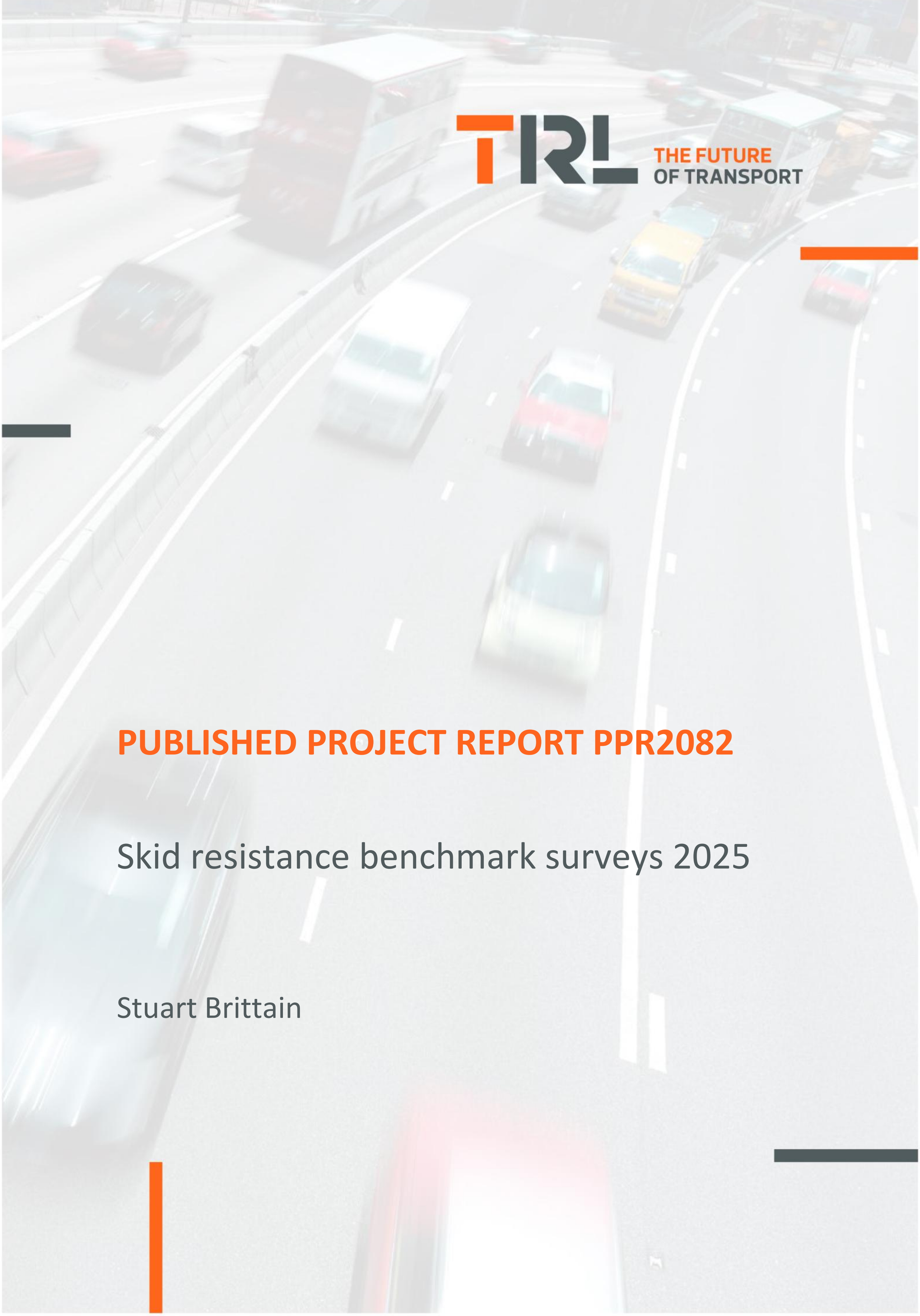

# PUBLISHED PROJECT REPORT PPR2082

## Skid resistance benchmark surveys 2025

Stuart Brittain

## Report details

| | | | |
|---|---|---|---|
| **Report prepared for:** | National Highways, SES | | |
| **Project/customer reference:** | SPaTS 2: T0098 | | |
| **Copyright:** | © TRL Limited | | |
| **Report date:** | 30/03/2026 | | |
| **Report status/version:** | Issue 1 | | |
| **Quality approval:** | | | |
| Cathy Booth (Project Manager) | 30/03/2026 | Martin Greene (Technical Reviewer) | 30/03/2026 |

## Disclaimer

# Executive summary

As part of its process for managing skid resistance on the Strategic Road network (SRN), National Highways undertakes single annual skid resistance surveys (SASS). These surveys are carried out over the course of the summer and are split over three survey periods (early, middle and late). It is known that skid resistance varies during the year and between years and the survey data is corrected by the application of correction factors called the "Local Equilibrium Correction Factors" (LECF). To monitor the ongoing trends in skid resistance levels, National Highways established a series of benchmark sites. These sites are surveyed in all three of the survey periods during the survey season. The data collected is then examined for within year and between year trends in the skid resistance levels. This report discusses the analysis of the benchmark sites survey data collected in 2025, and compares the results of the analysis to those from earlier years.

Initially, in 2002, 39 sites were selected as benchmark sites, with two additional sites added in 2008 and a further two in 2009. The initial 39 sites contain mainly asphalt surfaces and the additional four contain mainly concrete surfaces. For the analysis of the 2025 surveys 296 individual 100m lengths being suitable for use in the investigation of skid resistance trends over the last 10 years.

Comparison of the mean summer skid coefficient (MSSC) values from the asphalt benchmark sites suggests that 2025 was a "average to slightly low skid resistance" year in comparison to the average of the previous three years and a "low skid resistance" year when considering all of the years in the analysis.  The analysis also found that the minimum value appears to occur slightly before the midpoint of the middle period for the asphalt benchmark sites in 2025 (i.e. very slightly earlier than expected).

For the 2025 data, the between period standard deviation for the asphalt sites was below the 3 SR threshold suggesting very little seasonal variation. Conversely the concrete sites were just above the threshold. Examination of the change in skid resistance over the year identified that the asphalt sites followed the expected trend (with the minimum point slightly earlier as discussed above). The concrete sites did not follow the expected trend with the lowest values seen in the early period and the highest values in the late period. This suggests that the concrete sites are experiencing seasonal variation but it is different from the trend seen for the asphalt sites. Therefore, the practice of not applying the LECF calculated (primarily based on asphalt lengths) to the concrete lengths on the Strategic Road Network (SRN) should continue. However, further work should be undertaken to identify if concrete specific LECF values can be calculated and if they would provide a benefit.

Analysis of the results since 2010 identified that there appears to be a flat trend between 2010 and 2019 for both asphalt and concrete sites. This is then followed by a downward trend for both site types.  It is possible that this is indicative of a trend in skid resistance possibly due to longer term climatic changes. This should therefore be continued to be monitored to determine if this trend continues, returns to previous levels or if it stabilises at a new mean level.

An investigation into different geographic groupings of the benchmark sites was undertaken and this did not find any consistent geographic effects on the results.

# Table of Contents

# 1 Introduction

## 1.1 Background

As part of its process for managing skid resistance on the Strategic Road Network (SRN), National Highways undertakes single annual skid resistance surveys (SASS). These surveys are carried out over the course of the summer and are split over three survey periods (early, middle and late). It is known that skid resistance varies during the year and between years and the survey data is corrected by the application of correction factors called the "Local Equilibrium Correction Factors" (LECF). Further details on the surveys and how LECFs are calculated can be found in the skidding resistance part of the DMRB (DMRB CS 228)

To investigate long term trends in skid resistance values, National Highways established a series of benchmark sites. These benchmark sites have three surveys in each survey season (one in each survey period) in addition to the routine annual skid resistance survey. These additional surveys allow for the investigation of trends in skid resistance within and between years.

The first of the benchmark site surveys occurred in 2002 and they have been carried out in each year since. Initially there were 39 benchmark sites selected using the following criteria:

1. The site should be well defined (i.e. easily locatable)
2. Safe to test at 50km/h
3. Traffic delays or parked vehicles unlikely
4. Straight and level
5. Typical road surfacings (excluding concrete)
6. Surfacing in good condition

As part of the investigation into the seasonal correction values generated for the network (Donbavand & Brittain, 2007), it was found that concrete did not appear to behave in the same way as asphalt surfaces with regards to seasonal variation. National Highways therefore decided that some concrete sites should be added to the benchmark site investigations. Two sites were added in 2008 (labelled 40 and 41) and a further two were added in 2009 (labelled 42 and 43).

The expected distribution of skid resistance (shown diagrammatically in Figure 1.1) means that skid resistance should be at similar levels in the early and late period surveys with the middle period producing slightly lower results. However, during the analysis of the 2005 benchmark site data it was found that the late surveys did not appear to return to levels similar to the early surveys. It was decided that an additional very late survey (i.e. after the late period survey) would be conducted in 2006 to see if the skid resistance values returned to the levels seen in the early period. This additional survey was also conducted in 2007, 2008 and 2009. A review of the data from the additional very late surveys suggested that the skid resistance was returning to levels seen in the early period during the very late period. Based on these findings, National Highways decided that the survey season should be modified so that the late surveys would produce similar results to the early surveys. The modified survey periods were first used for the 2010 surveys and the survey periods are shown in Table 1.1. Analyses undertaken since 2010 have shown that the revised dates for the survey periods continue to remain suitable.

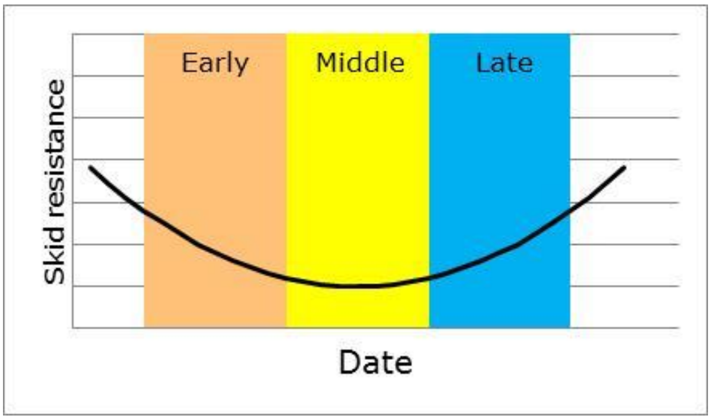


**Figure 1.1: Expected seasonal variation of skid resistance over the summer**

**Table 1.1: Dates for the skid resistance survey periods**

| | Prior to 2010 | 2010 onwards |
|---|---|---|
| Early start | 1st May | 1st May |
| Early end | 20th June | 27th June |
| Middle start | 21st June | 28th June |
| Middle end | 10th August | 24th August |
| Late start | 11th August | 25th August |
| Late end | 30th September | 20th October |
| Very Late[1] start | 1st October | n/a |
| Very late end | 31st October | n/a |

## 1.2 Directory of benchmark sites

The location and condition of each benchmark site is detailed within the directory of benchmark sites. The directory is a spreadsheet that contains schematics and summaries of the operators' notes to illustrate the surface changes and condition of each site. This directory is updated after each survey period to reflect the changes observed. The location information from the directory is reproduced in Table A.1 of Appendix A.

[1] The Very Late period was included in the surveys conducted in 2006 to 2009, inclusive

# 2 Analysis process

## 2.1 Development of 10 year rolling analysis

During the analysis of the 2011 skid resistance benchmark sites data (Brittain, 2012) it was proposed that the analysis process should be amended. Prior to the amendment, the process involved examining the data from all of the sites which had not had any treatment or other anomaly since the start of the benchmark site programme in 2002. Using this approach meant that, for the report on the 2011 data, only 21 of the 39 sites could be used in the main analysis.

To increase the amount of data included in the main analysis, a new approach was formulated which would only exclude the lengths maintained, rather than removing the whole site. In addition, a new cut-off date for identifying sites with anomalies or resurfaced lengths would be set at 2010 rather than 2002. This new date was selected in part due to availability of the data in a format suitable for this analysis, and partly due to the change in the survey periods which occurred in 2010.

In the analysis of the 2019 skid resistance benchmark sites data (Brittain, 2020) it was proposed that this analysis should be further refined to use a rolling 10 year analysis, i.e. for the analysis of the 2025 surveys, data from 2016 to 2025 would be used. The results from this analysis, incorporating the data from the 2025 surveys, are given in Section 4.

## 2.2 Combining 10 year rolling analyses

Over time, the 10 year rolling analysis approach will result in overlapping sets of 10 year analyses. Therefore, to provide an indication of trends going back to 2010 a method of providing values normalised to the current analysis from years before the current 10 year window was developed prior to the 2022 analysis.

The first step of this process is to determine the normalisation factor. This is calculated by dividing the average SR value for the earliest survey year in the current analysis by the average of the values obtained in previous analyses (which themselves are the average values of the included lengths) for the same survey year. This normalisation factor is then multiplied by the average SR values obtained for the earlier survey analyses (either directly measured or the normalised values) to generate the normalised value. This process is then repeated to produce normalised values back to 2010. An example illustrating this process is given in Figure 2.1.

| | Average SR for 2013 analysis year | Average SR for 2014 analysis year | Average SR for 2015 analysis year | Average SR for 2016 analysis year | Average SR for 2017 analysis year | Average SR for 2018 analysis year | Average SR for 2019 analysis year | Average SR for 2020 analysis year | Average SR for 2021 analysis year |
|---|---|---|---|---|---|---|---|---|---|
| 2010 survey year | I | II | III | IV | V | VI | VII | a | b |
| 2011 survey year | VIII | IX | X | XI | XII | XIII | XIV | XV | c |
| 2012 survey year | XVI | XVII | XVIII | XIX | XX | XXI | XXII | XXIII | XXIV |
| 2013 survey year | … | … | … | … | … | … | … | … | … |
| 2014 survey year | - | … | … | … | … | … | … | … | … |
| 2015 survey year | - | - | … | … | … | … | … | … | … |

Where:

$$a = \frac{XV}{Average(VIII\ to\ XIV)} \times Average(I\ to\ VII)$$

$$b = \frac{XXIV}{Average(XVI\ to\ XXIII)} \times Average(I\ to\ a)$$

$$c = \frac{XXIV}{Average(XVI\ to\ XXIII)} \times Average(VIII\ to\ XV)$$

**Figure 2.1: Overview of process for calculating normalised values for examination of trends since 2010**

## 2.3 Examination of trends going back to 2002

In previous reports on the benchmark sites, trends going back to 2002 were examined using an analysis based on the original approach. Each site used in this analysis needed to have no significant treatment or survey issues since 2002. As such the number of sites that could be included in this analysis and therefore its robustness has reduced over time. Of the 39 original sites, only 7 met these criteria when reviewing the 2025 data.

This analysis is also complicated by the fact that the dates for the survey periods were changed in 2010 meaning that data from before and after 2010 are not directly comparable. The trends seen from this analysis of the surveys after 2010 are consistent with the trends seen in the new approach. As such it has been identified that there is little benefit in continuing to report on the results of the analysis using the old approach and therefore it is not included in this report.

# 3 Survey issues

## 3.1 Alignment of data

Prior to 2021, the survey contractor provided data with markers entered using push button entry. When using these markers to align the data, it was found that the resulting alignments were, in general, good. It is, however, sometimes necessary to shift the locations of the markers by up to 50m (based on a visual analysis of the patterns in the data).

For the review of the 2021 surveys the data was manually aligned (using the graph shapes and OSGR data). This work identified that it would be better to use fitting tools to automatically identify the marker position using the OSGR data. This should ensure a good starting point for the alignment process. This approach was introduced for the 2022 surveys and the fitting was carried out using the software provided by National Highways (Machine Survey Pre-processor or MSP) to survey contractors to fit data for the SASS of the network. After fitting, the data was reviewed manually to identify if any small changes to the alignment would be necessary.

To run the fitting process, route files are required which contain OSGR coordinates of specified points in the survey. These were created prior to the 2022 analysis using the National Highways network section definition. The use of National Highways network sections will make it easier to extract the matching construction records (and other useful data) from National Highways pavement management system. It is known that the network definition can change over time so these files will need to be reviewed annually and updated as appropriate. In addition, some of the sites might start and finish partway through sections; as such, a record will be kept of these offsets and applied to the fitted data before manually checking the alignment. A review of the files prior to the processing of the 2025 data found that no updates were required in the reported position of the start and end points.

The average SR values for the whole of each site in each survey period (i.e. without removal of maintained lengths) is provided in Appendix B.

## 3.2 Issues and observations from surveys

Each 100m length of each site for each survey year is marked with one of three options. These are:

- Valid – No issues with the current year’s data and no maintenance between the previous year and the current year.
- Invalid – Issues with the consistency of the current year’s data. For example, if the length was resurfaced during the survey year or there was an issue with the survey (e.g. closed for roadworks). This data is not used in any analysis.
- Changed – Length has been resurfaced between the current and previous year’s survey. Previous data for this length will be excluded from future analyses (i.e. assuming no further issues this length will be re-included in the analyses in 10 years’ time).

For the 2025 survey data, ten sites (14, 15, 17, 21, 26, 32, 36, 37, 39 and 41) had issues identified from the data, the construction records in National Highways' pavement management system (P-AMS), the video and/or from the operator's notes (recorded in the directory of benchmark sites).

### 3.2.1 Site 14

The survey notes for this site identified maintenance was undertaken on three parts of this site prior to the early survey. These were between chainages 0 to 310, 860 to 1410 and 1620m to the end of the site. At the time of writing this report this maintenance was not recorded in P-AMS. Comparing the last year's average to the current year's data (see Figure 3.1) for these lengths showed some subtle changes which could be caused by a resurfacing. Therefore, for the 2025 survey these lengths have been marked as changed.

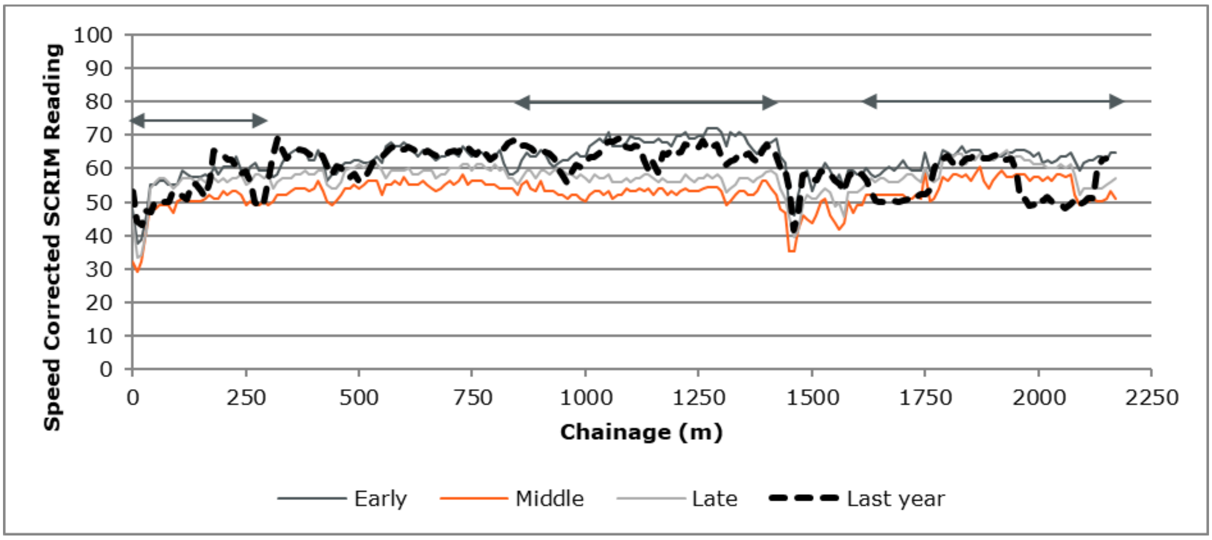


**Figure 3.1: Skid resistance values from the 2025 survey for site 14**

### 3.2.2 Site 15

Maintenance was identified in the survey notes between the early and middle surveys. At the time of writing this report this maintenance was not recorded in P-AMS. On examination of the survey data shown in Figure 3.2 it can be seen that the middle and late survey data differs over the reported length. Therefore, for the 2025 survey this length has been marked as invalid.

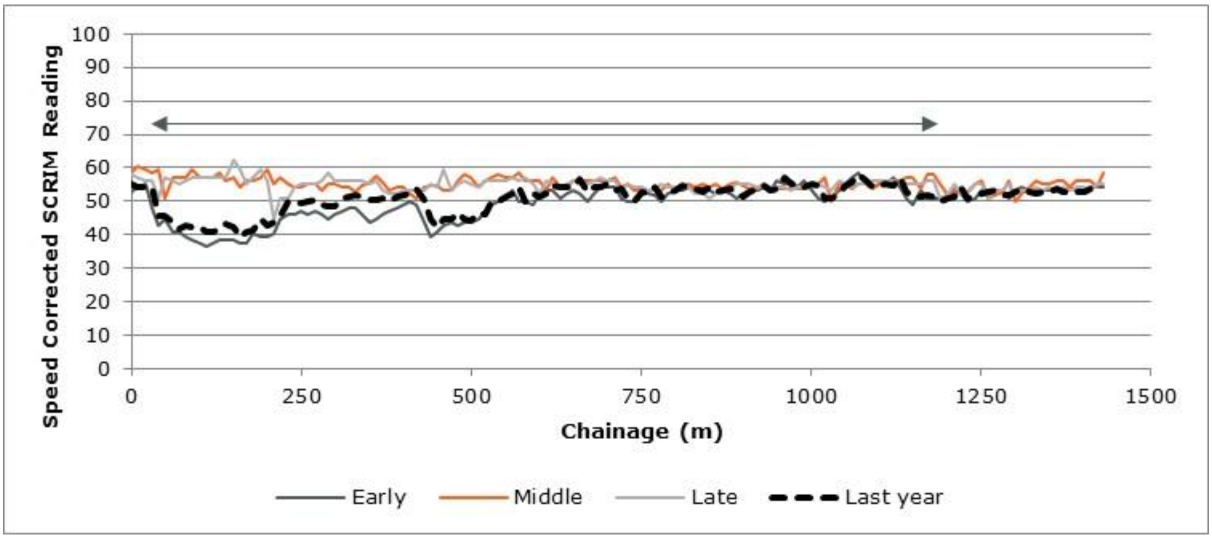


**Figure 3.2: Skid resistance values from the 2025 survey for site 15**

### *3.2.3 Site 17*

Both the survey notes and the P-AMS construction records identify a large proportion from the start of the site has been resurfaced between the 2024 and 2025 surveys. The lengths can also be seen in the survey data as shown in Figure 3.3. Therefore, these lengths have been marked as changed for the 2025 survey.

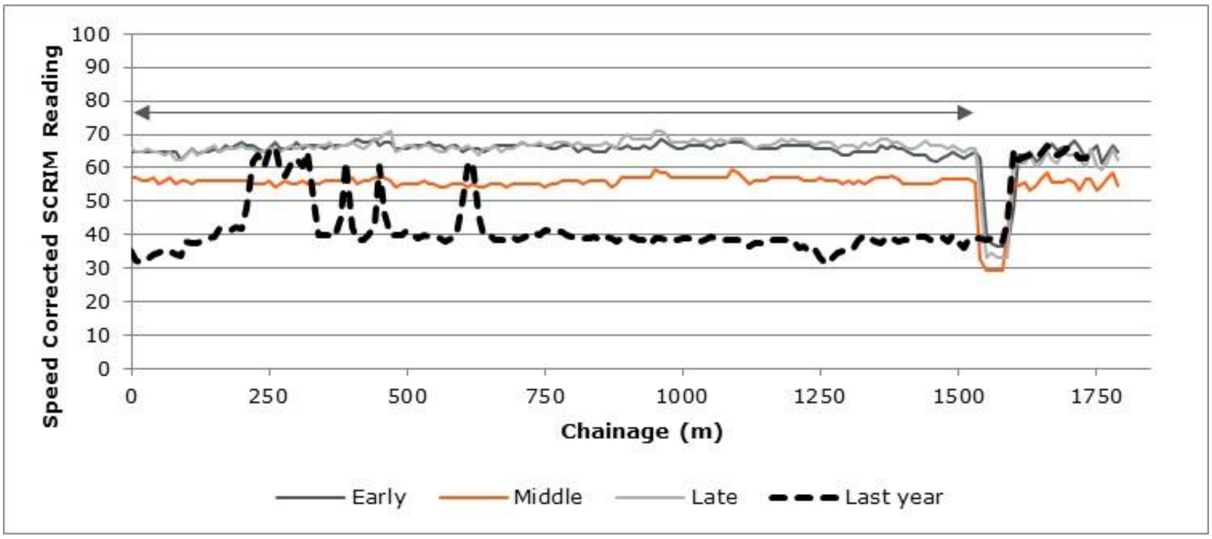


**Figure 3.3: Skid resistance values from the 2025 survey for site 17**

### *3.2.4 Site 21*

Examination of the survey data for site 21 identified a change in the condition between the early and middle surveys in 2025 as shown in Figure 3.4. The construction records within P-AMS record a resurfacing (although it is dated as 11th August which is after the middle survey). No change was observed in the survey notes. Due to the change within the year (over the whole site), the site has been marked as invalid for the 2025 survey.

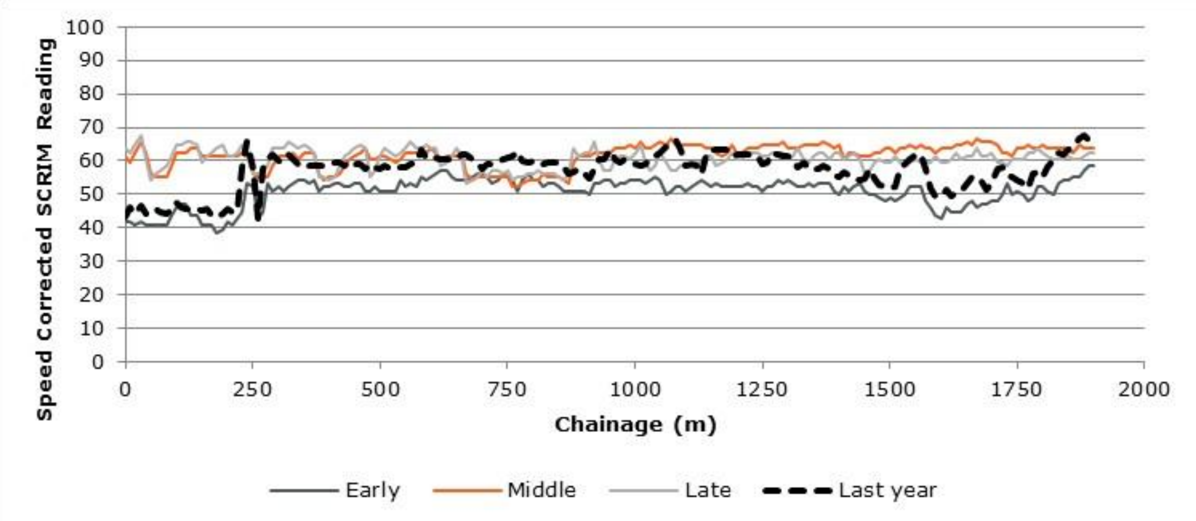


**Figure 3.4: Skid resistance values from the 2025 survey for site 21**

### *3.2.5 Site 26*

The start point of the early survey of this site was later than in previous years (and for the middle and late surveys). This meant that the first 100m of the site was missing for the early survey. As such the first 100m of the site has been marked as invalid for the 2025 survey.

### *3.2.6 Site 32*

The survey notes for this site identified that the end of the site may have been retextured between the middle and late surveys. At the time of writing this report this maintenance was not recorded in P-AMS. On examination of the survey data shown in Figure 3.5 it can be seen that there is a noticeable change between the middle and late surveys for the end of the site. Therefore, this length has been marked as invalid for the 2025 survey.

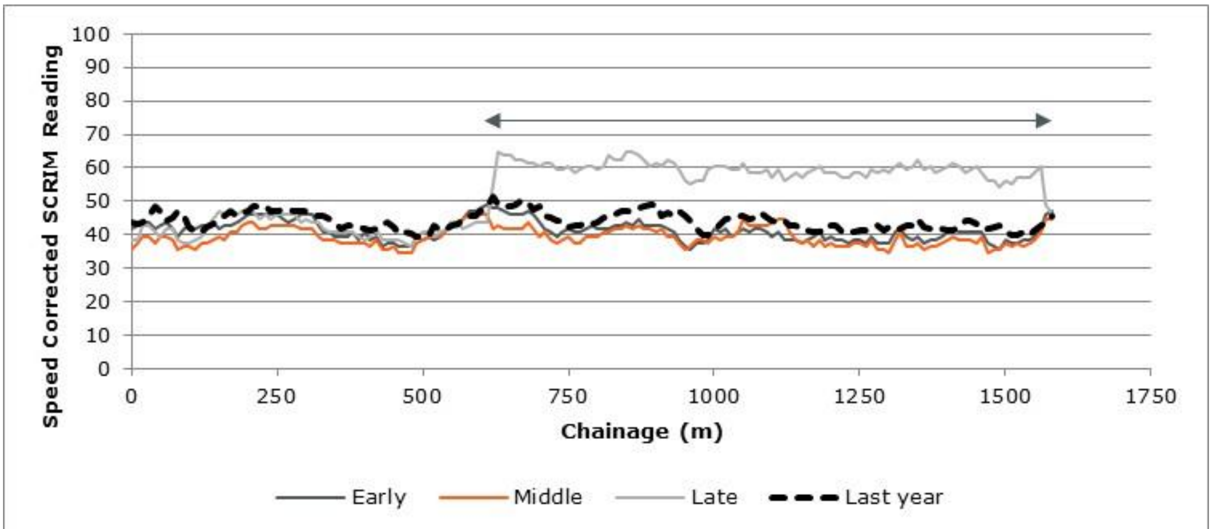


**Figure 3.5: Skid resistance values from the 2025 survey for site 32**

### 3.2.7 *Site 36*

On examination of the survey video it can be seen that the middle period survey of the site was carried out in lane 2 due to road works. This was recorded in the survey notes along with identifying that there was a new surface laid between the middle and late surveys. This maintenance is also recorded in P-AMS. Therefore, this site has been marked as invalid for the 2025 survey.

### 3.2.8 *Site 37*

A review of the survey data identified a change in the condition at the start of the site between the 2024 and 2025 surveys as shown in Figure 3.6. An inlay was also noted at this position in the survey notes. At the time of writing this report this maintenance was not recorded in P-AMS. This length has been marked as changed for the 2025 survey.

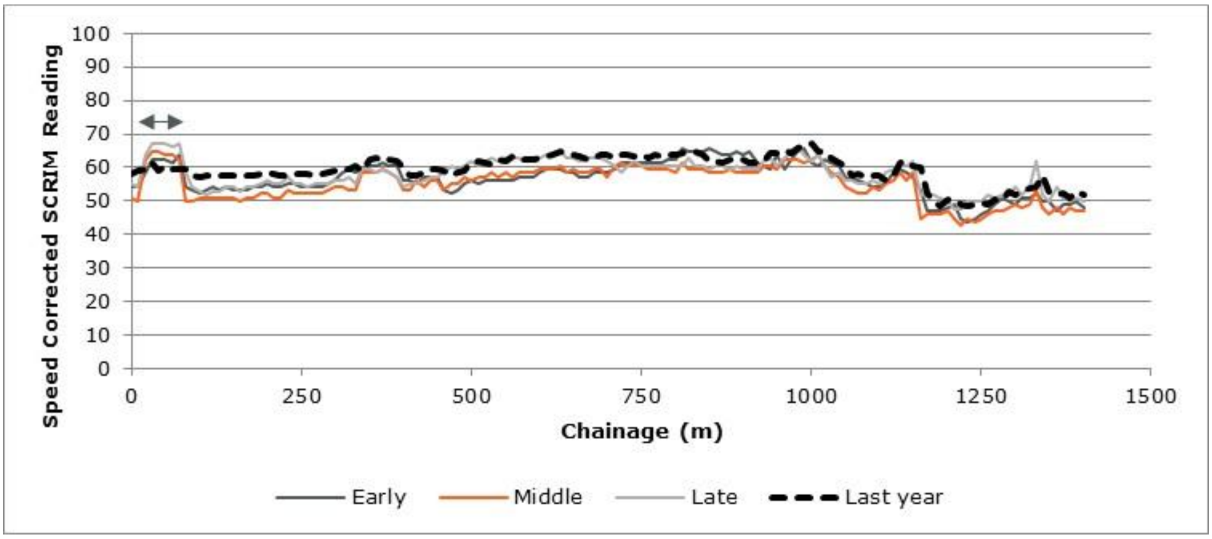


**Figure 3.6: Skid resistance values from the 2025 survey for site 37**

### 3.2.9 *Site 39*

The P-AMS construction records for this site identify that a retexturing treatment was undertaken for parts of the site before the early 2025 survey. This was also recorded in the operators notes and can be seen in the plot of the survey data as shown in Figure 3.7. These lengths have been marked as changed for the 2025 survey.

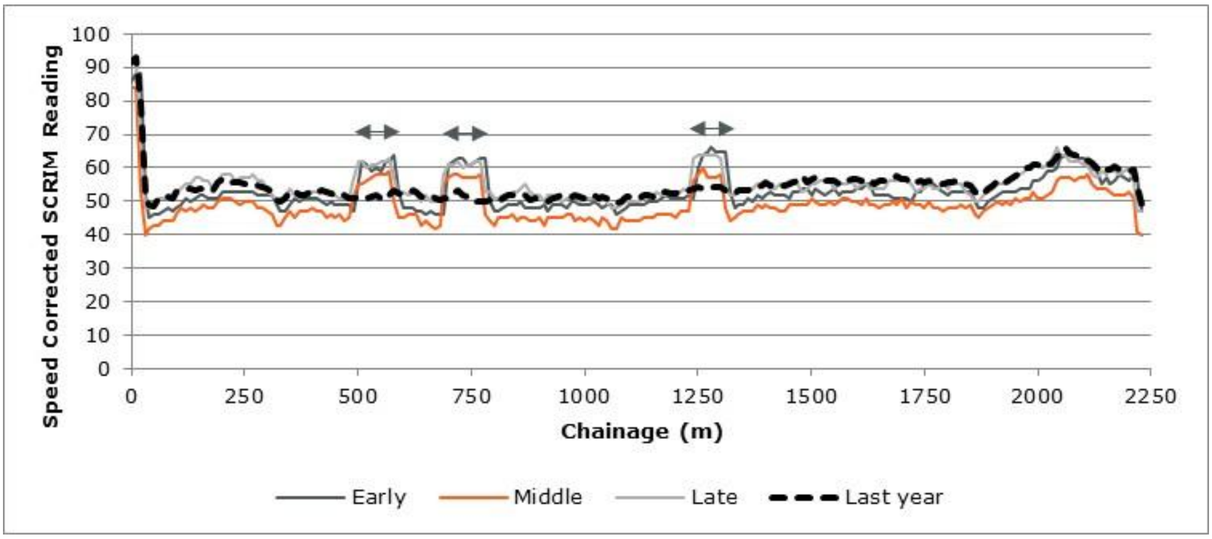


**Figure 3.7: Skid resistance values from the 2025 survey for site 39**

### *3.2.10 Site 41*

The first 2 km of this site (total length 5.62km) was resurfaced prior the 2025 survey. This is recorded in the survey notes and in P-AMS and can be seen in the plot of the survey data (Figure 3.8). This length has been marked as changed for the 2025 survey.

Site 41 is one of the concrete sites, and this length, along with the length resurfaced in 2022 (from the end of the 2025 resurfacing to 3.34km into the site) now have a bituminous surfacing. Therefore, it is recommended that for the analysis of the 2026 surveys (and onwards) the site should be analysed as two separate sites, site 41a and site 41b covering the bituminous and concrete lengths respectively. This will allow the data to be used appropriately in the analyses. It is noted that due to the rolling 10yr process and the variability seen in the length during the 2022 survey the bituminous part of the site would not be included in the analyses until 2033 at the earliest.

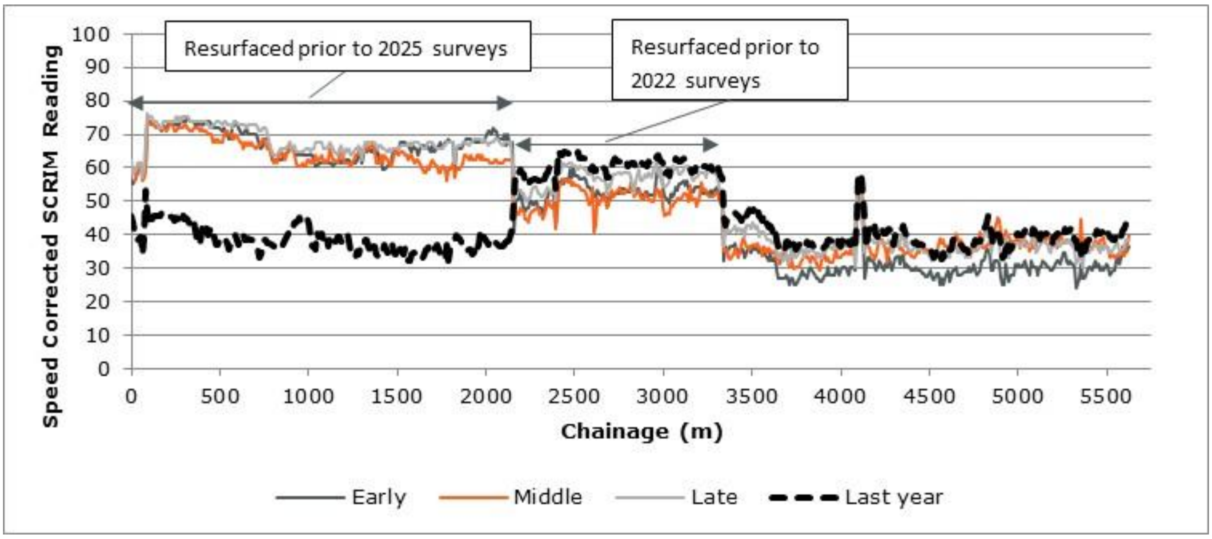


**Figure 3.8: Skid resistance values from the 2025 survey for site 41**

### *3.2.11 All lane running*

Some parts of the National Highways network have been converted to all lane running (ALR) which is resulting in Lane 1 changing position (to where the hard shoulder was). To date only two sites have been affected by changing to ALR.

The first is site 26 (on the M1). The first survey on this site on the new lane 1 was in 2015. As such it would have been expected to be re-included this year (due to the 10 year rolling analysis approach discussed in Section 4.1). However, during the middle and late surveys in 2024 the site was closed for roadworks. It is therefore expected that this site would be reincluded in 2034.

The second is site 23 (on the M6). The first survey on this site on the new lane 1 was in 2022. As such this site is currently excluded from the analysis and is expected to be reincluded in 2032.

# 4 Results from the 2025 surveys (10 year rolling analysis)

## 4.1 Average SR and between survey variation

The process implemented to examine data may, in some years, result in some of the sites reducing to very short lengths. These shorter sites should not have as much input into the overall benchmark statistics as longer sites. To allow a sensible weighting of the data, each site is split into 100m lengths, with the average values for each 100m length being averaged together to produce the overall average for the benchmark sites. The results from the 2025 surveys are given in Table 4.1.

Using this process means that the lengths used in the benchmark site analysis can change each year and, as such, the data provided in previous years' reports will not always be directly comparable to that in the current year's report. This is because some lengths will be excluded in the current analysis which were not previously excluded. In addition, lengths that were excluded as a result of the data collected 11 years ago would be brought back in for this analysis. To provide a comparison to the results of this year's analysis, the data from the preceding 9 years have been reprocessed using the same lengths used for the 2025 analysis; this analysis is presented in Appendix C.

Utilising 100m averages for this analysis also allows for the investigation of between run variation using the criteria from the accreditation trials for sideway-force skid resistance devices (TRL, 2020) as a comparison; i.e. if the road conditions remain the same, the upper limit on the acceptable between run standard deviation is 3 SR. This means that if seasonal variation is occurring then it would be expected that the variation between the early, middle and late runs would be larger than 3 SR. Note, the between run standard deviations have been averaged together using the root mean square approach (the standard approach for calculating averages of standard deviations).

For the 2025 data the between run standard deviation (BRSD) is below the 3 SR threshold for asphalt sites and above the threshold for concrete sites.

**Table 4.1: 2025 survey data**

| Site | Number of 100m lengths | Early Avg. SR | Middle Avg. SR | Late Avg. SR | BRSD | Average |
|---|---|---|---|---|---|---|
| 1 | 22 | 60.9 | 61.8 | 58.6 | 2.51 | 60.5 |
| 2 | 0 | - | - | - | - | - |
| 3 | 0 | - | - | - | - | - |
| 4 | 0 | - | - | - | - | - |
| 5 | 0 | - | - | - | - | - |
| 6 | 0 | - | - | - | - | - |
| 7 | 0 | - | - | - | - | - |
| 8 | 0 | - | - | - | - | - |
| 9 | 0 | - | - | - | - | - |
| 10 | 23 | 54.4 | 50.5 | 51.9 | 2.28 | 52.3 |
| 11 | 3 | 60.3 | 63.1 | 62.4 | 1.67 | 61.9 |
| 12 | 9 | 50.3 | 51.3 | 56.9 | 3.70 | 52.8 |
| 13 | 11 | 48.4 | 43.7 | 46.2 | 2.46 | 46.1 |
| 14 | 5 | 62.4 | 53.1 | 57.6 | 4.69 | 57.7 |
| 15 | 2 | 52.8 | 54.2 | 53.6 | 0.78 | 53.5 |
| 16 | 15 | 53.5 | 47.6 | 49.7 | 3.30 | 50.3 |
| 17 | 0 | - | - | - | - | - |
| 18 | 0 | - | - | - | - | - |
| 19 | 0 | - | - | - | - | - |
| 20 | 16 | 54.8 | 50.4 | 51.6 | 2.55 | 52.2 |
| 21 | 0 | - | - | - | - | - |
| 22 | 0 | - | - | - | - | - |
| 23 | 0 | - | - | - | - | - |
| 24 | 11 | 56.5 | 49.6 | 53.1 | 3.51 | 53.1 |
| 25 | 13 | 62.1 | 56.8 | 58.9 | 2.76 | 59.3 |
| 26 | 0 | - | - | - | - | - |
| 27 | 15 | 59.5 | 56.3 | 58.2 | 1.99 | 58.0 |
| 28 | 0 | - | - | - | - | - |
| 29 | 11 | 42.7 | 42.0 | 44.6 | 1.48 | 43.1 |
| 30 | 0 | - | - | - | - | - |
| 31 | 14 | 57.3 | 55.1 | 58.7 | 2.48 | 57.0 |
| 32 | 1 | 42.4 | 42.1 | 41.9 | 0.26 | 42.2 |
| 33 | 0 | - | - | - | - | - |
| 34 | 0 | - | - | - | - | - |
| 35 | 13 | 51.0 | 46.3 | 48.6 | 2.39 | 48.7 |
| 36 | 0 | - | - | - | - | - |
| 37 | 13 | 56.6 | 54.9 | 57.7 | 1.94 | 56.4 |
| 38 | 14 | 51.5 | 49.1 | 52.3 | 1.93 | 50.9 |
| 39 | 16 | 52.0 | 48.1 | 54.4 | 3.29 | 51.5 |
| 40 | 13 | 51.0 | 48.5 | 52.6 | 2.25 | 50.7 |
| 41 | 22 | 30.6 | 36.4 | 36.8 | 3.73 | 34.6 |
| 42 | 18 | 39.3 | 39.7 | 46.3 | 3.97 | 41.8 |
| 43 | 16 | 48.5 | 48.8 | 49.4 | 1.23 | 48.9 |
| Asphalt 0-39 | 227 | 54.8 | 51.6 | 53.8 | 2.64 | 53.4 |
| Concrete 40-43 | 69 | 40.9 | 42.4 | 45.2 | 3.14 | 42.8 |

A summary of between run standard deviations (BRSD) and the average SR values since 2016 are presented in Table 4.2 for the asphalt lengths and in Table 4.3 for the concrete lengths. The BRSD values are also shown in Figure 4.1, and the average SR values in Figure 4.2 (along with the trend lines for the data).

**Table 4.2: Summary of asphalt site data**

| Year | BRSD | Average SR |
|---|---|---|
| 2016 | 5.04 | 60.4 |
| 2017 | 6.32 | 58.5 |
| 2018 | 5.51 | 60.7 |
| 2019 | 4.46 | 60.0 |
| 2020 | 4.40 | 58.4 |
| 2021 | 5.91 | 58.6 |
| 2022 | 5.64 | 53.1 |
| 2023 | 2.77 | 56.5 |
| 2024 | 4.49 | 57.7 |
| 2025 | 2.64 | 53.4 |
| Average | 4.86 | 57.7 |

**Table 4.3: Summary of concrete site data**

| Year | BRSD | Average SR |
|---|---|---|
| 2016 | 2.16 | 52.0 |
| 2017 | 3.85 | 48.2 |
| 2018 | 3.62 | 50.4 |
| 2019 | 3.48 | 49.4 |
| 2020 | 2.42 | 46.0 |
| 2021 | 5.34 | 47.6 |
| 2022 | 3.90 | 42.9 |
| 2023 | 3.81 | 44.6 |
| 2024 | 3.82 | 46.4 |
| 2025 | 3.14 | 42.8 |
| Average | 3.65 | 47.0 |

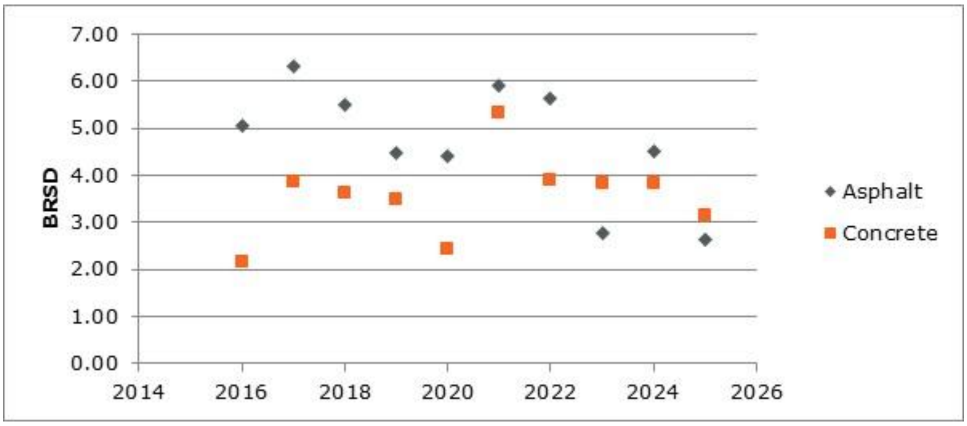


**Figure 4.1: Average BRSD of Benchmark sites over 10 year analysis period**

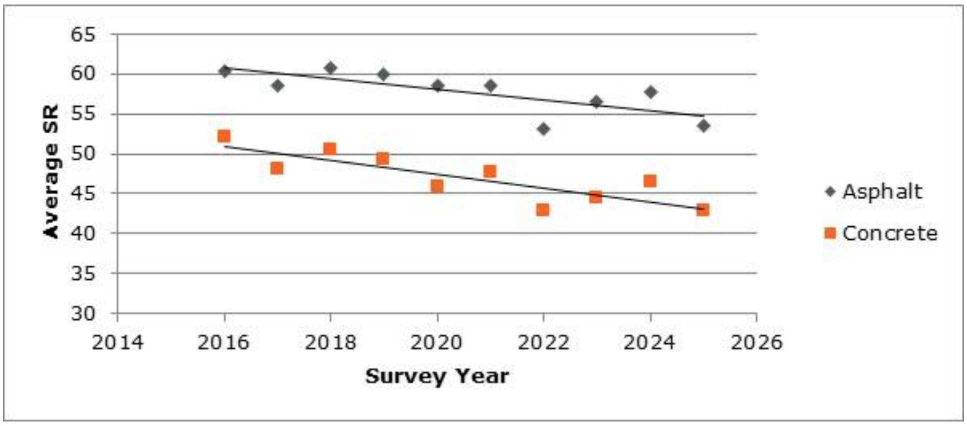


**Figure 4.2: Average SR of Benchmark sites over 10 year analysis period**

Table 4.2, Table 4.3 and Figure 4.1 show that the between run or between period standard deviation (BRSD) for the asphalt surfaces is highest for the 2017, 2018, 2021 and 2022 survey years, and lowest in 2023 and 2025. In addition, in the last 10 years, the BRSD is at or below the BRSD criteria from the accreditation trials (3 SR) in two instances for the asphalt surfaces (2023, 2025) and two years for the concrete surfaces (2016 and 2020). This suggests that the variation during these years is likely to be mainly or solely caused by normal machine variation.

Table 4.2, Table 4.3 and Figure 4.2 suggest that there is a downward trend in the average SR value over time for both asphalt and concrete sites. However, it can also be seen for the asphalt sites this trend is driven mainly by the lower values from 2022 onwards, with a fairly flat trend seen between 2016 and 2021.

## 4.2 Expected distribution of SC for asphalt sites

In order to visualise the variation of Skid Coefficient (SC) throughout the course of the survey season the ratio of the MSSC value to the measured value (for each period and each 100m length) was calculated. This ratio is approximately equivalent to a Local Equilibrium Correction Factor (LECF) value (although strictly it is not, as it would only correct within year variation and it is being applied to 100m lengths). The average MSSC value for the complete 2025 dataset was then divided by these “LECF” values and combined with the survey dates to produce an estimate for the distribution of SC values.

Using this approach allows the current year’s data to be compared to previous years on a like for like basis. In particular, differences in average values between years and also within year trends can be investigated. The lines of best fit for the data for the last five years are shown in Figure 4.3.

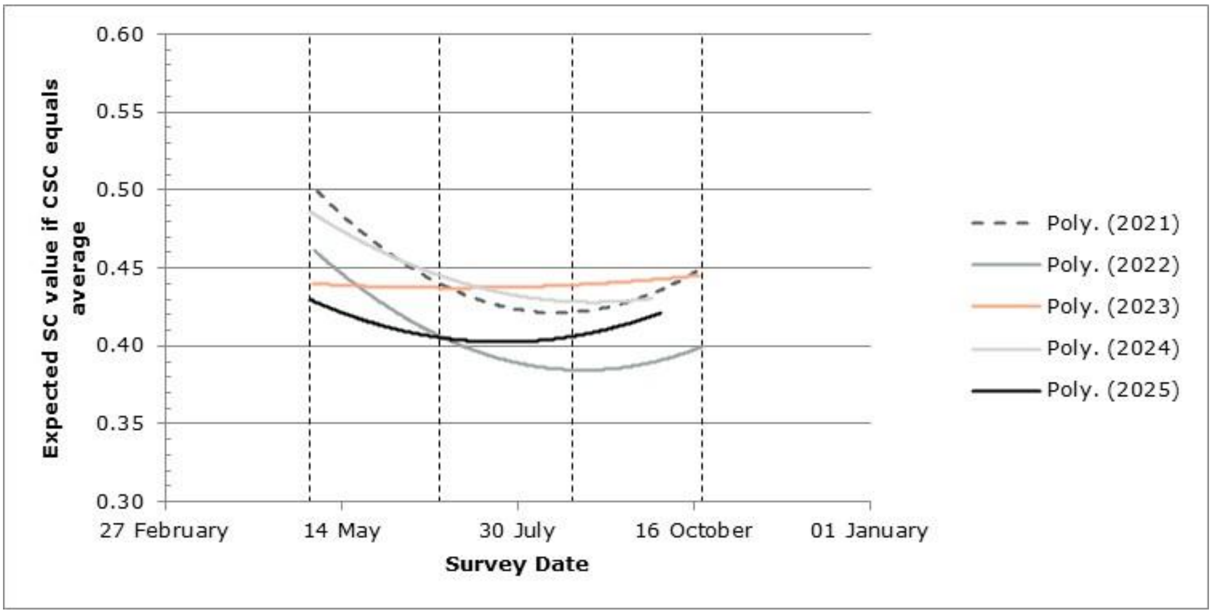


**Figure 4.3: Expected SC values (sites 1-39)**

It can be seen from Figure 4.3 that the within year seasonal variation, varies from year to year. It can also be seen that for the 2025 data the minimum value appears to be just before the expected point at the middle of the middle period. For the 2025 and 2024 surveys, the late surveys were completed about midway through the period which is why the lines end earlier on the graph.

The analysis of the 2025 LECFs (Brittain, 2026) suggested that the minimum value occurred towards the beginning of the middle period (i.e. slightly earlier than the benchmark site analysis suggests).

It is noted that in recent years the minimum value appeared towards the end of the middle period. This therefore suggests that the date of the minimum value can vary from year to year. In addition, the skid resistance has recovered in the late period to values similar to those in the early which also has not been the case in recent years. As such no changes to the dates of the survey season are recommended at this point. However, it is recommended that the suitability of the survey periods should continue to be reviewed on an annual basis.

The analysis of the 2025 LECFs also found that the measured skid resistance over the year was an average to slightly low skid resistance compared to the previous three years. On examination of Table 4.2 it can be seen that this is also true for the asphalt benchmark sites with an average value of 53.4 in 2025 compared to the average of the previous three years (2022, 2023 and 2024) of 55.8.

## 4.3 Expected distribution of SC for concrete sites

The approach used to visualise the distribution of SC values for asphalt sites (see Section 4.2) was also applied to the concrete sites and the results are shown in Figure 4.4.

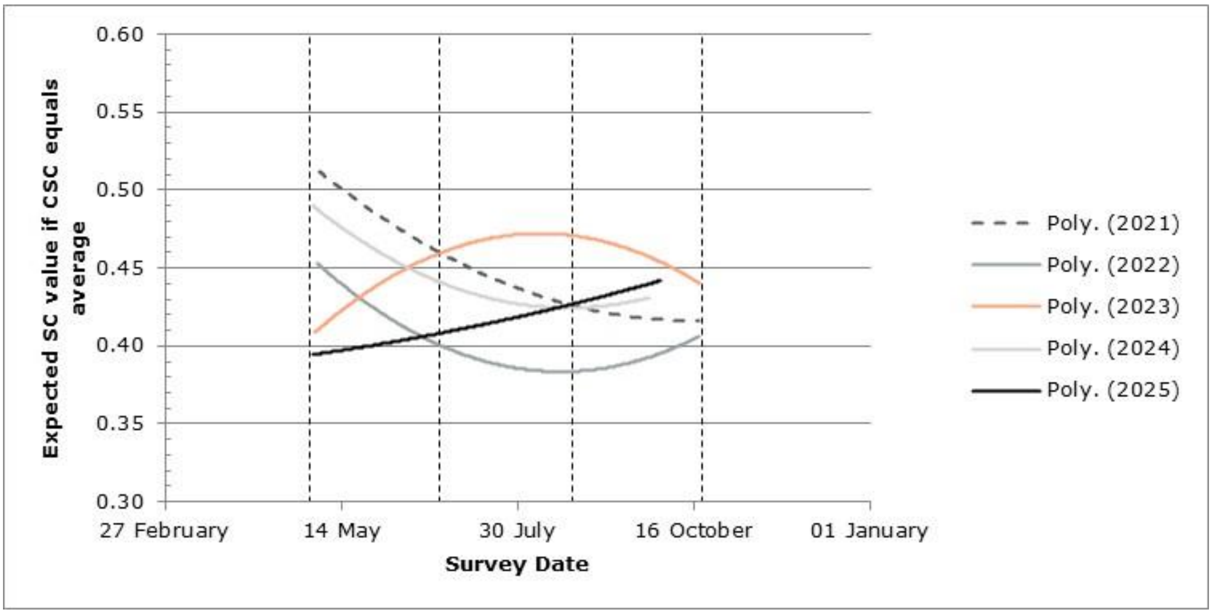


**Figure 4.4: Expected SC values (sites 40-43)**

Although there is a larger spread in the values from the concrete sites over 2025 relative to the asphalt sites (as seen by the larger BRSD value), the shape is not consistent with expectations. In 2025 the lowest value occurs during the early period. Examination of the previous years identifies that 2024, 2022 and 2021 showed the expected shape (with variations in the position of the lowest point). The 2023 surveys suggest the inverse of the expected relationship. The results from the 2023 surveys are further discussed in the 2023 benchmark sites report (Brittain, 2024) . As with previous years, these results suggest that concrete sites do experience seasonal variation but that this variation may differ from the variation seen for asphalt sites. Therefore, the practice of not applying the LECF calculated (primarily based on asphalt lengths) to the concrete lengths on the Strategic Road Network (SRN) should continue. However, further work is being undertaken to identify if concrete specific LECF values can be calculated and if they would provide a benefit.

## 4.4 Monitoring lengths available for the analysis

As discussed in section 2.1 the analysis carried out each year incorporates each 100m length which has not been maintained or had any anomalies in the rolling 10 year cut-off. This means that the lengths available to the analysis changes each year. The lengths used in the analysis for each survey year is given in Figure 4.5 for asphalt lengths and in Figure 4.6 for concrete lengths.

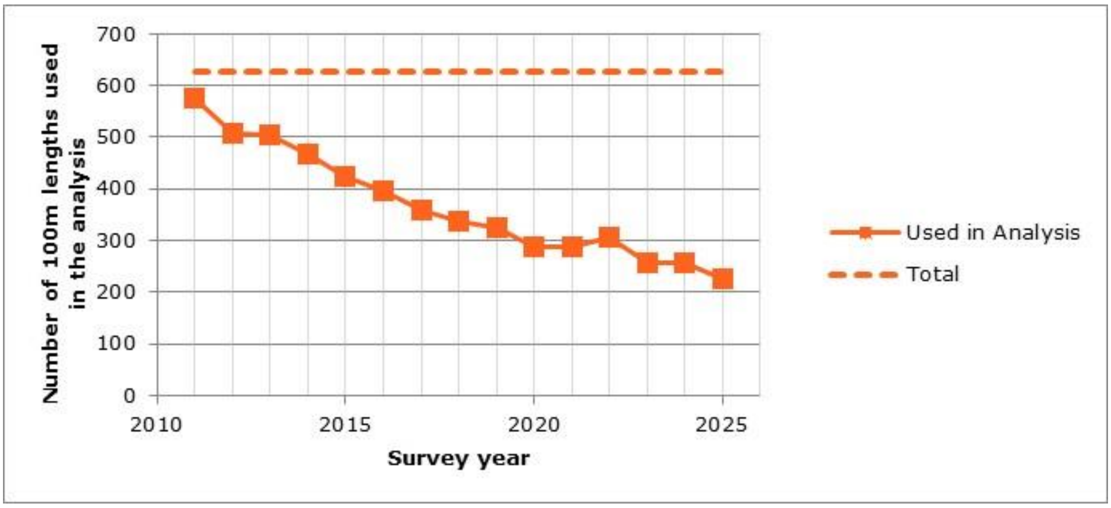


**Figure 4.5: Number of 100m asphalt lengths used in the anlaysis**

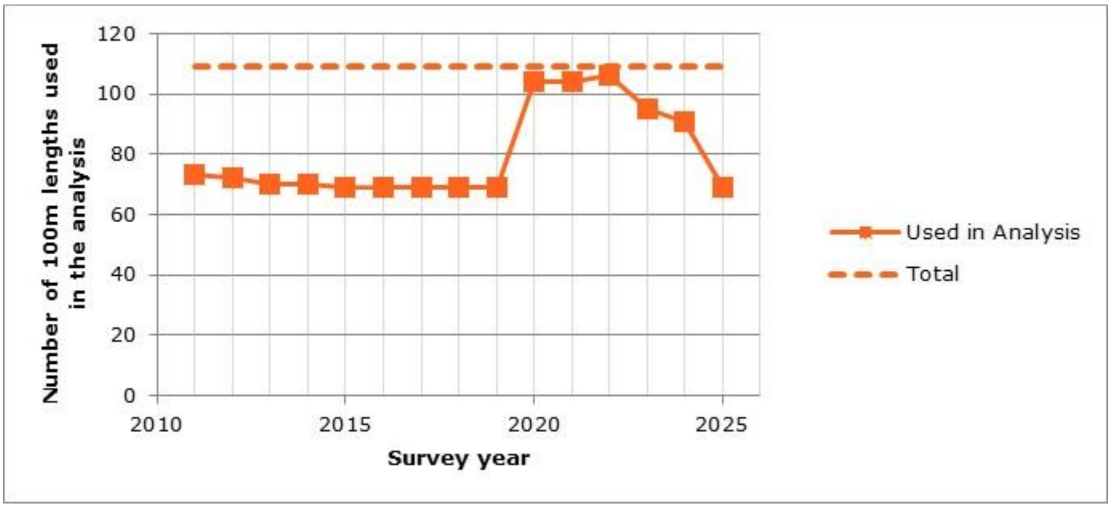


**Figure 4.6: Number of 100m concrete lengths used in the anlaysis**

The number of asphalt lengths decreased slightly this year and the number of concrete lengths decreased more significantly. Overall, 36% of the asphalt lengths were used in the current analysis, and 63% of the concrete lengths.

# 5 Results since 2010

As noted in Section 2.2, a method for combining the current 10 year rolling analysis with previous analyses has been developed to provide trends in SR values since 2010. The result of this analysis is presented in Figure 5.1 and Table 5.1.

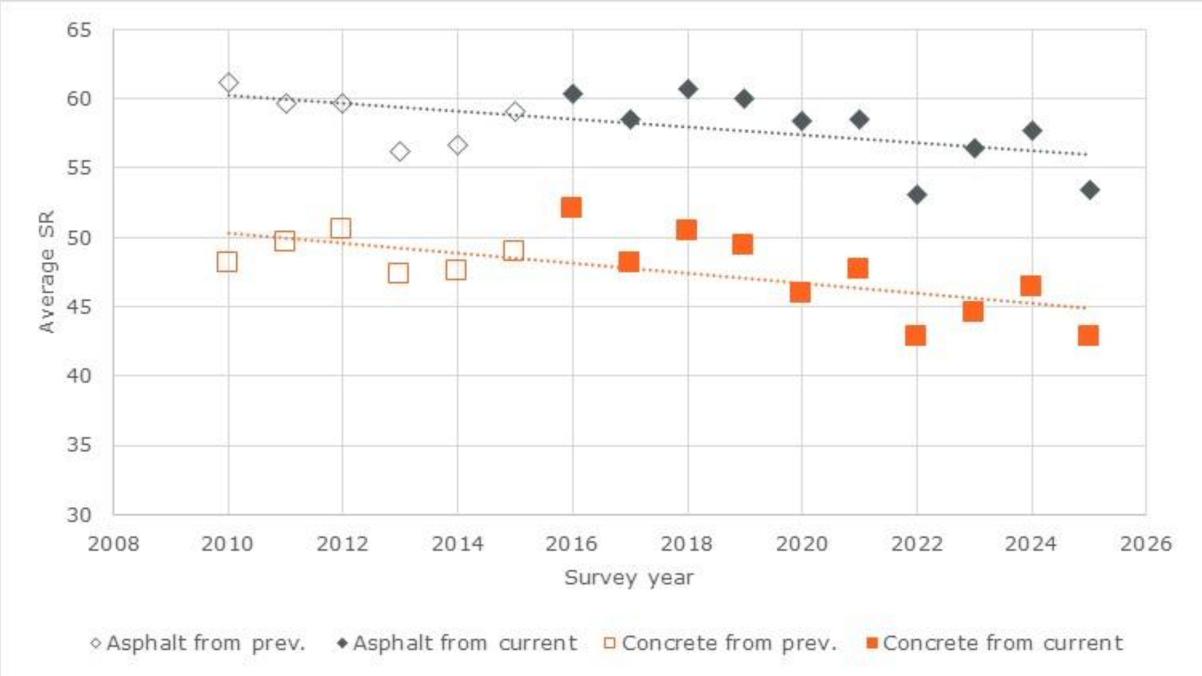


**Figure 5.1: Average SR of Benchmark sites since 2010**

**Table 5.1: Average SR of Benchmark sites since 2010**

| Year | Asphalt sites | Concrete sites |
|---|---|---|
| 2010 (estimate) | 61.23 | 48.11 |
| 2011 (estimate) | 59.64 | 49.64 |
| 2012 (estimate) | 59.72 | 50.55 |
| 2013 (estimate) | 56.23 | 47.34 |
| 2014 (estimate) | 56.68 | 47.59 |
| 2015 (estimate) | 59.14 | 48.91 |
| 2016 | 60.36 | 52.02 |
| 2017 | 58.49 | 48.18 |
| 2018 | 60.69 | 50.44 |
| 2019 | 59.98 | 49.35 |
| 2020 | 58.44 | 45.97 |
| 2021 | 58.56 | 47.65 |
| 2022 | 53.14 | 42.87 |
| 2023 | 56.49 | 44.58 |
| 2024 | 57.67 | 46.39 |
| 2025 | 53.43 | 42.82 |

The data shown in Figure 5.1 and Table 5.1 suggests a slight downward trend to SR over time. However, it could also be interpreted as close to a flat trend between 2010 and 2019, followed by a downward trend since 2019. This is illustrated in Figure 5.2 where the graph has been reproduced with the lines of best fit split in two at 2019.

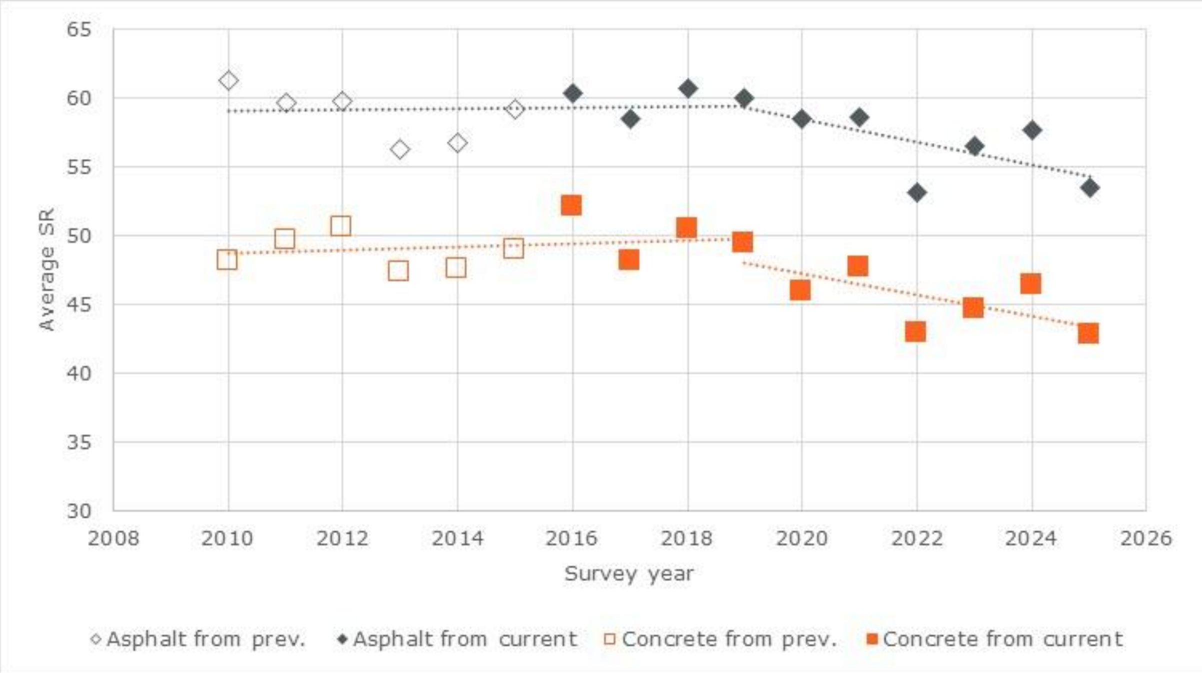


**Figure 5.2: Average SR of Benchmark sites since 2010 (with split lines of best fit)**

This suggests that there may be changes in skid resistance due to longer term climatic changes. It is however possible that this might be a temporary reduction and the values may return to similar values as before. This should, therefore, continue to be monitored to determine if this trend persists or whether SR values return to previous levels or if they stabilise at a new mean level.

If this trend continues or stabilises at a new level then this will have implications for the reporting of the pavement condition in National Highways key performance indicator (KPI). However, it is noted that due to implementation of seasonal correction (which normalises the current year's data to the average of the previous three years), any change will have a delayed effect on the KPI. If the values do not return to previous levels then it might be necessary to assess the impact of the reducing trend on National Highways' skid resistance policy. In addition, it might also lead to the need to review the appropriate levels of PSV (polished stone value) specified in "Surface course materials for construction" (DMRB CD 236).

# 6 Investigation into geographic effects on trends in skid resistance

The benchmark sites are distributed relatively evenly around the National Highways SRN. As such the analysis presented in Sections 4 and 5 provides good information on the overall trend for the SRN. However, it is possible that parts of the SRN may experience different trends in skid resistance over time due to more localised changes in climate or other effects.

To investigate possible locational effects, the benchmark sites were split into groups based on their location on the SRN. In order to maintain reasonably sized datasets for the analysis, it was decided that two grouping analyses would be undertaken. The first would compare the eastern and western sites, and the second would compare northern, central and southern sites. As there are relatively few concrete sites (and they show different patterns to the asphalt sites) these sites have been excluded from this analysis. The list of sites and the groupings assigned are provided in Appendix A. A pictorial representation of the east/west grouping is shown in Figure 6.1 and for the north/central/south grouping in Figure 6.2 (although not included in the analysis the concrete sites are also shown to indicate their locations). The number of 100m lengths available for each grouping in the 2025 analysis is shown in Table 6.1.

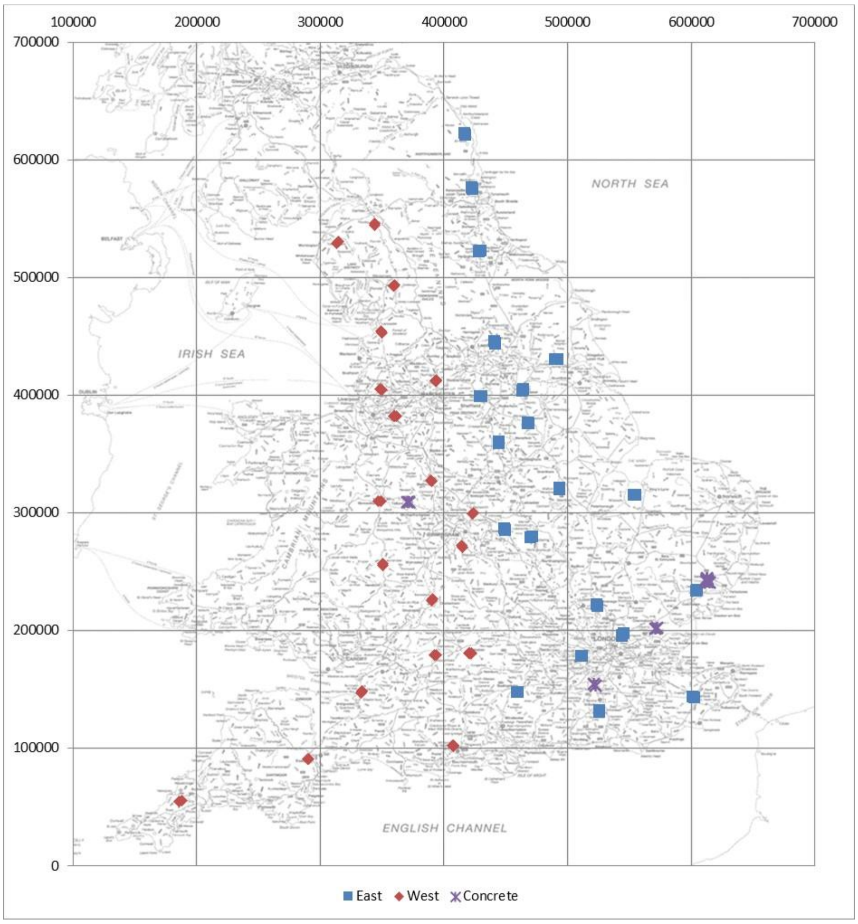


**Figure 6.1: Map of east/west grouping of Benchmark sites (contains Ordinance Survey data © Crown copyright and database right 2026)**

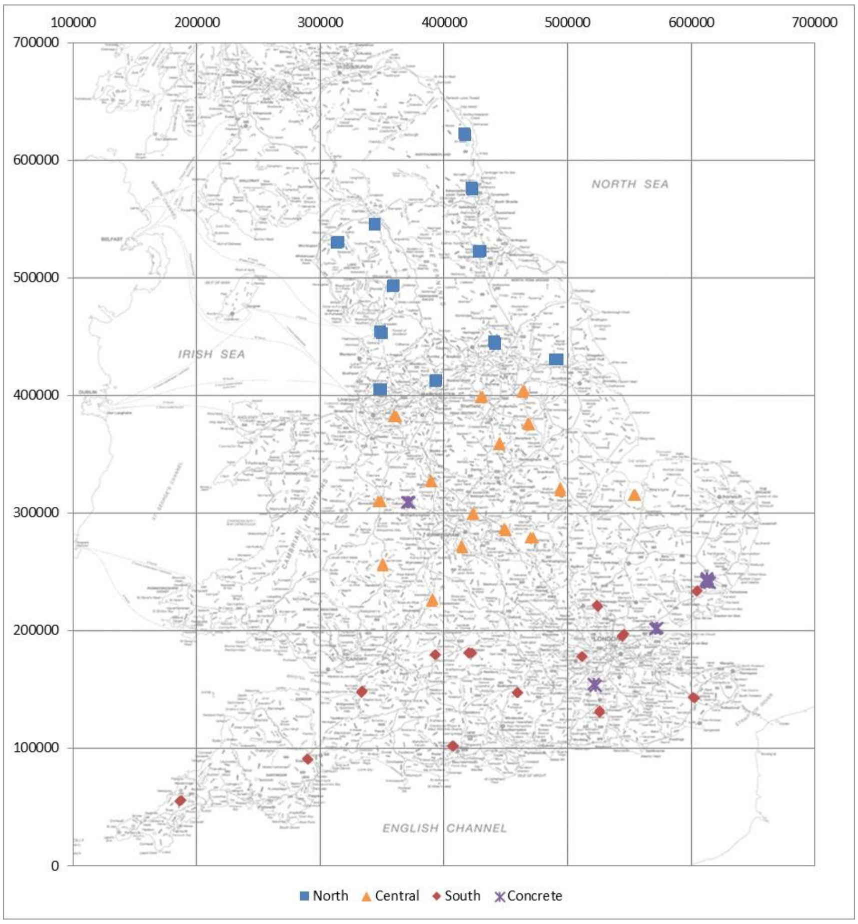


**Figure 6.2: Map of north/central/south grouping of Benchmark sites (contains Ordinance Survey data © Crown copyright and database right 2026)**

**Table 6.1: Number of 100m lengths in each geographic grouping for the analysis**

| Group | Number of 100m lengths |
|---|---|
| East | 124 |
| West | 103 |
| North | 71 |
| Central | 84 |
| South | 72 |

After splitting the sites into different groups, the average SR values for each grouping and each year were calculated. For this analysis we are interested in how the average SR varies over time for each grouping. Therefore, the difference in the SR value each year relative to the earliest year in the analysis (2016) was calculated for each grouping. This data can be seen in Figure 6.3 and Figure 6.4.

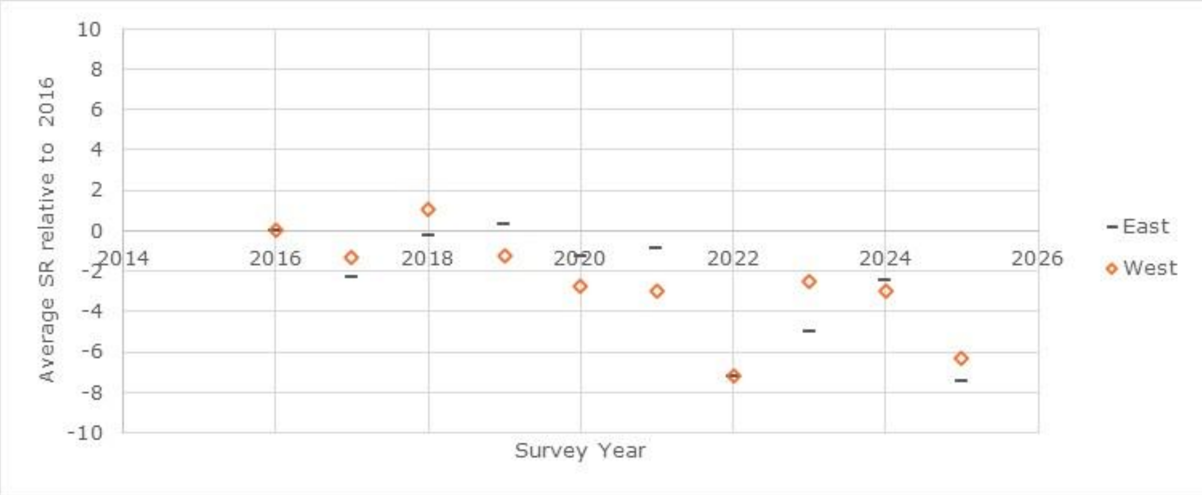


**Figure 6.3: Average SR relative to 2016 of (asphalt) Benchmark sites geographically split east/west**

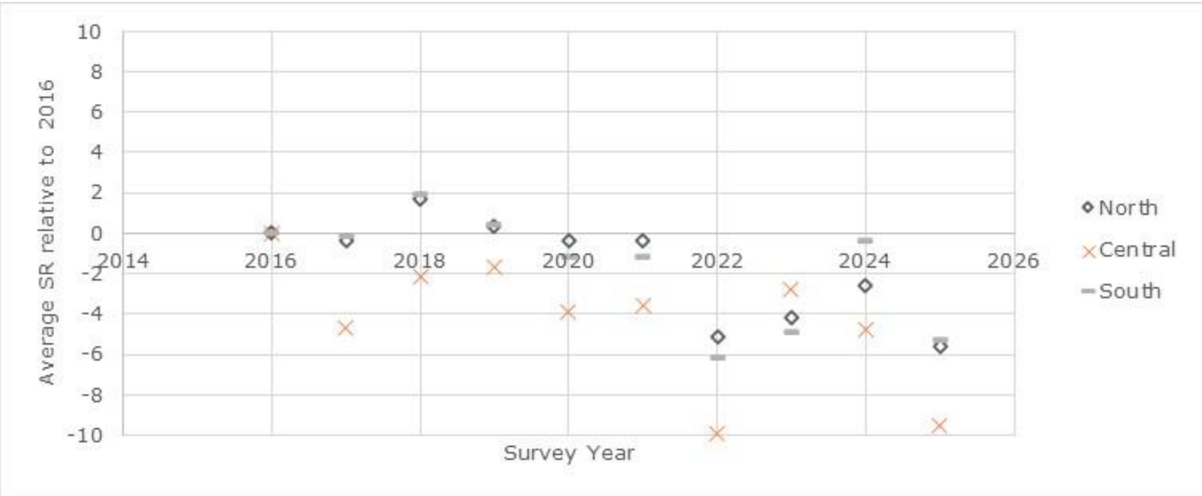


**Figure 6.4: Average SR relative to 2015 of (asphalt) Benchmark sites geographically split north/central/south**

From Figure 6.3 and Figure 6.4 it can be seen that all five groups generally follow the same basic shape over time.

On examining the east/west groupings half of the time the east sites show a higher value and half the time the west sties show a higher value. In addition, there does not appear to be a consistent change (e.g. where the values are lower than 2016, one of the two groups is lower/higher than the other, and the opposite pattern seen for higher than 2016). This suggests that the changes seen are mostly due to noise in the data.

In the latitude split, the central sites tend to be the lowest, however this is not always the case. The north and south sites tend to show similar values from year to year.

Overall, these results do not indicate any particular geographic bias to the data over time.

In addition to potentially varying in average skid resistance each year, it is possible that the within year variation may differ between the locations. To investigate this, the average between run standard deviation (BRSD) values were also calculated for each grouping and year. These numbers provide an indication of how shallow or deep the within year seasonal variation curves are (the higher the number the deeper the curve). As before the BRSD values are calculated by using the root mean square approach. This data can be seen in Figure 6.5 and Figure 6.6.

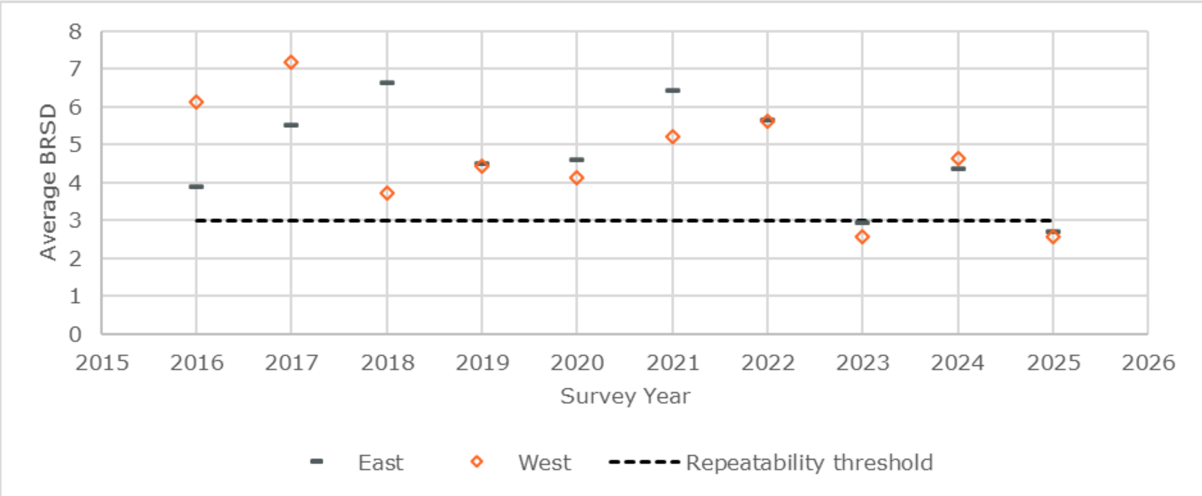


**Figure 6.5: Average BRSD of (asphalt) Benchmark sites geographically split east/west**

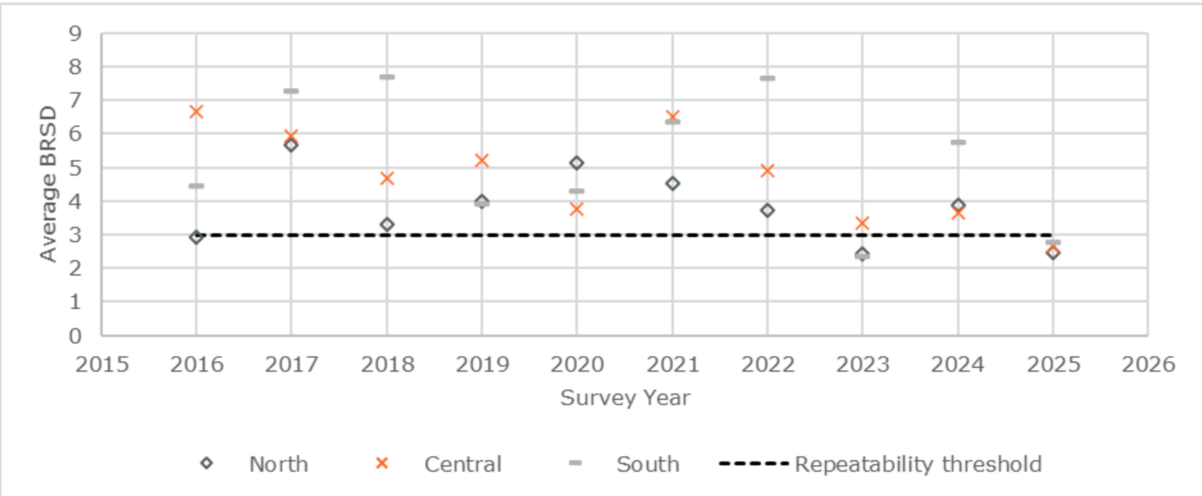


**Figure 6.6: Average BRSD of (asphalt) Benchmark sites geographically split north/central/south**

From Figure 6.5 and Figure 6.6 it can be seen that the five groupings show similar ranges of BRSD. There does not appear to be any particular trend between the east/west sites. However, the north sites appear to have a tendency to lower BRSD values and the south sites to have higher BRSD values, but this is not always the case. This might be indicative of lower levels of rainfall in the south causing a lower skid resistance value being reached in the middle of the summer. However, the central sites, which you might expect to behave somewhere in between the north and south sites, do not always lie between the two. Therefore, no firm conclusions can be drawn at this stage, and it should continue to be monitored.

# 7 Conclusions and recommendations

## 7.1 Data coverage

The analysis procedure for each year of benchmark site data uses a rolling 10 year cut-off for the analysis. These rolling 10 year analyses are then combined to provide information on the trends since 2010. For the current rolling 10 year analysis 296 individual 100m lengths (227 asphalt lengths and 69 concrete lengths) were found to be suitable for use.

## 7.2 Results (rolling 10 year analysis)

Investigation into the average SR values for asphalt sites suggests that 2025 was lower than the average SR value for the last 10 years, and close to the lowest value seen in 2022. This result was also seen on the concrete sites with the exception that it was slightly lower than the value seen in 2022. The analysis also found that the minimum value in 2025 appears to lie slightly before the midpoint of the middle period. These findings were broadly consistent with the analysis of the 2025 LECFs (Brittain, 2026). The LECF analysis provides an estimate of ongoing trends of the overall seasonal variation of the network, however it is complicated by the fact that it uses data from different areas for each period to perform the analysis. Therefore, the trend seen from the benchmark sites is generally the more reliable of the two when considering the overall trend in skid resistance over time (if the conclusions differ).

For the 2025 data, the between period standard deviation for the asphalt sites was below the 3 SR threshold (at 2.64 SR) suggesting very little seasonal variation. Conversely the concrete sites were just above the threshold (at 3.14). Examination of the expected distribution of SC found that the asphalt sites fitted the expected pattern (lowest value seen in the middle period and similar values in the early and late periods). The concrete sites did not follow the expected pattern, with the lowest values seen in the early period, and the highest in the late period. This suggests that while concrete sites do experience seasonal variation, it may differ from that seen on asphalt sites. Therefore, the practice of not applying the LECF calculated (primarily based on asphalt lengths) to the concrete lengths on the Strategic Road Network (SRN) should continue. However, further work is being undertaken to identify if concrete specific LECF values can be calculated and if they would provide a benefit.

## 7.3 Results since 2010

The data collected for successive rolling 10 year analyses have been combined so that the trends since 2010 can be investigated. This analysis suggests a relatively stable pattern of skid resistance for both the asphalt and concrete sites from 2010 to 2019. The data since 2019 suggests a downward trend for both the asphalt and concrete sites.

It is possible that this is indicative of a trend in skid resistance possibly due to longer term climatic changes. This should, therefore, continue to be monitored to determine if this trend persists, returns to previous levels or if it stabilises at a new mean level.

If this trend continues or stabilises at a new level then this will have implications for the reporting of the pavement condition in National Highways key performance indicator (KPI). If the values do not return to previous levels then it might be necessary to assess the impact of the reducing trend on National Highways' skid resistance policy. In addition, it might also lead to the need to review the appropriate levels of PSV (polished stone value) specified in "Surface course materials for construction" (DMRB CD 236).

## 7.4 Geographic effects on trends in skid resistance

An investigation was carried out to see if different geographic groupings of the benchmark sites experience different seasonal variation. This found that there did not appear to be any significant ongoing differences between the different groupings. However, given the likely differences in climate experienced by different parts of the network it is recommended that investigation of geographical effects should be further investigated and built upon in future benchmark sites analyses.

# References

*Note: this list of references contains both unpublished reports (UPR) and client project reports (CPR) produced for National Highways. Please make a personal application to National Highways if you wish to obtain a copy.*

Brittain, S. (2012). *SCRIM Benchmark surveys 2011 (CPR 1298).* Wokingham: TRL.

Brittain, S. (2020). *Skid resistance benchmark surveys 2019 (PPR 950).* Wokingham: TRL.

Brittain, S. (2024). *Skid resistance benchmark surveys 2023 (PPR2036).* Wokingham: TRL.

Brittain, S. (2026). *Calculation of Local Equilibrium Correction Factors for the 2025 Skid Resistance surveys (PPR2081).* Wokingham: TRL.

DMRB CD 236. (n.d.). *Design Manual for Roads and Bridges CD 236 Surface course materials for construction*. https://www.standardsforhighways.co.uk/dmrb/: The Stationery Office.

DMRB CS 228. (n.d.). *Design Manual for Roads and Bridges Volume 7 Section 1, CS 228 Skidding resistance*. https://www.standardsforhighways.co.uk/dmrb/: The Stationery Office.

Donbavand, J., & Brittain, S. (2007). *Task 3: Review of Correction Factors (UPR/IE/213/06).* Wokingham: TRL.

TRL. (2020). *Accreditation and Quality Assurance of Sideways Force Skid Resistance Survey Devices v4.1 [online]. [Accessed 4th March 2021].* Available from World Wide Web: https://ukrlg.ciht.org.uk/ukrlg-home/guidance/road-condition-information/data-collection/skid-resistance/.

# Appendix A Benchmark site locations

**Table A.1: Location details of the benchmark sites**

| Site No. | Area | Road | Direction | Section(s) | Length (m) | Description | Nodes | East or west group | North, central or south group |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 1 | A30 | E/B | 0800A30/400 | 2260 | Studs under A3076 bridge at Mitchell to studs at 2260m | 21435-21460 | West | South |
| 2 | 1 | A30 | W/B | 1100A30/115 | 1180 | End of slip On from A377 to studs at 1180m | 492-431 | West | South |
| 3 | 2 | M5 | S/B | 3300M5/210, 3300M5/220 | 1694 | End of slip On at Jct 22 to studs at 1694m | 15179-15184-15185 | West | South |
| 4 | 2 | M4 | E/B | 3900M4/162 | 1226 | End of slip On at Jct 17 to studs at 1226m | 448-446 | West | South |
| 5 | 3 | M3 | S/B | 1700M3/383, 1700M3/391 | 1003 | Start of slip Off at Jct 7 (A30) to studs at 1003m | 75990-75940-75897 | East | South |
| 6 | 3 | M4 | E/B | 0300M4/393, 0300M4/391 | 2875 | End of slip On at Jct 15 to studs at 2875m | 35593-35941-35489 | West | South |
| 7 | 3 | A31 | E/B | 1200A31/461, 1200A31/467 | 1358 | Exit from Ameysford Rbt to studs under B3072 bridge | 12071-12076-12999 | West | South |
| 8 | 4 | M20 | E/B | 2200M20/290 | 1634 | End of slip On at Jct 9 (A20/A28) for 1634m | 5230-1859 | East | South |
| 9 | 4 | A23 | N/B | 3800A23/340 | 1402 | Studs just after bridge over approx. 1050m after B2110 (bridge over at Handcross) to studs under footbridge at 1402m | 13078-13216 | East | South |
| 10 | M25 DBFO | M11 | N/B | 1500M11/114, 1500M11/116 | 2473 | Start of slip Off at Jct 5 (A1168) to start of concrete | 70050-70060-70070 | East | South |
| 11 | M25 DBFO | M4 | W/B | 5540M4/244 | 976 | Start of slip Off to Heston Services to end of Slip On | 32828-32830 | East | South |
| 12 | 6 | A12 | N/B | 1500A12/294 | 1053 | Studs at Suffolk boundary to start of slip road off to B1029 | 40560-42270 | East | South |
| 13 | 6 | A47 | E/B | 2600A47/145, 2600A47/147 | 1348 | Studs under bridge at centre of Terrington St John interchange to bridge at 1348m | 5027-5733-50343 | East | Central |
| 14 | 7 | A1 | N/B | 2500A1/110 | 2150 | End of slip On from South Witham to Jct Left (to North Witham) | 7005-7015 | East | Central |
| 15 | 7 | A1 | N/B | 3000A1/345, 3000A1/347, 3000A1/360 | 1426 | Jct L to Elkesley Village (744m N of B6387) 1426m to Jct Rt | 20125-20129 | East | Central |
| 16 | 8 | A1(M) | S/B | 1900A1M/58 | 1946 | End of slip On at Jct 7 to studs under bridge at 1981m | 1530-11489 | East | South |
| 17 | 7 | A14 | E/B | 2800A14/120 | 1728 | Studs under bridge 3742m W of A508 (bridge over) to studs under bridge at 1728m | 1820-2022 | East | Central |
| 18 | 2 | M5 | N/B | 1600M5/138 | 1264 | Studs under A4019 bridge at Jct 10 to studs under next bridge | 4231-30034 | West | Central |
| 19 | 9 | A49 | N/B | 1800A49/320 | 1760 | Jct R (to Stoke Prior) to River Bridge | 43133-43134 | West | Central |
| 20 | 9 | A5 | W/B | 3200A5/293 | 1641 | Exit from A49/A5112 Rbt to studs under bridge at 1641m | 50293-50289 | West | Central |
| 21 | 10 | M56 | W/B | 0600M56/419, 0600M56/422 | 1898 | End of slip On at Jct 10 (A49) to studs at 1898m | 63410-63501-63601 | West | Central |
| 22 | 7 | A5 | S/B | 2400A5/50 | 2007 | Studs near start of 2 lanes 2.5k S of Jct B577 for 2007m to studs near end of 2 lanes (studs are at start and end of grassed central reserve). | 20067-20049 | East | Central |
| 23 | 9 | M6 | S/B | 3400M6/430 | 995 | Studs 2255m before start of slip Off at | 23101- | West | Central |

| Site No. | Area | Road | Direction | Section(s) | Length (m) | Description | Nodes | East or west group | North, central or south group |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Jct 14 to studs at 995m | 23001 | | |
| 24 | 9 | M42 | N/B | 3700M42/334 | 1090 | Studs 1090m before start of Slip Off to Jct 10 (A5) to start of Slip Off | 28687-28685 | West | Central |
| 25 | 9 | M40 | S/B | 3700M40/183 | 1403 | End of slip On at Jct 17 (M42 Jct 3a) to start of slip Off at Jct 16 | 29504-29503 | West | Central |
| 26 | 7 | M1 | S/B | 1000M1/216 | 1600 | End of slip on at Tibshelf services to studs at "Jct 28 1 mile" sign | 10054 (now 9997)-10052 | East | Central |
| 27 | 12 | A616 | W/B | 4405A616/30 | 1717 | Studs L Jct A629 to studs on river bridge at 1717m | 61630-61644 | East | Central |
| 28 | 10 | M62 | E/B | 4200M62/450, 4200M62/460 | 1308 | End of slip On at Jct 21 to studs at 1308m | 22105-22107 | West | North |
| 29 | 12 | M18 | S/B | 4400M18/108 | 1681 | End of slip On at Jct 4 (A630) to studs at 1681m | 4308-321 | East | Central |
| 30 | 12 | A63 | W/B | 2000A63/409 | 2378 | End of slip On at A1034 to studs at bridge over 2378m | 2002-30482 | East | North |
| 31 | 13 | M6 | S/B | 2300M6/291 | 1973 | End of slip On at Jct 33 to start of slip Off to Lancaster services | 18323-18239 | West | North |
| 32 | 10 | M58 | W/B | 2300 M58/431 | 1570 | End of slip On at Jct 5 to start of slip Off at Jct 4 | 8618-20005 | West | North |
| 33 | A1DD DBFO | A1 | N/B | 2700A1/242, 2700A1/252 | 1864 | End of slip On at Bramham to start of slip Off to A659 (may now be DBFO) | 21488-21422-21184 | East | North |
| 34 | 14 | A1(M) | N/B | 1300A1M/212, 1300A1M/216 | 1426 | End of slip on at Jct 59 (A167) to studs at 1426m | 17-18-19 | East | North |
| 35 | 13 | A66 | E/B | 0900A66/142 | 1860 | Studs on bridge over B5292 (1950m E of A5086 Rbt) to studs at 1860m | 31347-31507 | West | North |
| 36 | 13 | M6 | S/B | 0900M6/373, 0900M6/379 | 1121 | Start of slip Off at Jct 37 (A684) to end of slip On at Jct 37 | 14192-14187-14181 | West | North |
| 37 | 13 | M6 | S/B | 0900M6/351 | 1385 | Start of slip Off to Southwaite services to end of slip On from services | 14779-14766 | West | North |
| 38 | 14 | A1 | S/B | 2900A1/106 | 1727 | Studs (road under) 2.22km before A19 bridge over to studs at 1727m (25m after Newcastle sign and 45m before start of slip off to A19) | 14063-14002 | East | North |
| 39 | 14 | A1 | N/B | 2900A1/380 | 2200 | Jct Rt B6347 (to Christon Bank) to studs at start of dual c/way central reserve | 11030-11101 | East | North |
| 40 | 9 | M54 | E/B | 3200M54/784 | 1434 | Asphalt/PQC surface change @ marker post 27/7 to start slip off to J4 | 54006-40100 | Concrete | Concrete |
| 41 | 6 | A14 | E/B | 3500A14/632 to 3500A14/716 | 5601 | End slip on J54, Sproughton to start slip off J56, Wherstead | 90366-90301 | Concrete | Concrete |
| 42 | 6 | A12 | S/B | 1500A12/158 | 1960 | Baddow Park Overbridge to Slip off | 40950-40960 | Concrete | Concrete |
| 43 | M25 DBFO | M25 | C/W | 3600M25/464 | 2004 | MP55/0 to MP57/0 | 21543-21541 | Concrete | Concrete |

# Appendix B 2025 survey results (whole site)

The average speed corrected skid readings (speed corrected SR) and the range between the highest and lowest average speed corrected SR for the 2025 surveys are shown in Table B.1. These values may differ from those in Table 4.1 in the main analysis as the data in that table will have any lengths with maintenance over the last 10 years removed (whereas Table B.1 includes the whole length of the site). In this table, the mid survey for site 36 is not shown as the site was surveyed in lane 2 due to roadworks. Anomalies in the surveys and changes in the sites are discussed in Section 3.2.

**Table B.1: Results of the 2025 surveys (whole site)**

| Site | Early speed corrected SR | Middle speed corrected SR | Late speed corrected SR |
|---|---|---|---|
| 1 | 60.80 | 61.59 | 58.39 |
| 2 | 59.12 | 56.08 | 58.86 |
| 3 | 57.00 | 54.26 | 58.45 |
| 4 | 48.68 | 45.13 | 50.92 |
| 5 | 56.46 | 55.10 | 55.30 |
| 6 | 52.99 | 50.37 | 54.58 |
| 7 | 54.60 | 54.27 | 52.73 |
| 8 | 53.75 | 54.54 | 54.24 |
| 9 | 56.04 | 59.17 | 57.77 |
| 10 | 54.37 | 50.39 | 51.90 |
| 11 | 63.64 | 65.77 | 65.58 |
| 12 | 50.03 | 50.75 | 56.61 |
| 13 | 49.18 | 44.65 | 47.14 |
| 14 | 62.60 | 52.48 | 57.22 |
| 15 | 49.57 | 55.28 | 54.90 |
| 16 | 53.51 | 48.31 | 49.95 |
| 17 | 64.88 | 55.34 | 65.27 |
| 18 | 57.75 | 51.31 | 55.90 |
| 19 | 61.20 | 54.78 | 57.51 |
| 20 | 54.71 | 50.27 | 51.51 |
| 21 | 50.79 | 61.59 | 60.56 |
| 22 | 66.47 | 60.23 | 66.92 |
| 23 | 66.12 | 60.42 | 62.83 |
| 24 | 56.49 | 49.61 | 53.14 |
| 25 | 61.81 | 56.54 | 58.67 |
| 26 | 56.40 | 52.37 | 56.42 |
| 27 | 60.21 | 56.60 | 58.54 |
| 28 | 56.70 | 56.37 | 58.43 |
| 29 | 46.26 | 44.99 | 47.01 |
| 30 | 48.89 | 47.77 | 51.37 |
| 31 | 56.79 | 55.40 | 58.54 |
| 32 | 41.30 | 39.42 | 52.59 |
| 33 | 61.09 | 57.51 | 63.88 |
| 34 | 61.24 | 61.14 | 65.49 |
| 35 | 54.59 | 50.49 | 52.57 |
| 36 | 51.68 | - | 75.15 |
| 37 | 56.68 | 55.10 | 57.95 |
| 38 | 51.06 | 48.58 | 51.55 |
| 39 | 53.25 | 49.04 | 55.34 |
| 40 | 50.66 | 48.22 | 52.20 |
| 41 | 49.24 | 50.17 | 53.18 |
| 42 | 39.31 | 39.67 | 46.28 |
| 43 | 48.72 | 49.69 | 50.07 |

# Appendix C Historic data processed using the current defined site lengths

**Table C.1: 2016 benchmark surveys using the current defined lengths**

| Site | Number of 100m lengths | Early avg. SR | Middle avg. SR | Late avg. SR | Between run standard deviation | Average |
|---|---|---|---|---|---|---|
| 1 | 22 | 59.8 | 58.8 | 71.0 | 7.00 | 63.2 |
| 2 | 0 | - | - | - | - | - |
| 3 | 0 | - | - | - | - | - |
| 4 | 0 | - | - | - | - | - |
| 5 | 0 | - | - | - | - | - |
| 6 | 0 | - | - | - | - | - |
| 7 | 0 | - | - | - | - | - |
| 8 | 0 | - | - | - | - | - |
| 9 | 0 | - | - | - | - | - |
| 10 | 23 | 62.2 | 59.1 | 59.8 | 2.07 | 60.4 |
| 11 | 3 | 67.7 | 61.3 | 66.6 | 3.67 | 65.2 |
| 12 | 9 | 60.7 | 57.3 | 58.1 | 2.63 | 58.7 |
| 13 | 11 | 52.0 | 49.3 | 53.5 | 2.55 | 51.6 |
| 14 | 5 | 70.7 | 62.6 | 60.1 | 5.71 | 64.5 |
| 15 | 2 | 51.2 | 53.4 | 56.5 | 2.69 | 53.7 |
| 16 | 15 | 57.1 | 51.4 | 55.8 | 3.24 | 54.8 |
| 17 | 0 | - | - | - | - | - |
| 18 | 0 | - | - | - | - | - |
| 19 | 0 | - | - | - | - | - |
| 20 | 16 | 76.9 | 57.4 | 58.6 | 10.86 | 64.6 |
| 21 | 0 | - | - | - | - | - |
| 22 | 0 | - | - | - | - | - |
| 23 | 0 | - | - | - | - | - |
| 24 | 11 | 64.0 | 56.0 | 61.1 | 4.22 | 60.4 |
| 25 | 13 | 75.8 | 65.5 | 68.7 | 5.48 | 70.0 |
| 26 | 0 | - | - | - | - | - |
| 27 | 15 | 62.0 | 77.0 | 66.7 | 7.88 | 68.6 |
| 28 | 0 | - | - | - | - | - |
| 29 | 11 | 55.9 | 54.5 | 53.7 | 2.41 | 54.7 |
| 30 | 0 | - | - | - | - | - |
| 31 | 14 | 64.0 | 58.6 | 63.6 | 3.11 | 62.1 |
| 32 | 1 | 49.6 | 48.5 | 56.2 | 4.17 | 51.4 |
| 33 | 0 | - | - | - | - | - |
| 34 | 0 | - | - | - | - | - |
| 35 | 13 | 54.3 | 50.1 | 53.4 | 2.54 | 52.6 |
| 36 | 0 | - | - | - | - | - |
| 37 | 13 | 60.8 | 56.4 | 61.4 | 2.81 | 59.6 |
| 38 | 14 | 53.9 | 56.3 | 60.5 | 3.51 | 56.9 |
| 39 | 16 | 57.9 | 60.9 | 62.4 | 2.39 | 60.4 |
| 40 | 13 | 64.5 | 62.7 | 63.8 | 1.92 | 63.7 |
| 41 | 22 | 42.3 | 43.8 | 44.0 | 1.60 | 43.4 |
| 42 | 18 | 52.1 | 57.4 | 55.1 | 2.86 | 54.8 |
| 43 | 16 | 52.4 | 49.1 | 52.4 | 2.09 | 51.3 |
| Asphalt 0-39 | 227 | 61.5 | 58.3 | 61.1 | 5.04 | 60.4 |
| Concrete 40-43 | 69 | 51.4 | 52.1 | 52.6 | 2.16 | 52.0 |

**Table C.2: 2017 benchmark surveys using the current defined lengths**

| Site | Number of 100m lengths | Early avg. SR | Middle avg. SR | Late avg. SR | Between run standard deviation | Average |
|---|---|---|---|---|---|---|
| 1 | 22 | 71.5 | 55.5 | 67.5 | 8.43 | 64.8 |
| 2 | 0 | - | - | - | - | - |
| 3 | 0 | - | - | - | - | - |
| 4 | 0 | - | - | - | - | - |
| 5 | 0 | - | - | - | - | - |
| 6 | 0 | - | - | - | - | - |
| 7 | 0 | - | - | - | - | - |
| 8 | 0 | - | - | - | - | - |
| 9 | 0 | - | - | - | - | - |
| 10 | 23 | 66.5 | 52.7 | 60.8 | 7.51 | 60.0 |
| 11 | 3 | 77.4 | 59.3 | 64.3 | 9.53 | 67.0 |
| 12 | 9 | 55.9 | 49.6 | 58.5 | 4.77 | 54.7 |
| 13 | 11 | 49.4 | 41.4 | 49.3 | 4.64 | 46.7 |
| 14 | 5 | 66.0 | 51.5 | 60.7 | 7.48 | 59.4 |
| 15 | 2 | 55.5 | 50.1 | 55.6 | 3.17 | 53.7 |
| 16 | 15 | 59.7 | 48.8 | 55.2 | 5.55 | 54.5 |
| 17 | 0 | - | - | - | - | - |
| 18 | 0 | - | - | - | - | - |
| 19 | 0 | - | - | - | - | - |
| 20 | 16 | 60.3 | 50.6 | 65.6 | 7.68 | 58.8 |
| 21 | 0 | - | - | - | - | - |
| 22 | 0 | - | - | - | - | - |
| 23 | 0 | - | - | - | - | - |
| 24 | 11 | 62.6 | 49.3 | 55.6 | 6.73 | 55.8 |
| 25 | 13 | 72.3 | 57.7 | 65.0 | 7.29 | 65.0 |
| 26 | 0 | - | - | - | - | - |
| 27 | 15 | 64.5 | 58.6 | 65.3 | 3.85 | 62.8 |
| 28 | 0 | - | - | - | - | - |
| 29 | 11 | 55.4 | 49.6 | 53.5 | 3.11 | 52.8 |
| 30 | 0 | - | - | - | - | - |
| 31 | 14 | 66.7 | 56.2 | 62.8 | 5.39 | 61.9 |
| 32 | 1 | 53.3 | 42.9 | 47.0 | 5.27 | 47.7 |
| 33 | 0 | - | - | - | - | - |
| 34 | 0 | - | - | - | - | - |
| 35 | 13 | 60.1 | 47.1 | 56.1 | 6.67 | 54.4 |
| 36 | 0 | - | - | - | - | - |
| 37 | 13 | 66.5 | 53.3 | 62.1 | 6.87 | 60.7 |
| 38 | 14 | 57.2 | 48.4 | 57.2 | 5.15 | 54.3 |
| 39 | 16 | 61.7 | 54.3 | 61.7 | 4.30 | 59.2 |
| 40 | 13 | 60.1 | 55.7 | 62.4 | 3.66 | 59.4 |
| 41 | 22 | 40.5 | 37.3 | 43.1 | 3.23 | 40.3 |
| 42 | 18 | 49.7 | 46.0 | 54.0 | 4.24 | 49.9 |
| 43 | 16 | 49.5 | 43.3 | 51.2 | 4.32 | 48.0 |
| Asphalt 0-39 | 227 | 63.0 | 52.0 | 60.4 | 6.32 | 58.5 |
| Concrete 40-43 | 69 | 48.7 | 44.4 | 51.4 | 3.85 | 48.2 |

**Table C.3: 2018 benchmark surveys using the current defined lengths**

| Site | Number of 100m lengths | Early avg. SR | Middle avg. SR | Late avg. SR | Between run standard deviation | Average |
|---|---|---|---|---|---|---|
| 1 | 22 | 73.5 | 61.2 | 67.5 | 6.29 | 67.4 |
| 2 | 0 | - | - | - | - | - |
| 3 | 0 | - | - | - | - | - |
| 4 | 0 | - | - | - | - | - |
| 5 | 0 | - | - | - | - | - |
| 6 | 0 | - | - | - | - | - |
| 7 | 0 | - | - | - | - | - |
| 8 | 0 | - | - | - | - | - |
| 9 | 0 | - | - | - | - | - |
| 10 | 23 | 67.8 | 54.4 | 63.4 | 6.91 | 61.9 |
| 11 | 3 | 72.2 | 55.7 | 64.6 | 8.55 | 64.2 |
| 12 | 9 | 67.0 | 47.6 | 58.4 | 9.87 | 57.7 |
| 13 | 11 | 57.6 | 46.6 | 50.4 | 5.72 | 51.5 |
| 14 | 5 | 70.1 | 54.4 | 62.5 | 7.90 | 62.4 |
| 15 | 2 | 60.6 | 49.0 | 56.2 | 5.87 | 55.2 |
| 16 | 15 | 65.2 | 47.4 | 56.2 | 9.00 | 56.3 |
| 17 | 0 | - | - | - | - | - |
| 18 | 0 | - | - | - | - | - |
| 19 | 0 | - | - | - | - | - |
| 20 | 16 | 63.2 | 59.2 | 61.5 | 2.13 | 61.3 |
| 21 | 0 | - | - | - | - | - |
| 22 | 0 | - | - | - | - | - |
| 23 | 0 | - | - | - | - | - |
| 24 | 11 | 61.1 | 57.0 | 59.6 | 2.20 | 59.3 |
| 25 | 13 | 67.8 | 66.1 | 68.3 | 1.37 | 67.4 |
| 26 | 0 | - | - | - | - | - |
| 27 | 15 | 68.0 | 59.7 | 65.0 | 4.27 | 64.2 |
| 28 | 0 | - | - | - | - | - |
| 29 | 11 | 61.8 | 46.9 | 52.9 | 7.79 | 53.9 |
| 30 | 0 | - | - | - | - | - |
| 31 | 14 | 64.2 | 60.2 | 67.3 | 3.62 | 63.9 |
| 32 | 1 | 54.1 | 46.8 | 53.5 | 4.03 | 51.5 |
| 33 | 0 | - | - | - | - | - |
| 34 | 0 | - | - | - | - | - |
| 35 | 13 | 55.8 | 54.4 | 58.4 | 2.21 | 56.2 |
| 36 | 0 | - | - | - | - | - |
| 37 | 13 | 65.5 | 59.5 | 63.7 | 3.31 | 62.9 |
| 38 | 14 | 61.6 | 54.2 | 58.0 | 3.90 | 57.9 |
| 39 | 16 | 61.5 | 56.4 | 61.1 | 3.09 | 59.7 |
| 40 | 13 | 60.4 | 60.8 | 65.4 | 3.12 | 62.2 |
| 41 | 22 | 42.5 | 38.3 | 44.2 | 3.38 | 41.7 |
| 42 | 18 | 55.5 | 51.0 | 56.8 | 3.28 | 54.4 |
| 43 | 16 | 52.2 | 43.5 | 49.6 | 4.57 | 48.5 |
| Asphalt 0-39 | 227 | 64.8 | 55.8 | 61.4 | 5.51 | 60.7 |
| Concrete 40-43 | 69 | 51.5 | 47.1 | 52.7 | 3.62 | 50.4 |

## Table C.4: 2019 benchmark surveys using the current defined lengths

| Site | Number of 100m lengths | Early avg. SR | Middle avg. SR | Late avg. SR | Between run standard deviation | Average |
|---|---|---|---|---|---|---|
| 1 | 22 | 64.4 | 60.2 | 67.9 | 4.16 | 64.2 |
| 2 | 0 | - | - | - | - | - |
| 3 | 0 | - | - | - | - | - |
| 4 | 0 | - | - | - | - | - |
| 5 | 0 | - | - | - | - | - |
| 6 | 0 | - | - | - | - | - |
| 7 | 0 | - | - | - | - | - |
| 8 | 0 | - | - | - | - | - |
| 9 | 0 | - | - | - | - | - |
| 10 | 23 | 60.9 | 58.4 | 62.3 | 2.55 | 60.5 |
| 11 | 3 | 62.4 | 73.2 | 66.8 | 5.51 | 67.4 |
| 12 | 9 | 65.9 | 54.4 | 56.7 | 6.16 | 59.0 |
| 13 | 11 | 58.3 | 48.4 | 53.4 | 5.04 | 53.3 |
| 14 | 5 | 72.4 | 59.2 | 64.4 | 6.79 | 65.3 |
| 15 | 2 | 66.1 | 52.9 | 56.2 | 6.85 | 58.4 |
| 16 | 15 | 57.7 | 53.5 | 52.9 | 2.99 | 54.7 |
| 17 | 0 | - | - | - | - | - |
| 18 | 0 | - | - | - | - | - |
| 19 | 0 | - | - | - | - | - |
| 20 | 16 | 65.1 | 55.2 | 59.6 | 5.09 | 60.0 |
| 21 | 0 | - | - | - | - | - |
| 22 | 0 | - | - | - | - | - |
| 23 | 0 | - | - | - | - | - |
| 24 | 11 | 63.5 | 55.9 | 56.3 | 4.67 | 58.6 |
| 25 | 13 | 69.6 | 62.4 | 64.3 | 3.80 | 65.5 |
| 26 | 0 | - | - | - | - | - |
| 27 | 15 | 72.6 | 60.3 | 64.7 | 6.41 | 65.9 |
| 28 | 0 | - | - | - | - | - |
| 29 | 11 | 60.9 | 52.7 | 55.3 | 4.47 | 56.3 |
| 30 | 0 | - | - | - | - | - |
| 31 | 14 | 67.0 | 57.1 | 62.3 | 5.09 | 62.2 |
| 32 | 1 | 50.8 | 47.2 | 48.6 | 1.79 | 48.9 |
| 33 | 0 | - | - | - | - | - |
| 34 | 0 | - | - | - | - | - |
| 35 | 13 | 56.9 | 48.5 | 53.0 | 4.40 | 52.8 |
| 36 | 0 | - | - | - | - | - |
| 37 | 13 | 63.4 | 56.3 | 59.3 | 3.77 | 59.7 |
| 38 | 14 | 62.6 | 57.9 | 56.0 | 3.91 | 58.9 |
| 39 | 16 | 63.0 | 58.7 | 58.3 | 2.81 | 60.0 |
| 40 | 13 | 62.5 | 55.1 | 60.5 | 4.06 | 59.3 |
| 41 | 22 | 45.4 | 40.1 | 40.6 | 3.18 | 42.0 |
| 42 | 18 | 57.1 | 48.9 | 51.6 | 4.40 | 52.5 |
| 43 | 16 | 46.5 | 47.5 | 49.1 | 1.81 | 47.7 |
| Asphalt 0-39 | 227 | 63.6 | 56.7 | 59.6 | 4.46 | 60.0 |
| Concrete 40-43 | 69 | 51.9 | 46.9 | 49.2 | 3.48 | 49.4 |

## Table C.5: 2020 benchmark surveys using the current defined lengths

| Site | Number of 100m lengths | Early avg. SR | Middle avg. SR | Late avg. SR | Between run standard deviation | Average |
|---|---|---|---|---|---|---|
| 1 | 22 | 65.3 | 59.3 | 58.6 | 4.09 | 61.1 |
| 2 | 0 | - | - | - | - | - |
| 3 | 0 | - | - | - | - | - |
| 4 | 0 | - | - | - | - | - |
| 5 | 0 | - | - | - | - | - |
| 6 | 0 | - | - | - | - | - |
| 7 | 0 | - | - | - | - | - |
| 8 | 0 | - | - | - | - | - |
| 9 | 0 | - | - | - | - | - |
| 10 | 23 | 61.2 | 55.9 | 55.9 | 3.45 | 57.7 |
| 11 | 3 | 65.3 | 60.1 | 70.6 | 5.29 | 65.3 |
| 12 | 9 | 64.8 | 55.5 | 61.2 | 4.96 | 60.5 |
| 13 | 11 | 49.3 | 52.3 | 54.6 | 2.84 | 52.1 |
| 14 | 5 | 58.5 | 61.3 | 66.7 | 4.27 | 62.2 |
| 15 | 2 | 51.8 | 54.5 | 58.6 | 3.45 | 55.0 |
| 16 | 15 | 56.9 | 50.2 | 59.8 | 5.13 | 55.6 |
| 17 | 0 | - | - | - | - | - |
| 18 | 0 | - | - | - | - | - |
| 19 | 0 | - | - | - | - | - |
| 20 | 16 | 57.1 | 58.8 | 57.0 | 1.69 | 57.6 |
| 21 | 0 | - | - | - | - | - |
| 22 | 0 | - | - | - | - | - |
| 23 | 0 | - | - | - | - | - |
| 24 | 11 | 56.7 | 55.5 | 58.7 | 1.94 | 57.0 |
| 25 | 13 | 64.5 | 61.8 | 66.9 | 2.77 | 64.4 |
| 26 | 0 | - | - | - | - | - |
| 27 | 15 | 60.2 | 62.0 | 70.5 | 5.57 | 64.3 |
| 28 | 0 | - | - | - | - | - |
| 29 | 11 | 47.1 | 49.1 | 57.3 | 5.46 | 51.1 |
| 30 | 0 | - | - | - | - | - |
| 31 | 14 | 54.8 | 60.9 | 65.4 | 5.53 | 60.4 |
| 32 | 1 | 49.6 | 48.9 | 48.5 | 0.54 | 49.0 |
| 33 | 0 | - | - | - | - | - |
| 34 | 0 | - | - | - | - | - |
| 35 | 13 | 57.3 | 49.6 | 55.4 | 4.20 | 54.1 |
| 36 | 0 | - | - | - | - | - |
| 37 | 13 | 52.9 | 59.0 | 65.8 | 6.54 | 59.2 |
| 38 | 14 | 56.2 | 56.6 | 63.5 | 4.69 | 58.8 |
| 39 | 16 | 54.4 | 56.2 | 63.0 | 4.62 | 57.9 |
| 40 | 13 | 54.4 | 57.6 | 61.2 | 3.51 | 57.7 |
| 41 | 22 | 39.3 | 36.1 | 37.7 | 2.00 | 37.7 |
| 42 | 18 | 50.4 | 47.0 | 46.3 | 2.74 | 47.9 |
| 43 | 16 | 46.5 | 45.1 | 45.3 | 1.14 | 45.6 |
| Asphalt 0-39 | 227 | 57.8 | 56.6 | 61.0 | 4.40 | 58.4 |
| Concrete 40-43 | 69 | 46.7 | 45.1 | 46.2 | 2.42 | 46.0 |

### Table C.6: 2021 benchmark surveys using the current defined lengths

| Site | Number of 100m lengths | Early avg. SR | Middle avg. SR | Late avg. SR | Between run standard deviation | Average |
|---|---|---|---|---|---|---|
| 1 | 22 | 64.3 | 57.8 | 63.1 | 3.76 | 61.7 |
| 2 | 0 | - | - | - | - | - |
| 3 | 0 | - | - | - | - | - |
| 4 | 0 | - | - | - | - | - |
| 5 | 0 | - | - | - | - | - |
| 6 | 0 | - | - | - | - | - |
| 7 | 0 | - | - | - | - | - |
| 8 | 0 | - | - | - | - | - |
| 9 | 0 | - | - | - | - | - |
| 10 | 23 | 64.6 | 56.1 | 53.2 | 6.19 | 58.0 |
| 11 | 3 | 72.3 | 59.7 | 61.1 | 6.93 | 64.4 |
| 12 | 9 | 68.6 | 53.6 | 53.7 | 8.93 | 58.6 |
| 13 | 11 | 57.6 | 43.6 | 43.6 | 8.13 | 48.3 |
| 14 | 5 | 71.5 | 58.1 | 55.4 | 8.69 | 61.7 |
| 15 | 2 | 63.7 | 49.2 | 49.1 | 8.39 | 54.0 |
| 16 | 15 | 63.1 | 53.7 | 48.8 | 7.53 | 55.2 |
| 17 | 0 | - | - | - | - | - |
| 18 | 0 | - | - | - | - | - |
| 19 | 0 | - | - | - | - | - |
| 20 | 16 | 66.6 | 52.3 | 55.7 | 7.57 | 58.2 |
| 21 | 0 | - | - | - | - | - |
| 22 | 0 | - | - | - | - | - |
| 23 | 0 | - | - | - | - | - |
| 24 | 11 | 60.1 | 51.8 | 53.7 | 4.46 | 55.2 |
| 25 | 13 | 66.4 | 63.2 | 61.1 | 2.77 | 63.6 |
| 26 | 0 | - | - | - | - | - |
| 27 | 15 | 76.9 | 61.0 | 67.8 | 8.03 | 68.6 |
| 28 | 0 | - | - | - | - | - |
| 29 | 11 | 56.7 | 51.0 | 54.8 | 3.47 | 54.1 |
| 30 | 0 | - | - | - | - | - |
| 31 | 14 | 66.8 | 54.3 | 62.5 | 6.43 | 61.2 |
| 32 | 1 | 53.5 | 46.2 | 47.6 | 3.85 | 49.1 |
| 33 | 0 | - | - | - | - | - |
| 34 | 0 | - | - | - | - | - |
| 35 | 13 | 53.4 | 47.2 | 54.8 | 4.14 | 51.8 |
| 36 | 0 | - | - | - | - | - |
| 37 | 13 | 60.1 | 53.8 | 64.2 | 5.69 | 59.4 |
| 38 | 14 | 58.6 | 57.6 | 61.9 | 2.68 | 59.4 |
| 39 | 16 | 60.0 | 55.5 | 59.8 | 2.73 | 58.5 |
| 40 | 13 | 63.7 | 56.8 | 59.2 | 3.86 | 59.9 |
| 41 | 22 | 44.9 | 39.3 | 33.9 | 5.60 | 39.4 |
| 42 | 18 | 55.0 | 44.1 | 42.4 | 6.88 | 47.2 |
| 43 | 16 | 53.5 | 48.9 | 46.4 | 3.79 | 49.6 |
| Asphalt 0-39 | 227 | 63.5 | 54.7 | 57.5 | 5.91 | 58.6 |
| Concrete 40-43 | 69 | 53.1 | 46.1 | 43.8 | 5.34 | 47.6 |

## Table C.7: 2022 benchmark surveys using the current defined lengths

| Site | Number of 100m lengths | Early avg. SR | Middle avg. SR | Late avg. SR | Between run standard deviation | Average |
|---|---|---|---|---|---|---|
| 1 | 22 | 62.8 | 55.2 | 46.2 | 8.53 | 54.8 |
| 2 | 0 | - | - | - | - | - |
| 3 | 0 | - | - | - | - | - |
| 4 | 0 | - | - | - | - | - |
| 5 | 0 | - | - | - | - | - |
| 6 | 0 | - | - | - | - | - |
| 7 | 0 | - | - | - | - | - |
| 8 | 0 | - | - | - | - | - |
| 9 | 0 | - | - | - | - | - |
| 10 | 23 | 61.0 | 49.4 | 52.3 | 6.38 | 54.2 |
| 11 | 3 | 60.2 | 52.3 | 57.5 | 4.07 | 56.7 |
| 12 | 9 | 63.4 | 47.4 | 52.7 | 8.56 | 54.5 |
| 13 | 11 | 47.5 | 40.4 | 40.6 | 4.09 | 42.9 |
| 14 | 5 | 59.1 | 52.4 | 54.3 | 3.76 | 55.2 |
| 15 | 2 | 52.3 | 44.5 | 45.8 | 4.21 | 47.5 |
| 16 | 15 | 60.4 | 45.1 | 49.0 | 8.06 | 51.5 |
| 17 | 0 | - | - | - | - | - |
| 18 | 0 | - | - | - | - | - |
| 19 | 0 | - | - | - | - | - |
| 20 | 16 | 58.5 | 53.7 | 52.1 | 3.57 | 54.7 |
| 21 | 0 | - | - | - | - | - |
| 22 | 0 | - | - | - | - | - |
| 23 | 0 | - | - | - | - | - |
| 24 | 11 | 59.2 | 46.6 | 49.1 | 6.79 | 51.6 |
| 25 | 13 | 64.8 | 56.4 | 53.9 | 5.71 | 58.4 |
| 26 | 0 | - | - | - | - | - |
| 27 | 15 | 62.0 | 54.2 | 54.9 | 4.48 | 57.0 |
| 28 | 0 | - | - | - | - | - |
| 29 | 11 | 50.6 | 40.5 | 45.1 | 5.08 | 45.4 |
| 30 | 0 | - | - | - | - | - |
| 31 | 14 | 60.2 | 54.0 | 59.8 | 3.85 | 58.0 |
| 32 | 1 | 43.4 | 40.8 | 36.4 | 3.56 | 40.2 |
| 33 | 0 | - | - | - | - | - |
| 34 | 0 | - | - | - | - | - |
| 35 | 13 | 52.5 | 45.9 | 50.2 | 3.37 | 49.5 |
| 36 | 0 | - | - | - | - | - |
| 37 | 13 | 59.3 | 53.2 | 56.7 | 3.19 | 56.4 |
| 38 | 14 | 55.1 | 47.1 | 50.1 | 4.35 | 50.8 |
| 39 | 16 | 56.2 | 52.1 | 49.0 | 3.80 | 52.4 |
| 40 | 13 | 57.7 | 52.8 | 51.5 | 3.47 | 54.0 |
| 41 | 22 | 37.4 | 32.1 | 35.0 | 2.85 | 34.8 |
| 42 | 18 | 49.2 | 40.2 | 41.1 | 5.09 | 43.5 |
| 43 | 16 | 47.9 | 40.7 | 43.9 | 3.96 | 44.2 |
| Asphalt 0-39 | 227 | 58.6 | 50.0 | 50.9 | 5.64 | 53.1 |
| Concrete 40-43 | 69 | 46.7 | 40.1 | 41.8 | 3.90 | 42.9 |

## Table C.8: 2023 benchmark surveys using the current defined lengths

| Site | Number of 100m lengths | Early avg. SR | Middle avg. SR | Late avg. SR | Between run standard deviation | Average |
|---|---|---|---|---|---|---|
| 1 | 22 | 59.4 | 60.1 | 60.5 | 1.26 | 60.0 |
| 2 | 0 | - | - | - | - | - |
| 3 | 0 | - | - | - | - | - |
| 4 | 0 | - | - | - | - | - |
| 5 | 0 | - | - | - | - | - |
| 6 | 0 | - | - | - | - | - |
| 7 | 0 | - | - | - | - | - |
| 8 | 0 | - | - | - | - | - |
| 9 | 0 | - | - | - | - | - |
| 10 | 23 | 56.1 | 50.4 | 54.1 | 3.02 | 53.5 |
| 11 | 3 | 59.6 | 57.9 | 59.8 | 1.40 | 59.1 |
| 12 | 9 | 54.2 | 56.1 | 50.5 | 2.99 | 53.6 |
| 13 | 11 | 44.2 | 53.1 | 45.4 | 4.86 | 47.6 |
| 14 | 5 | 56.5 | 61.2 | 54.8 | 3.42 | 57.5 |
| 15 | 2 | 51.2 | 46.9 | 53.5 | 3.37 | 50.5 |
| 16 | 15 | 52.9 | 50.1 | 49.7 | 2.02 | 50.9 |
| 17 | 0 | - | - | - | - | - |
| 18 | 0 | - | - | - | - | - |
| 19 | 0 | - | - | - | - | - |
| 20 | 16 | 58.3 | 61.5 | 63.3 | 2.69 | 61.0 |
| 21 | 0 | - | - | - | - | - |
| 22 | 0 | - | - | - | - | - |
| 23 | 0 | - | - | - | - | - |
| 24 | 11 | 53.5 | 62.6 | 57.1 | 4.73 | 57.7 |
| 25 | 13 | 77.9 | 78.0 | 75.5 | 2.64 | 77.2 |
| 26 | 0 | - | - | - | - | - |
| 27 | 15 | 62.8 | 57.3 | 60.9 | 2.99 | 60.3 |
| 28 | 0 | - | - | - | - | - |
| 29 | 11 | 51.6 | 52.4 | 52.0 | 0.80 | 52.0 |
| 30 | 0 | - | - | - | - | - |
| 31 | 14 | 57.3 | 55.3 | 58.2 | 1.89 | 57.0 |
| 32 | 1 | 40.8 | 39.5 | 45.1 | 2.95 | 41.8 |
| 33 | 0 | - | - | - | - | - |
| 34 | 0 | - | - | - | - | - |
| 35 | 13 | 48.0 | 46.0 | 50.3 | 2.30 | 48.1 |
| 36 | 0 | - | - | - | - | - |
| 37 | 13 | 54.8 | 53.9 | 57.8 | 2.18 | 55.5 |
| 38 | 14 | 53.1 | 54.7 | 58.5 | 3.02 | 55.5 |
| 39 | 16 | 55.8 | 52.7 | 57.1 | 2.44 | 55.2 |
| 40 | 13 | 52.6 | 57.0 | 61.5 | 4.56 | 57.0 |
| 41 | 22 | 32.4 | 40.7 | 35.9 | 4.26 | 36.3 |
| 42 | 18 | 41.8 | 49.7 | 45.5 | 4.12 | 45.7 |
| 43 | 16 | 45.0 | 45.3 | 43.4 | 1.33 | 44.6 |
| Asphalt 0-39 | 227 | 56.3 | 56.1 | 57.0 | 2.77 | 56.5 |
| Concrete 40-43 | 69 | 41.6 | 47.2 | 45.0 | 3.81 | 44.6 |

**Table C.9: 2024 benchmark surveys using the current defined lengths**

| Site | Number of 100m lengths | Early avg. SR | Middle avg. SR | Late avg. SR | Between run standard deviation | Average |
|---|---|---|---|---|---|---|
| 1 | 22 | 70.7 | 59.4 | 62.4 | 6.11 | 64.2 |
| 2 | 0 | - | - | - | - | - |
| 3 | 0 | - | - | - | - | - |
| 4 | 0 | - | - | - | - | - |
| 5 | 0 | - | - | - | - | - |
| 6 | 0 | - | - | - | - | - |
| 7 | 0 | - | - | - | - | - |
| 8 | 0 | - | - | - | - | - |
| 9 | 0 | - | - | - | - | - |
| 10 | 23 | 63.3 | 55.0 | 56.0 | 4.91 | 58.1 |
| 11 | 3 | 72.2 | 57.1 | 65.7 | 7.68 | 65.0 |
| 12 | 9 | 60.2 | 59.1 | 54.2 | 3.77 | 57.8 |
| 13 | 11 | 55.5 | 54.0 | 49.0 | 3.51 | 52.8 |
| 14 | 5 | 63.4 | 61.6 | 61.2 | 1.28 | 62.1 |
| 15 | 2 | 54.0 | 49.4 | 54.5 | 2.86 | 52.6 |
| 16 | 15 | 63.2 | 50.1 | 53.4 | 6.91 | 55.6 |
| 17 | 0 | - | - | - | - | - |
| 18 | 0 | - | - | - | - | - |
| 19 | 0 | - | - | - | - | - |
| 20 | 16 | 57.4 | 61.5 | 52.1 | 4.81 | 57.0 |
| 21 | 0 | - | - | - | - | - |
| 22 | 0 | - | - | - | - | - |
| 23 | 0 | - | - | - | - | - |
| 24 | 11 | 59.8 | 56.4 | 51.6 | 4.12 | 55.9 |
| 25 | 13 | 67.3 | 64.4 | 60.3 | 3.65 | 64.0 |
| 26 | 0 | - | - | - | - | - |
| 27 | 15 | 63.8 | 60.2 | 62.4 | 1.99 | 62.2 |
| 28 | 0 | - | - | - | - | - |
| 29 | 11 | 53.8 | 48.5 | 46.4 | 3.92 | 49.6 |
| 30 | 0 | - | - | - | - | - |
| 31 | 14 | 65.3 | 58.2 | 54.5 | 5.51 | 59.4 |
| 32 | 1 | 46.1 | 40.9 | 41.4 | 2.86 | 42.8 |
| 33 | 0 | - | - | - | - | - |
| 34 | 0 | - | - | - | - | - |
| 35 | 13 | 53.2 | 50.8 | 48.0 | 2.65 | 50.7 |
| 36 | 0 | - | - | - | - | - |
| 37 | 13 | 62.8 | 58.4 | 56.9 | 3.22 | 59.4 |
| 38 | 14 | 59.1 | 53.8 | 54.4 | 3.04 | 55.8 |
| 39 | 16 | 59.5 | 51.8 | 52.9 | 4.21 | 54.8 |
| 40 | 13 | 58.2 | 54.1 | 54.0 | 2.80 | 55.4 |
| 41 | 22 | 41.9 | 39.2 | 37.2 | 2.45 | 39.4 |
| 42 | 18 | 51.7 | 43.2 | 44.9 | 4.61 | 46.6 |
| 43 | 16 | 53.8 | 45.1 | 46.5 | 4.94 | 48.5 |
| Asphalt 0-39 | 227 | 61.7 | 56.2 | 55.1 | 4.49 | 57.7 |
| Concrete 40-43 | 69 | 50.3 | 44.4 | 44.5 | 3.82 | 46.4 |

Skid resistance benchmark surveys 2025

National Highways manages levels of skid resistance on strategic road network by carrying out single annual skid resistance surveys. These are carried out over the summer, split over three survey periods. It is known that skid resistance varies during the year and between years. To monitor the ongoing trends in skid resistance a series of benchmark sites were established. These sites are surveyed in all three of the survey periods. This report discusses the analysis of the data collected in 2025.

**Other titles from this subject area**

**PPR 2058** Skid resistance benchmark surveys 2024. S Brittain. 2025

**PPR 2036** Skid resistance benchmark surveys 2023. S Brittain. 2024

**PPR 2023** Skid resistance benchmark surveys 2022. S Brittain. 2024

**PPR 1030** Skid resistance benchmark surveys 2021. S Brittain. 2022

**TRL**
Unit 19 The Business Centre, Molly Millars Lane,
Wokingham, Berkshire, RG41 2QY,
United Kingdom
T: +44 (0) 1344 773131
E: enquiries@trl.co.uk
W: www.trl.co.uk

ISSN 2514-9652

DOI 10.58446/mrpr8618

**PPR2082**