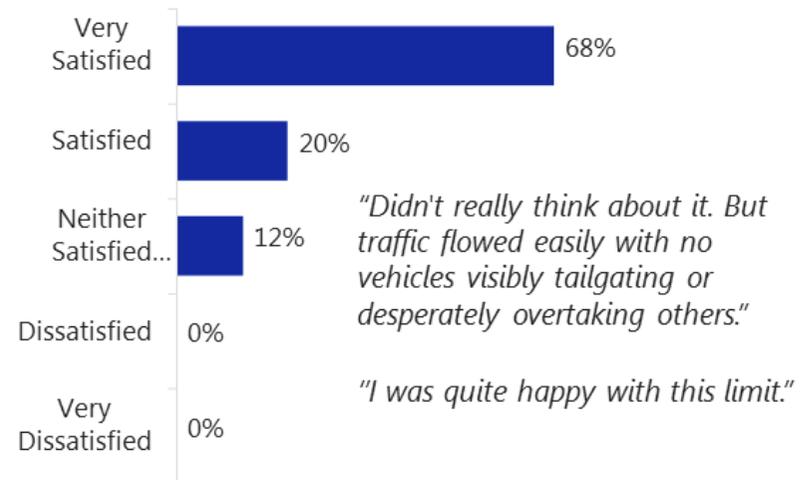
How satisfied were they with the speed limit?

### 50 MPH



Base: n=21

### 60 MPH



Base: n=25

# Recommendations & Conclusions



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## Recommendations & Conclusions



### The increase in speed limit was noted by some auditors but widely it was perceived very similarly to the 50mph limit

This is the second trial whereby auditors have undertaken observations. On the M49 trial, shoppers did note that safety was an issue at the higher limit. Especially when larger vehicles were in vicinity. However, this trend was not seen on the M5. Even in busy periods, the traffic flowed well at both speeds. A small proportion of the 50mph tests did state there may be a potential to increase the limit. This suggests that the disruption was kept to a minimum, and the lane sizes were suitable.

### Signage was very clear.

The auditors noted that they all saw the speed limit signage, and all of the signs were very clearly displayed. In comparison to the M49 this is a very positive result, as there were examples on that scheme where auditors couldn't see signage clearly. However, this could have been due to traffic levels.



## Monitoring and evaluation of the 60mph trials



The purpose of this trial was to understand the impact of changing the speed restriction within the M5 Willand road works scheme from 50mph to 60mph on driver behaviour, customer satisfaction and the scheme's costs 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.

Data were monitored from 'control' and 'experimental' locations positioned within and adjacent to the road works scheme. A number of 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 road side radar data, scheme incident logs, online surveys from customers and the scheme's workforce, and feedback gathered during workshops with scheme representatives.

Average speeds were found to increase significantly in response to the change in speed restriction at the scheme. This in turn resulted in reductions in average journey time and reductions in the proportion of drivers travelling over the speed limit. The change in speed restriction had little impact on self-reported levels of satisfaction. Further findings are detailed within the report.

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