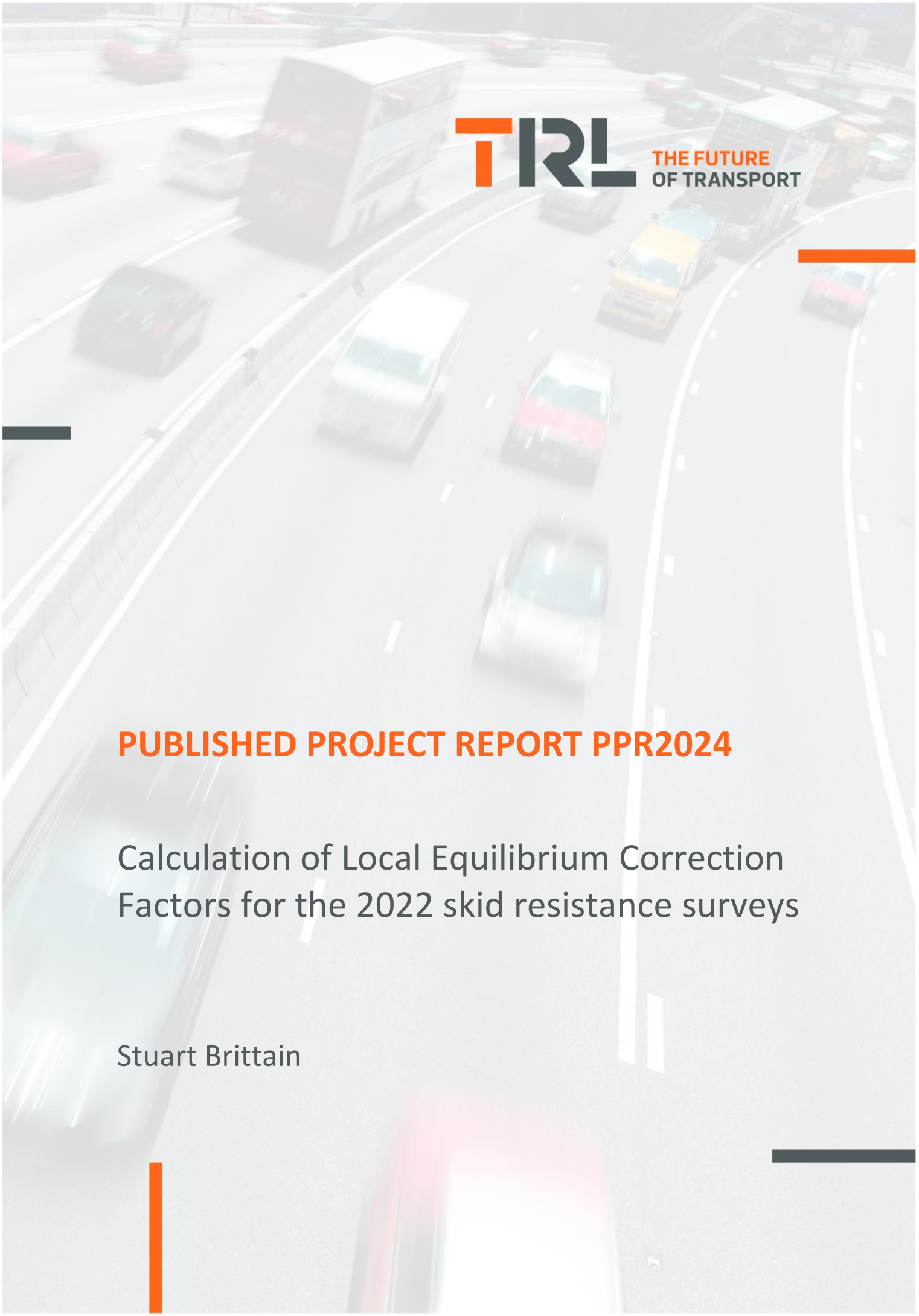

THE FUTURE OF TRANSPORT

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Calculation of Local Equilibrium Correction Factors for the 2022 skid resistance surveys

Stuart Brittain

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Disclaimer

Executive Summary

As part of the process for managing skid resistance on its network (the Strategic Road Network or SRN), National Highways carries out single annual skid resistance surveys (SASS). This data is used to identify sites where there is a need to undertake an investigation to determine whether a treatment to improve skid resistance would be beneficial in mitigating the risk of skidding collisions at a site. Further details on the site investigation process are given in the Skidding Resistance part of the DMRB (DMRB CS 228). In addition, this data feeds into the KPI for pavement condition.

The measurements from these surveys are corrected for seasonal variation by the application of correction factors called the "Local Equilibrium Correction Factors" (LECF). The procedure used since 2007 to calculate the LECFs was used again during 2022. This document provides a record of the procedure used to derive the LECFs that have been applied to the 2022 skid resistance survey data.

A high percentage (98.7%) of the National Highways Areas was surveyed in 2022, with each National Highways Area having at least 95.2% coverage of survey data. In addition to the National Highways Areas, LECFs were provided for the A1 Darrington to Dishforth, M25 and Second Severn Crossing DBFOs.

All of the Areas and DBFOs where LECFs were calculated were surveyed within their target survey period (apart from some lengths which changed Area after the survey).

The spread of survey dates was 28 days or less for all localities.

Surveys of lanes other than lane 1 were undertaken for some Areas and DBFOs. For the Areas and DBFOs where LECFs were calculated the majority of these surveys were carried out in the same period as the lane 1 surveys and therefore have the lane 1 LECF applied.

Previous research by TRL identified that concrete does not appear to experience seasonal variation to the same degree as other surfacings. Therefore, an LECF of 1.000 (i.e. no correction) was applied to concrete sections. An investigation into the application of LECFs on concrete sections using the 2022 data found no conflict with the previous investigations into concrete. Therefore, due to the unsuitability of the calculated LECFs for concrete it is recommended that the application of an LECF of 1.000 for concrete sections is continued.

Analysis of the spread of 2022 survey data values suggests that the minimum value occurred slightly later than expected. The weighted average LECF value was 1.07 for 2022, showing that the measured skid resistance of the network (i.e. before correction) was lower than the average of the previous three years. Analysis of data from the National Highways benchmark sites that monitor long term trends in skid resistance across the network also identified these two conclusions.

Table of Contents

1 Introduction

As part of the process for managing skid resistance on its network (the Strategic Road Network or SRN) National Highways carries out single annual skid resistance surveys (SASS). The test season for these surveys is broadly over the summer months, and is divided into three survey periods (early, middle and late). The network has been divided so that approximately a third of its length is tested in each survey period; the survey period rotates to ensure that each length of the network is tested once in each period over three years. Skid resistance levels vary during the course of the year with the lowest levels of skid resistance generally experienced in the middle of the summer. The general trend for skid resistance is shown diagrammatically in Figure 1.1. Levels of skid resistance can also fluctuate from year to year.

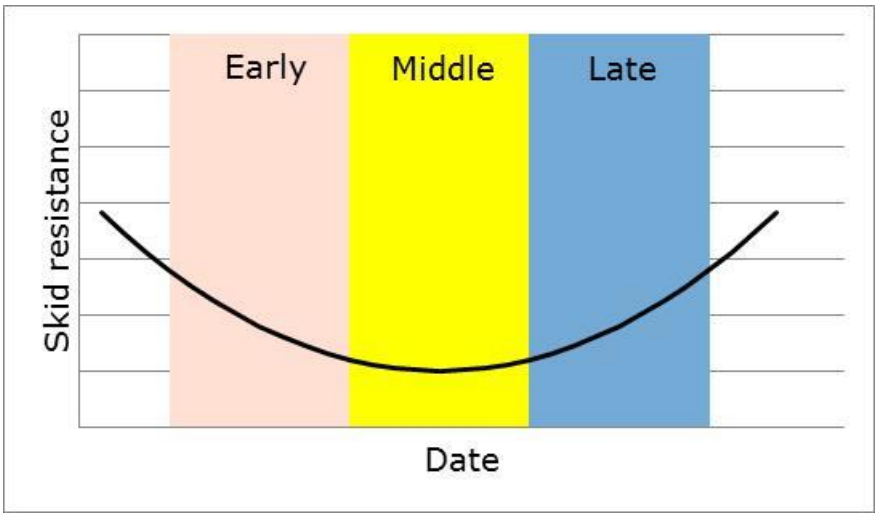

Figure 1.1: Idealised seasonal variation of skid resistance over the summer

In order to correct for this seasonal variation (both within and between years), Local Equilibrium Correction Factors (LECFs) are calculated which are then applied to the speed corrected skid resistance data (SC). Once this data has been seasonally corrected it is termed the Characteristic Skid Coefficient (CSC). Further details on the use of CSC data are provided in CS 228 of the Design Manual for Roads and Bridges (DMRB CS 228).

The network is split into “localities”, consisting of the length of each road within a specified National Highways Maintenance and Improvement Area, and a LECF value is assigned to each of these localities. The LECF is calculated from the average of the past three years’ SC data for the locality (known as the Local Equilibrium SC or LESC) and the current average for the locality (known as the Local Mean SC or LMSC).

For each locality two types of LECF are calculated. The first, known as the road LECF, is calculated using the data available for that locality only. The other LECF is called the Area LECF and uses all of the data available for the Area that contains the locality. The Area LECF uses data from surveys which can be spread over several weeks and are over a wide area. Since fluctuations in skid resistance can occur within this period of time, this generally

means that the Area LECF is less robust than the road LECF. However, some localities are quite small and therefore have little data available for calculation of a robust road LECF. A minimum length is therefore applied for the calculation of a road LECF. If a locality has 25km or more of valid SC data (i.e. SC data for the current year and a suitable dataset for the past years) then the road LECF is applied, otherwise the Area LECF is used. Full details of the LECF calculation procedure are given in Appendix A.

Once the LECF values have been calculated for each survey period, they are loaded into National Highways' Pavement Management System (HAPMS) so that they can be used in conjunction with the skid resistance survey data.

This document provides a record of the procedure used to derive the LECFs that have been applied to the 2022 skid resistance survey data.

The procedure developed in 2007 (Brittain, 2007) which incorporates a visual analysis and was refined in 2008 to include an automated analysis (Brittain, 2009) was used again this year.

A summary of the survey coverage and range of survey dates is given in section 3.1. Section 4 contains an overview of the calculation and delivery of the 2022 LECF values, along with any issues identified. Additional observations from the 2022 LECF calculation are discussed in Section 5 and Appendix B contains tables of the LECF values calculated.

2 Changes affecting the LECF calculation

Measures in place during 2020 to combat the COVID-19 pandemic (specifically work from home orders and travel restrictions) meant that lower levels of traffic were seen on the National Highways SRN. It is believed that a significant proportion of the seasonal variation of skid resistance values is caused by the interaction of traffic, particularly heavy vehicles, with detritus on the road surface. Therefore, changes in traffic levels as a result of Covid-19 restrictions, could impact the suitability of using the 2020 survey data in the LECF calculation.

However, it is noted that although traffic levels were reduced, this was primarily a reduction in light vehicles and heavy vehicles levels were less affected. During the calculation of the 2021 LECF values (Brittain, 2022) it was identified that the data from the 2020 surveys were suitable for use in the LECF calculation. Therefore, on that basis the 2020 data was used as part of the previous years' dataset in the calculation of the 2022 LECFs.

3 Data quality

3.1 Survey Coverage

The survey coverage obtained for 2022 is presented in Table 3.1. In some cases the value shown for "Over year" does not equal the sum of the percentages surveyed in the survey periods. This is because the same length was surveyed in more than one survey period.

A high percentage of the network survey was achieved (98.7% total coverage for National Highways Areas) with at least 95.2% coverage in each National Highways Area. All of the National Highways Areas were surveyed in the target survey period (apart from some lengths which changed operational area as discussed in section 3.1.1). The spread of survey dates is discussed further in section 3.3.

High survey coverage was also seen for the DBFOs loaded into HAPMS with a defined (SASS compatible) survey rotation. As with previous years some data has also been loaded for some of the other DBFOs. All of the DBFOs with survey data loaded into HAPMS are discussed further in section 4.4.

Table 3.1: Percentage of Area surveyed in 2022, lane 1, not ox bow lay-by (analysis run 4th January 2023)

Target period	Area	Early	Middle	Late	Very Late[1]	Over year
Early	Area 4	99.8%	-	-	-	99.8%
Early	Area 8	99.0%	-	-	-	99.0%
Early	Area 12	99.6%	-	-	-	99.6%
Early	M25 DBFO	99.0%	-	-	-	99.2%
Early	A1DD DBFO	100.0%	-	-	-	100.0%
Middle	South West	-	99.8%	-	-	99.8%
Middle	Area 3	-	95.2%	-	-	95.2%
Middle	Area 9	-	98.0%	0.2%[2]	-	98.2%
Middle	Area 10	0.5%[2]	98.5%	0.0%[2]	-	99.0%
Middle	Second Severn Crossing	-	100.0%	-	-	100.0%
Late	Area 6	-	-	98.6%	-	98.6%
Late	Area 7	-	-	99.6%	-	99.6%
Late	Area 13	-	-	98.5%	-	98.5%
Late	Area 14	-	-	98.1%	-	98.1%
not defined	A19 DBFO	-	-	-	-	-
not defined	A1M DBFO	-	-	-	-	-
not defined	A249 DBFO	-	-	-	-	-
not defined	A30/A35 DBFO	-	-	-	-	-
not defined	A69 DBFO	-	-	-	-	-
not defined	A417/A419 DBFO	40.8%	41.2%	41.2%	-	41.2%
not defined	M40 DBFO	-	-	-	-	-
n/a	NH Areas	n/a	n/a	n/a	n/a	98.7%

[1] Surveys conducted between the end of the survey season (20th October) and the end of the calendar year

[2] These lengths were in a different Area at the time of the survey. These are discussed further in section 3.1.1.

3.1.1 Change of assigned Area

During the survey season a number of sections were moved between Areas after the survey plans were determined. These were surveyed according to the target survey period of the original Area.

3.1.2 Survey load dates

After the surveys are conducted, the data are loaded into HAPMS and undergo independent checks (further discussed in section 3.2). The survey contract states that the Contractor must ensure that data has been loaded, passes the independent checks and is ready for further analysis (i.e. the LECF calculation) by specified dates. These dates are given in Table 3.2. The percentage of the data loaded by these dates for each Area is given in Table 3.3 (excluding the additional surveys discussed in section 3.1.1).

Table 3.2: End of survey period and target data availability dates

Survey period	End of survey period	Target date for data available for LECF calculation
Early	27th June	9th August
Middle	24th August	7th October
Late	20th October	30th November

Table 3.3: Percentage of current data loaded by target date (analysis run 4th January 2023)

Target survey period	Area	Percentage of current data loaded by expected survey load date
Early	Area 4	96.4%
Early	Area 8	100.0%
Early	Area 12	100.0%
Early	M25 DBFO	99.9%
Early	A1DD DBFO	100.0%
Middle	South West	100.0%
Middle	Area 3	100.0%
Middle	Area 9	100.0%
Middle	Area 10	98.6%
Middle	Second Severn Crossing	100.0%
Late	Area 6	100.0%
Late	Area 7	100.0%
Late	Area 13	100.0%
Late	Area 14	100.0%

It can be seen from Table 3.3 that vast majority of the survey data for the National Highways surveys was loaded by the expected load date and not modified after this date due to the independent checks.

3.2 Suitability of data loaded

During the survey season the survey data is inspected visually to help identify any issues that should be resolved. This process was undertaken after each survey period when the survey contractor had loaded and carried out initial checks on the data for that period.

The types of anomalies that are looked for in this review include:

- Lengths where the data suggests that either the test wheel was up or it had experienced a puncture
- Lengths where the data appears to be misaligned relative to the previous years' data (i.e. the section markers may be in the wrong place)
- Lengths which exhibited oscillating data or otherwise anomalous data
- Lengths with duplicate surveys loaded

During the review the following anomalies were found:

- Downward slope to survey data over section
- Possible misalignment
- Very low value (<0.1)

The lengths identified by this analysis were supplied to National Highways and the survey contractor for review and, where necessary, amendment.

3.3 Survey spread

The purpose of the LECFs is to correct for the seasonal and between year variations in skid resistance experienced on the network. However, the longer the timescale for the survey of a road the more likely the correction will start to become unsuitable for parts of the survey due to changes in the weather. Therefore, in order to obtain the most robust data it is necessary to conduct surveys within an Area in a short timescale, with particular attention paid to the time taken to survey an individual road. The survey contract states that the time between the start and end of a survey for each locality is no more than 28 days. In addition, any surveys not conducted in the target survey period will cause issues with the calculation of LECF values in future years (or would not be used).

The spread of survey dates for each Area is shown in Figure 3.1. The coloured bars represent the extent of the period during which the survey for that Area was undertaken, the vertical red lines show the survey period boundaries, and the crosses mark dates when surveys were conducted. As the surveys which had changed area (discussed in section 3.1.1) were not used in the LECF calculation these surveys have been excluded from the plots.

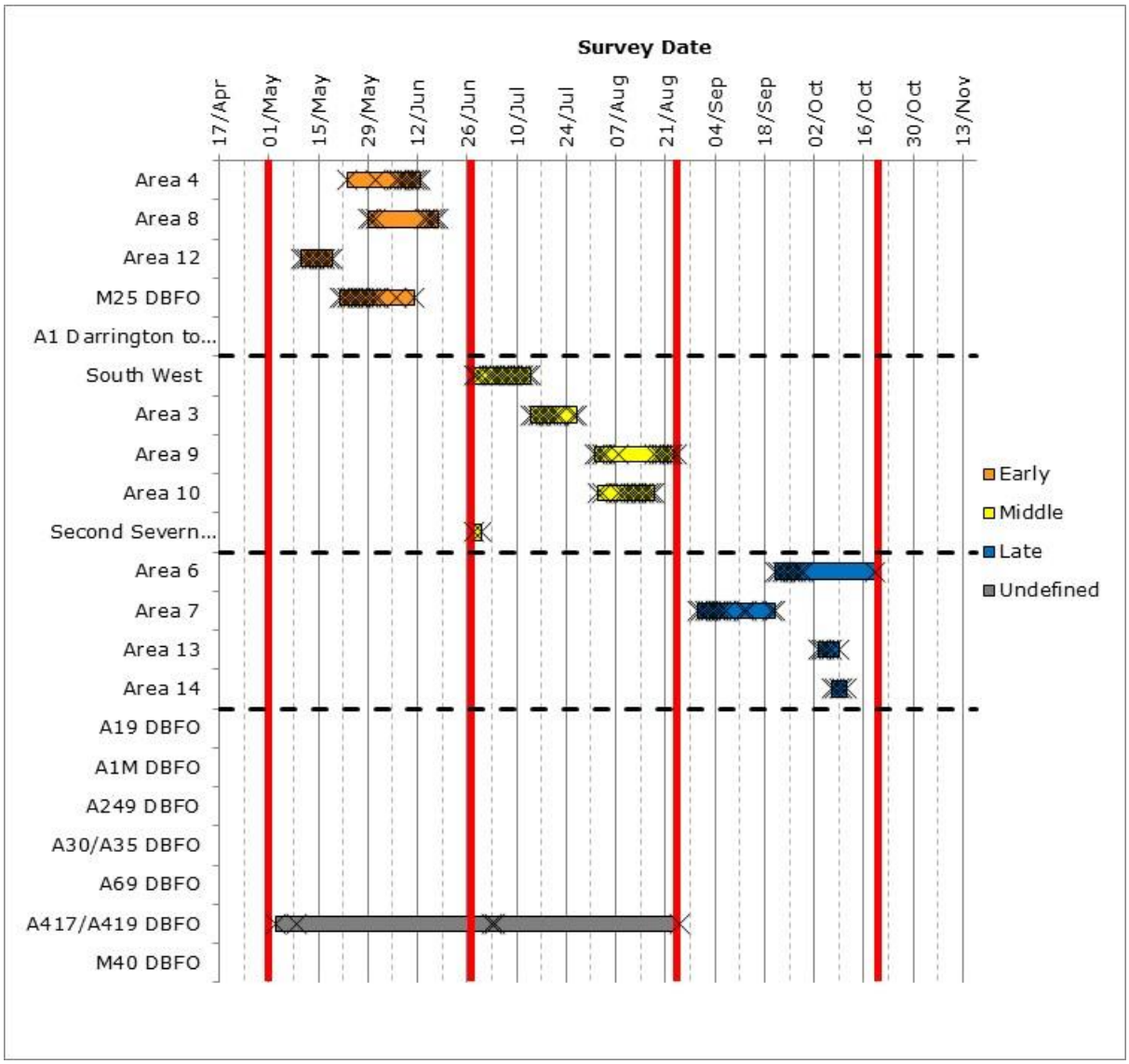

Figure 3.1: Spread of survey dates in 2022 (Lane 1 surveys)

On examination of the data is was found that all Areas were surveyed within 28 days or less (with the exception of the A417/A419 DBFO which is discussed in 4.4.3.

4 LECF Calculation and visual analysis

4.1 Early Period LECFs

An examination of the survey rotation for the past three years of surveys found that all Areas with a target of an Early survey in 2022 had a suitable combination of survey periods for calculation of the LESCs.

Visual analysis carried out on the early survey data identified a number of sections that needed to be removed from the LECF analysis due to anomalies (localised differences between the survey data from different years, for example, as a result of maintenance). The length of data removed and the length with skid resistance data remaining is shown in Table 4.1.

Table 4.1: Data removed as a result of visual analysis for early surveys

Area	Length removed by analysis (km)	Remaining length with data (km)
Area 4	80.79	987.22
Area 8	128.56	756.78
Area 12	184.74	1,029.31
A1DD DBFO	8.82	115.46
M25 DBFO	183.76	830.57

Fifteen localities which had early surveys in 2022 had a significant length of data removed (>10km). These were:

- A2, A27 and M20 in Area 4
- A5, A14 and M1 in Area 8
- A63, A64, A180, M1, M18 and M62 in Area 12
- A1M, M4 and M25 in M25 DBFO

Most localities that had sufficient data to calculate a road LECF prior to the visual analysis still had enough data for a road LECF calculation after the removal of anomalies identified by the visual analysis. The exceptions to this were the A13 and A282 in the M25 DBFO.

4.2 Middle Period LECFs

As with the early period surveys, the past years' survey rotation was examined prior to calculation of the mid period LECFs. It was found that the standard past years' survey rotation was suitable for all Areas.

The visual analysis of the middle period surveys identified a number of sections for removal from the analysis, spread over the Areas as shown in Table 4.2.

Table 4.2: Data removed as a result of visual analysis for middle surveys

Area	Length removed by analysis (km)	Remaining length with data (km)
South West	106.52	1,767.75
Area 3	195.30	1,083.90
Area 9	138.22	1,623.32
Area 10	125.11	1,178.79
Second Severn Crossing DBFO	3.00	19.98

Eighteen localities had a significant length of data removed (>10km). These were:

- A30, A38 and M5 in South West
- A3, A34, M3, M4 and M27 in Area 3
- A5, A46, M5, M6 and M42 in Area 9
- M6, M53, M56, M60 and M62 in Area 10

All but two localities that had enough data to calculate a road LECF prior to the visual analysis still had sufficient data following the removal of anomalies identified by the visual analysis. These localities were the A46 in South West and the A50 in Area 9.

The remaining length of the second Severn crossing DBFO was lower than the threshold for a road LECF, however the calculated LECF was reviewed and deemed suitable for use.

4.3 Late Period LECFs

An examination of the survey rotation for the past three years of surveys found that all Areas had a suitable combination of survey periods for calculation of the LESCs.

The visual analysis carried out on the late period surveys identified a number of sections for removal. The lengths removed and the remaining lengths used in the LECF calculation, by Area, are shown in Table 4.3.

Table 4.3: Data removed as a result of visual analysis for late surveys

Area	Length removed by analysis (km)	Remaining length with data (km)
Area 6	74.92	1,236.75
Area 7	118.55	1,560.18
Area 13	34.14	781.77
Area 14	65.63	580.69

Ten localities had significant lengths of data removed (>10km). These were:

- A11, A12, A14 and A47 in Area 6
- A1 and M1 in Area 7
- A66 and M6 in Area 13
- A1 and A1M in Area 14

All but one locality that had sufficient data to calculate a road LECF prior to the visual analysis still had enough data for a road LECF calculation after the removal of anomalies identified by the visual analysis. This locality was the A19 in Area 14.

4.4 DBFOs

LECFs are also calculated, where possible, for any DBFOs that have data loaded into HAPMS. No issues were identified for the A1 Darrington to Dishforth, and M25 DBFOs. The other DBFOs are discussed below.

4.4.1 Second Severn Crossing DBFO

The Second Severn Crossing DBFO contains just over 25km of main carriageway and approximately 2km of slip roads. This is only just over the threshold for a road LECF, and therefore it is likely that in most years (due to maintenance or anomalous data) this DBFO would not have sufficient data for the calculation of a LECF (if the rules are applied strictly). However, the DBFO is wholly contained within the South West Area (which is surveyed in the same survey period) and other lengths of the two roads which make up the DBFO are also present in this Area. Therefore, in years with low survey coverage (or high maintenance) the LECFs calculated for the South West can be used for this DBFO. In 2022 approximately 18km of data remained for this DBFO after the visual analysis. The suitability of the LECF calculated was compared to the corresponding LECFs from the South West. After review, it was identified that the LECF calculated for the Second Severn Crossing DBFO was the most suitable.

4.4.2 A249 DBFO and A69 DBFO

In previous years, data for the A249 DBFO and the A69 DBFO were loaded into HAPMS with a suitable survey rotation for the calculation of LECF values. By the time of the analysis for this report no data was loaded into HAPMS for the 2022 survey of either of these DBFOs.

4.4.3 A1M DBFO and A417/A419 DBFO

This year, data was also loaded into HAPMS for the for A1M DBFO (for lane two) and for the A417/A419 DBFO. However, the data appears to be surveys for a Mean Summer Skid Coefficient (MSSC) style calculation (i.e. were surveyed in all three survey periods) and the data are therefore unsuitable for calculating LECF values.

4.5 Surveys in lanes other than lane 1

Surveys were loaded into HAPMS for lanes other than lane 1 for some Areas and DBFOs. The majority of these surveys were undertaken in the same survey period targeted for the lane 1 surveys. Therefore, the LECFs calculated for the lane 1 surveys can be applied to most of the additional surveys. The exceptions to this are related to changes in the assigned Area discussed in 3.1.1.

5 Additional observations and further work

5.1 Applying LECFs on concrete sections

During the calculation of the 2007 LECFs (Donbavand & Brittain, 2007; Brittain, 2007) it was identified that concrete surfaces did not appear to experience seasonal variation to the same degree as other surface types. Therefore, an LECF of 1.000 (i.e. no correction) was applied to concrete sections. To determine if this assumption remains valid an additional investigation has been carried out in parallel to the calculation of the LECF values in subsequent years.

The effectiveness of the LECF correction can be determined by comparing the current year's SC data (i.e. the data prior to being corrected for seasonal variation) and the current year's CSC data (i.e. seasonally corrected data) to the average of the past years' SC data. The process of applying the LECF correction should make the average of this year's CSC data match the average of the past three years. Therefore, in this data set, the past years' average is effectively the expected value. If the LECF is reducing seasonal variation then the difference between the CSC data and this expected value should be less than the difference between the SC data and the same expected value. This can be visualised by plotting the distribution of these differences. In these plots a data set which has low seasonal effects would have a mean close to zero (i.e. on average the value of the data set is the same as the average of the past years' data). In addition, a seasonally corrected data set should have a lower standard deviation for these differences (i.e. more of the data set is closer to the past years' data).

This analysis was undertaken for HRA sections (approx. 2,100km), Thin Surfacing (TSCS) sections (approx. 9,100km) and concrete sections (approx. 400km), and the results are presented in Figure 5.1, Figure 5.2 and Figure 5.3 respectively. For the concrete sections (Figure 5.3), the CSC value shown is the value that would have been generated if the LECF calculated for that road/Area was used rather than the factor of 1.000 that was actually applied.

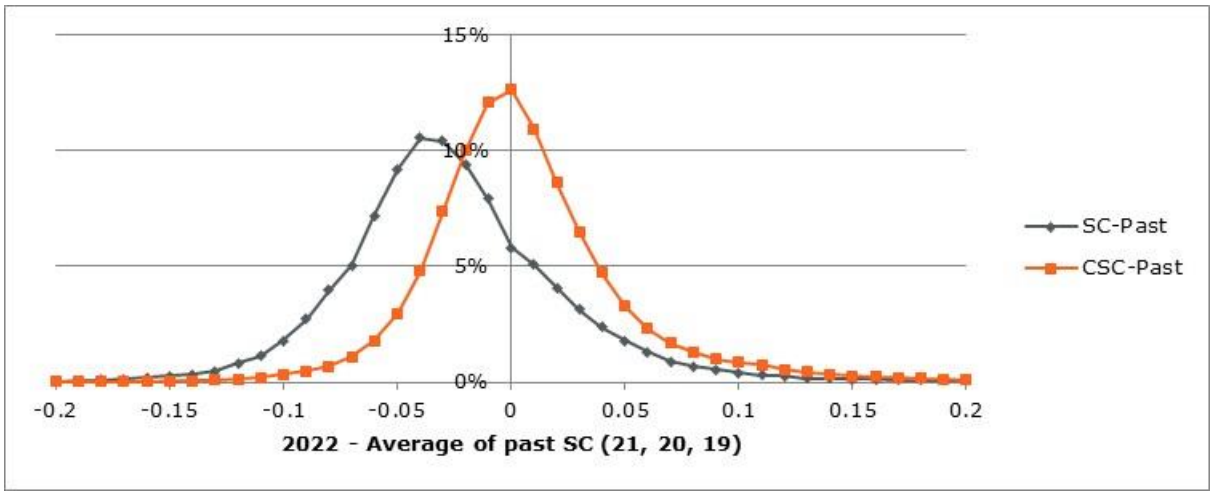

Figure 5.1: 2022 data – Past year average for HRA surveys

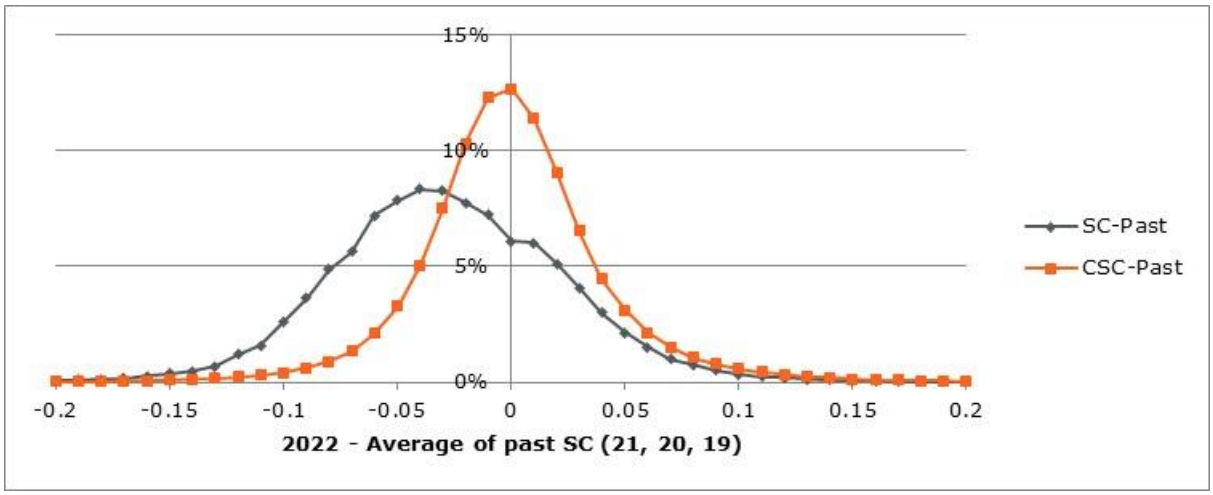

Figure 5.2: 2022 data – Past year average for TS surveys

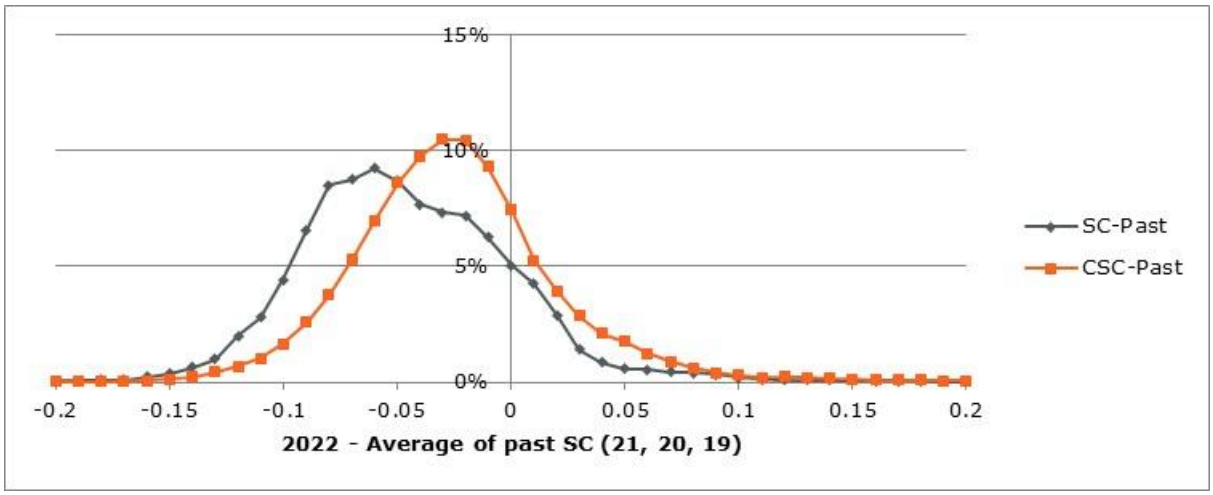

Figure 5.3: 2022 data – Past year average for concrete surveys

As expected, the LECFs reduce the seasonal variation for the HRA and TSCS sections. This can be seen by the narrower distribution/higher mid peak (with mean close to zero) in Figure 5.1 and Figure 5.2 for the 2022 CSC minus the average of past SC values in comparison to the same distribution for the 2022 SC data. The concrete sections (Figure 5.3) also show an improvement, but it can be seen that the CSC-Past is still offset. This verifies the assumption that concrete sections do not experience the same seasonal variation as HRA and TSCS sections. It is noted that all three datasets the SC-Past are offset to the left which signifies a low skid resistance year.

5.2 LECF Distribution by date

As stated previously, the levels of skid resistance vary during the course of the year. To investigate this effect and to monitor the suitability of the survey dates, the spread of LECF values was plotted. This investigation has been carried out at the same time as the LECF

calculation since 2008 and is discussed further in the annual reports on the LECF calculation for each year.

The first part of this analysis is to plot the LECF values by date (2022 data shown in Figure 5.4), which gives an impression of the spread of values. However, this can be hard to interpret in terms of SC data and therefore a second plot is generated. This second plot is created by taking a typical value for CSC (0.5 is used in this case) and dividing by the LECF to determine an estimated SC value (2022 data shown in Figure 5.5).

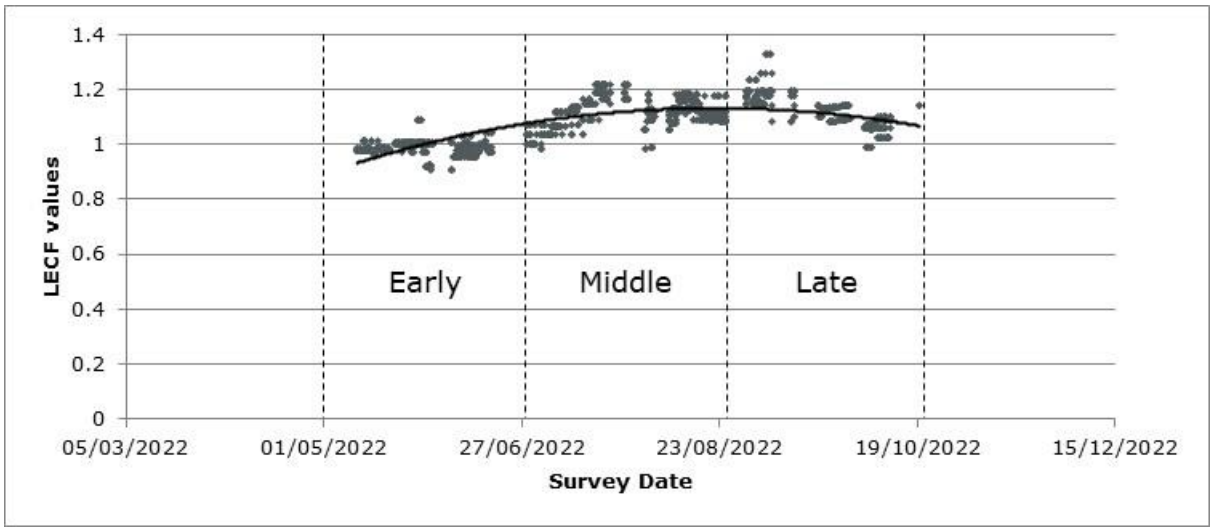

Figure 5.4: Distribution of LECF values by date from SASS analysis

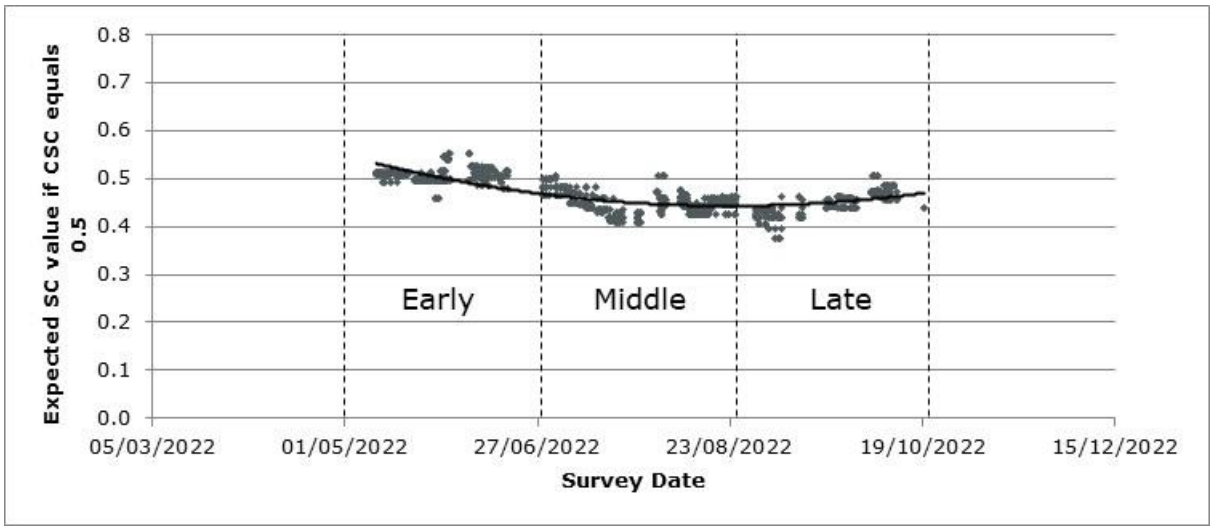

Figure 5.5: Expected SC if CSC equals 0.5 from SASS analysis

From the analysis of the 2022 data, it can be seen that the typical shape of skid resistance over the survey season (see Figure 1.1) does appear to be present, with the minimum value positioned on the middle/late boundary.

It is recommended that the suitability of the survey periods should continue to be reviewed on an annual basis.

5.3 Usage of LECF values by length

Figure 5.6 shows the length of the network to which each LECF value was applied (excluding concrete sections). The weighted average of the LECF for 2022 is 1.07 which corresponds to a low skid resistance year compared to the previous three years (similar to the observations noted in section 5.1).

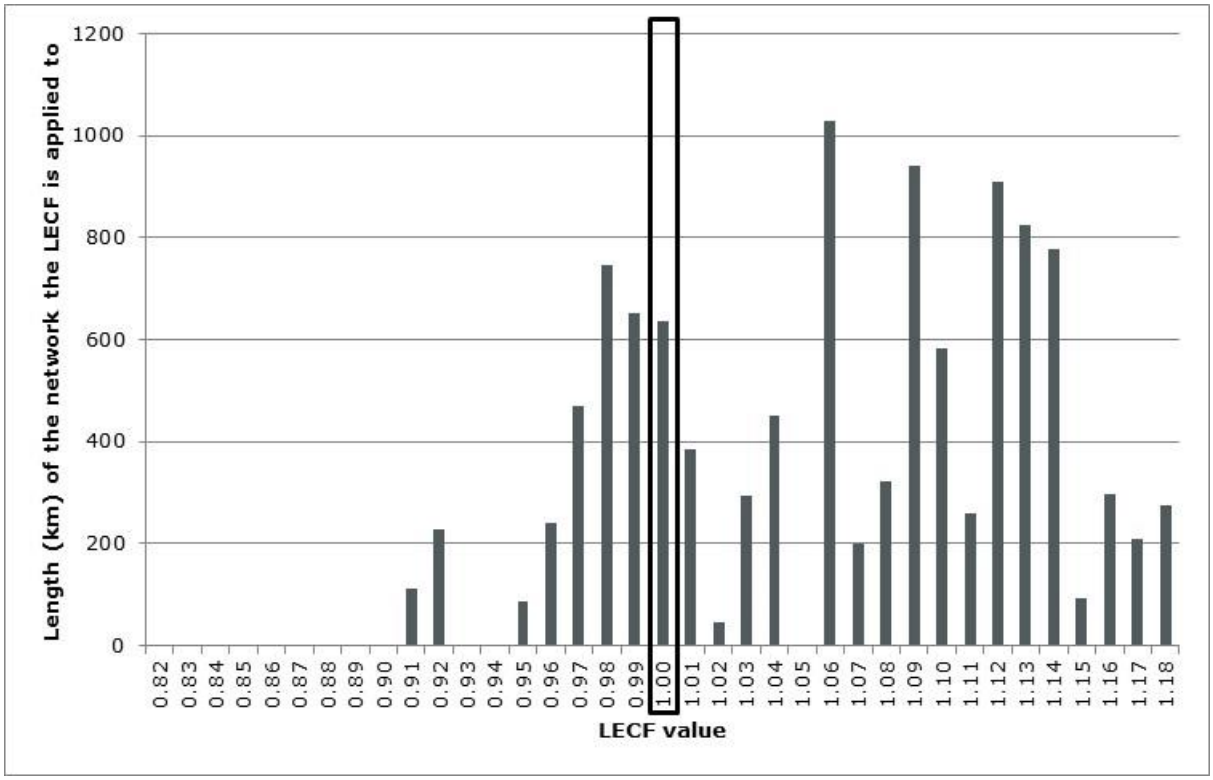

Figure 5.6: Length to which each LECF was applied

5.4 Seasonal trend and the skid resistance benchmark sites

In addition to the work done in analysing the SASS network data and resulting LECFs, National Highways also commissions annual surveys of benchmark sites to examine long term trends in skid resistance on the network. The analysis of the 2022 data (Brittain, 2023) also found that the minimum value appeared to occur on the middle/late survey period boundary and that the 2022 values were low when compared to the average of the previous three years.

The seasonal trend analysis discussed in this report provides an estimate of ongoing trends of the overall seasonal variation of the network, however it is complicated by the fact it uses data from different areas for each period to perform the analysis. Therefore, the trend seen from the benchmark sites work is generally the more reliable of the two when considering

the overall trend in skid resistance over time. However, in terms of estimating future CSC values for the network, the results from the LECF analysis should be used (as it is using the same data that would be used in future LECF calculations).

6 Summary

6.1 Lane 1 survey coverage

When combined together 98.7% of the length of the National Highways Areas had data coverage. Individually each of the National Highways Areas had at least 95.2% data coverage.

Survey coverage for the DBFOs loaded into HAPMS with defined survey rotations for LECF calculation (A1 DD, M25 and Second Severn crossing) also had high survey coverage and provided data suitable for the LECF calculation. Two DBFOs that have previously had survey data loaded into HAPMS (A249 and A69) did not have any data loaded at the time of the analyses for this report. Two more DBFOs had data loaded into HAPMS, however the survey pattern suggested the MSSC approach is being used for these DBFOs and was therefore unsuitable for LECF calculation.

The skid resistance survey contract states that survey data should be loaded into HAPMS, pass independent checks and be ready for further analysis (i.e. the LECF calculation) by specified dates. For the 2022 surveys the vast majority of the data was available by these dates for the National Highways Areas.

6.2 Suitability of data loaded

During the processing of the data for the LECFs a few anomalies were found with the data. The types of anomalies identified were:

1. Downward slope to survey data over section
2. Possible misalignment
3. Very low value (<0.1)

The lengths identified by this analysis were supplied to National Highways and the survey contractor for review and where necessary amendment.

6.3 Lane 1 survey dates and timescales

All of the surveys of the National Highways Areas were surveyed within the target survey period (excluding some sections which changed Area after the survey). All of the DBFOs with data loaded into HAPMS with defined LECF compatible survey rotations were also surveyed within the target survey period.

The spread of survey dates was 28 days or less for all Areas where a LECF was calculated

6.4 Calculation of LECF

The modified LECF procedure used since 2007 (Brittain, 2007) was used again for the 2022 data. To aid the visual analysis of the data the automated analysis developed during 2008 (Brittain, 2009) was also used.

The survey rotation pattern established for the National Highways Areas meant that, for the lane 1 surveys, all of the Areas had valid past years' data in the standard years (2021, 2020 and 2019).

Visual analyses of the survey data were carried out which identified several sections for removal. All but five localities that had sufficient data to calculate the more robust road LECF prior to the visual analysis still had enough data for that calculation following removal of lengths identified during the visual analysis.

As with previous years, the lane 1 LECFs were calculated for DBFOs with sufficient data loaded into HAPMS. This year LECFs were calculated for the A1DD, M25 and Second Severn Crossing DBFOs.

6.5 Surveys of lanes other than lane 1

Surveys were loaded into HAPMS for lanes other than lane 1 for some Areas and DBFOs. In the locations where LECFs were calculated the majority of these additional surveys were completed in the same period as the lane 1 surveys. Therefore, the LECFs calculated for the lane 1 surveys are suitable for use for most of the additional lane surveys.

6.6 Seasonal variation of concrete sections

An investigation into the application of LECFs on concrete sections confirmed the findings from previous studies that concrete sections do not experience the same seasonal variation as asphalt sections.

6.7 Variation of LECF values during the survey season

As with previous years, the spread of LECF values (by date) was investigated. This analysis suggests that for 2022 the minimum value occurred slightly later than expected, on the boundary between the mid and late periods. In addition, the weighted average LECF value for the network was 1.07 which corresponds to a low skid resistance year compared to the previous three years. The benchmark sites analysis found similar conclusions. The low skid resistance values in 2022 will lower the seasonally corrected skid resistance values in 2023, 2024 and 2025 due to its inclusion in the past years' average. This will likely lead to additional lengths being identified as requiring investigation under CS 228 (DMRB CS 228).

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 of either a UPR or CPR.

Brittain, S. (2007). *Task 1 Methodology for deriving Local Equilibrium Correction Factors for the 2007 SCRIM surveys (UPR/IE/213/06).* Wokingham: TRL.

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DMRB CS 228. (n.d.). *Design Manual for Roads and Bridges Volume 7 Section 1, CS 228 Skidding resistance*. London: The Stationery Office.

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

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Appendix A Calculating the LECF

A.1 Derivation of LECF

The following equation is used to calculate an LECF:

$$LECF = \frac{Local\ Equilibrium\ Skid\ Coefficient\ (LESC)}{Local\ Mean\ Skid\ Coefficient\ (LMSC)} \quad \textbf{A.1}$$

where LESC is the estimate of the local, long term skid resistance obtained from the average of the previous 3 years' surveys and LMSC is the average of the current year's survey in the same locality as the LESC.

The LESC incorporates one survey from each of the 3 survey periods to avoid bias in the estimate of long term skid resistance. Table A.1 shows all possible combinations of early (E), middle (M) and late (L) survey periods for the past years and current year that were used to calculate a LECF. For each current year survey period a length-weighted average[1] LECF was calculated for three localities: each road individually within each Area, for all roads within each Area, and for all roads in all Areas.

Table A.1: Possible combinations of survey period for LECF Calculation

Current year	One year into the past	Two year's into the past	Three year's into the past
Early	Early	Middle	Late
Early	Early	Late	Middle
Early	Middle	Early	Late
Early	Middle	Late	Early
Early	Late	Early	Middle
Early	Late	Middle	Early
Middle	Early	Middle	Late
Middle	Early	Late	Middle
Middle	Middle	Early	Late
Middle	Middle	Late	Early
Middle	Late	Early	Middle
Middle	Late	Middle	Early
Late	Early	Middle	Late
Late	Early	Late	Middle
Late	Middle	Early	Late
Late	Middle	Late	Early
Late	Late	Early	Middle
Late	Late	Middle	Early

[1] An Average of all six valid combinations of past and current surveys, weighted by the length of road that each individual combination was based on.

The LECFs are applied by locality because the influence of climate and the type of road could affect the within year skid resistance variation and hence the LECF. Table A.2 shows the order of LECF allocation that is applied to each road. If an LECF by road does not exist or the length of road data is less than 25km[2], the Area LECF is applied; this also occurs when a given road is surveyed but does not have a valid combination of past years' data. If an LECF by road or by Area does not exist, an LECF by survey period is applied; in practice this has only occurred in 2005 on a few sections where there was no valid past years' data for any road in a given Area and survey period. There has been no occurrence of this since then.

Table A.2: Allocation of LECFs

Order of allocation	Calculation type	Description
1	Road	Calculation by individual road within an Area
2	Area	Calculation by all roads within an Area
3	Survey Period	Calculation by all roads and all Areas

A.2 Survey period boundaries

The current survey period boundaries for skid resistance surveys are given in Table A.3.

Table A.3: Survey period boundaries from the 2010 survey season onwards

Survey Period	Start Date	End Date
Early	1 May	27 June
Middle	28 June	24 August
Late	25 August	20 October

These dates were developed based on work carried out on the National Highways benchmark sites, which are used to monitor long term trends in skid resistance, (Donbavand & Kennedy, 2010). Prior to 2010 the survey periods were the dates shown in Table A.4.

Table A.4: Survey period boundaries prior to the 2010 survey season

Survey Period	Start Date	End Date
Early	1 May	20 June
Middle	21 June	10 August
Late	11 August	30 September

[2] This was implemented to ensure that the LECFs by road were not based on small lengths that could have been unrepresentative of the overall road length that it was applied to. It was originally set at 50km, however after investigation into the effects during the 2007 LECF calculation it was reduced to 25km.

To help smooth the transition from the MSSC (Mean Summer Skid Coefficient) approach to the SASS (Single Annual Skid Survey) method, introduced in 2005, extended survey period boundaries were used when extracting the data. This approach was taken to maximise the lengths upon which the LECF was calculated. This was originally required due to the smaller time scales allowed for the survey season, which on occasion resulted in surveys conducted outside of the planned dates. Due to the extension of the survey season in 2010, extending the dates for extraction of data is no longer necessary. The dates for these extended survey periods are shown in Table A.5.

Table A.5: Extended survey period boundaries for data before 2010

Survey Period	Start Date	End Date
Early	1 May	27 June
Middle	14 June	17 August
Late	4 August	7 October

A.3 Construction cut-off

Data from roads re-surfaced during the 5 year period covering the current year, 3 past years and a wear in year were excluded from the analysis because a comparison in skid resistance between past years and the current year was not valid. To ensure that these sections were not included in the analysis a construction cut-off date was employed to ignore any such maintenance. For the 2022 LECFs this meant that the construction cut off was 1st May 2018. Employing an extra gap of one year before the first year of the past years' data means that new surfaces will have had time for the skid resistance level to stabilise; therefore, the within year skid resistance variation for the data will not be influenced by early life skid resistance changes.

A.4 Concrete sections

It was observed in 2007 (Donbavand & Brittain, 2007; Brittain, 2007) that concrete sections do not experience seasonal variation in the same manner as asphalt sections. National Highways therefore decided that concrete sections would have an LECF of 1.00 applied (i.e. no correction). Given this, it is therefore necessary to exclude all sections which include concrete from the LECF analysis.

A.5 Visual Analysis

A visual analysis of the survey data is carried out in order to identify data which do not conform with the general pattern; these data can then be investigated further and, where appropriate, removed from the LECF calculation. The visual analysis process consists of an inspection of line charts of the current and historic data, and can be used to identify sections which appear to have been resurfaced (but do not have appropriate construction records) and other anomalies (e.g. negative skid resistance values). Once a section has been identified it is removed if more than 20% of the section is deemed to be unrepresentative.

A.6 Verification of LECF values

Once the LECF values have been calculated they are then verified in order to identify any inconsistencies. Two processes are used to do this:

1. The difference (absolute value) between the past years' SC values (values which have not had the LECF correction applied) and the current year's CSC values are compared to the difference between the past years' SC values and the current year's SC values. If there is an issue with the LECF then the current year's SC values will be closer to the past years' SC values than the current year's CSC values.
2. The line charts for the current year's CSC values against the past years' SC values are inspected and compared to the line chart for the current year's SC values against the past years SC values. If an LECF value is unsuitable then the lines seen in these charts would have similar shapes, i.e. they are representative of the same surface, but the average values would be different.

The verification processes were found to be particularly useful during the calculation of the Early 2007 LECFs. During the survey period, one of the survey machines underwent a repair. The verification process identified that the skid resistance values were found to be characteristically different before and after the repair. This was particularly relevant to the M25 which had surveys carried out with the machine in both states. This was resolved by producing two LECF values for the M25 (along with two "Area" LECFs), one for before the repair and one for after.

A.7 Example detail of LECF calculation – Area 3 (Late 2005 surveys)

The tables below show the LECF calculation process for 2005 late period surveys in Area 3. Table A.6 shows the length weighted LECF calculated for each road that had valid combinations of current year and past years' data. These values were applied as the preferred option.

Table A.7 shows the LECF calculated for all roads in the Area, which was applied as a secondary option where there were roads with insufficient valid data for a LECF to be calculated or if the LECF was based on less than 25km of data. These two options would provide a LECF for the majority of roads. The final option was to apply a national LECF calculated by survey period, which is shown in Table A.8. This is based on all roads and Areas and reflects the seasonal variation experienced for England as a whole for the late period survey in comparison to the surveys in the previous years.

The LECF method applied to Area 3 2005 late surveys is shown in Table A.9. Seven of the road based LECFs were applied, with four roads requiring the Area LECF; two of which were due to the application of the minimum 25km data rule.

Table A.6: LECF calculated by road

Area	Road	Calculation Length (km)	LESC	LMSC	LECF
Area 3	A27	83	0.565	0.577	0.980
Area 3	A3	112	0.516	0.492	1.049
Area 3	A303	138	0.523	0.519	1.008
Area 3	A308M	0	-	-	-
Area 3	A31	101	0.543	0.495	1.097
Area 3	A34	139	0.530	0.535	0.991
Area 3	A3M	0	-	-	-
Area 3	A404	37	0.576	0.574	1.004
Area 3	A404M	16	0.565	0.575	0.982
Area 3	M27	3	0.532	0.519	1.026
Area 3	M271	28	0.499	0.500	0.998
Area 3	M3	288	0.522	0.520	1.003
Area 3	M4	77	0.524	0.521	1.005

Table A.7: LECF calculated by Area

Area	Calculation Length (km)	LESC	LMSC	LECF
Area 3	1023	0.530	0.523	1.013

Table A.8: LECF calculated by survey period

Area	Calculation Length (km)	LESC	LMSC	LECF
All Areas	5423	0.496	0.481	1.031

Table A.9: Application of LECF to 2005 surveys (Area 3 – late season surveys)

Area	Road	LECF	Calculation Type
Area 3	A27	0.979	Road
Area 3	A3	1.049	Road
Area 3	A303	1.007	Road
Area 3	A308M	1.013	Area
Area 3	A31	1.097	Road
Area 3	A34	0.991	Road
Area 3	A3M	1.013	Area
Area 3	A404	1.004	Road
Area 3	A404M	1.013	Area
Area 3	M27	1.013	Area
Area 3	M271	0.998	Road
Area 3	M3	1.003	Road
Area 3	M4	1.005	Road

Appendix B 2022 LECF values

Note: the dates shown here refer to the cut off (applied at midnight) for the surveys, i.e. a survey end date of 28th June here would include all of the surveys on the 27th but none of the surveys on the 28th.

Table B.1: Early season surveys

Area	Road	LECF	Type	Survey period start date	Survey period end date
Area 4	A2	0.978	AREA & ROAD	01/05/2022	28/06/2022
Area 4	A20	0.965	AREA	01/05/2022	28/06/2022
Area 4	A2070	1.005	AREA & ROAD	01/05/2022	28/06/2022
Area 4	A21	0.906	AREA & ROAD	01/05/2022	28/06/2022
Area 4	A23	0.994	AREA & ROAD	01/05/2022	28/06/2022
Area 4	A249	0.965	AREA	01/05/2022	28/06/2022
Area 4	A259	1.029	AREA & ROAD	01/05/2022	28/06/2022
Area 4	A26	0.965	AREA	01/05/2022	28/06/2022
Area 4	A27	0.956	AREA & ROAD	01/05/2022	28/06/2022
Area 4	M2	0.993	AREA & ROAD	01/05/2022	28/06/2022
Area 4	M20	0.954	AREA & ROAD	01/05/2022	28/06/2022
Area 4	M23	0.974	AREA & ROAD	01/05/2022	28/06/2022
Area 8	A1	0.922	AREA & ROAD	01/05/2022	28/06/2022
Area 8	A1081	0.973	AREA	01/05/2022	28/06/2022
Area 8	A11	1.014	AREA & ROAD	01/05/2022	28/06/2022
Area 8	A1307	0.973	AREA	01/05/2022	28/06/2022
Area 8	A14	0.988	AREA & ROAD	01/05/2022	28/06/2022
Area 8	A141	0.973	AREA	01/05/2022	28/06/2022
Area 8	A1M	0.925	AREA & ROAD	01/05/2022	28/06/2022
Area 8	A414	0.973	AREA	01/05/2022	28/06/2022
Area 8	A421	0.919	AREA & ROAD	01/05/2022	28/06/2022
Area 8	A428	1.043	AREA & ROAD	01/05/2022	28/06/2022
Area 8	A5	0.994	AREA & ROAD	01/05/2022	28/06/2022
Area 8	A5183	0.973	AREA	01/05/2022	28/06/2022
Area 8	M1	0.973	AREA & ROAD	01/05/2022	28/06/2022
Area 8	M11	0.999	AREA & ROAD	01/05/2022	28/06/2022
Area 12	A1	0.982	AREA	01/05/2022	28/06/2022
Area 12	A1033	0.982	AREA	01/05/2022	28/06/2022
Area 12	A160	0.982	AREA	01/05/2022	28/06/2022
Area 12	A162	0.982	AREA	01/05/2022	28/06/2022
Area 12	A180	0.982	AREA	01/05/2022	28/06/2022
Area 12	A1M	1.016	AREA & ROAD	01/05/2022	28/06/2022
Area 12	A58	0.982	AREA	01/05/2022	28/06/2022
Area 12	A61	0.982	AREA	01/05/2022	28/06/2022
Area 12	A616	0.982	AREA	01/05/2022	28/06/2022
Area 12	A62	0.982	AREA	01/05/2022	28/06/2022

Area	Road	LECF	Type	Survey period start date	Survey period end date
Area 12	A628	0.982	AREA	01/05/2022	28/06/2022
Area 12	A63	0.983	AREA & ROAD	01/05/2022	28/06/2022
Area 12	A631	0.982	AREA	01/05/2022	28/06/2022
Area 12	A638	0.982	AREA	01/05/2022	28/06/2022
Area 12	A64	0.968	AREA & ROAD	01/05/2022	28/06/2022
Area 12	M1	0.987	AREA & ROAD	01/05/2022	28/06/2022
Area 12	M18	0.977	AREA & ROAD	01/05/2022	28/06/2022
Area 12	M180	0.977	AREA & ROAD	01/05/2022	28/06/2022
Area 12	M181	0.982	AREA	01/05/2022	28/06/2022
Area 12	M606	0.982	AREA	01/05/2022	28/06/2022
Area 12	M62	0.978	AREA & ROAD	01/05/2022	28/06/2022
Area 12	M621	0.982	AREA	01/05/2022	28/06/2022
A1DD DBFO	A1M	0.972	AREA & ROAD	01/05/2022	28/06/2022
A1DD DBFO	A63	0.972	AREA	01/05/2022	28/06/2022
M25 DBFO	A1	1.006	AREA	01/05/2022	28/06/2022
M25 DBFO	A10	1.006	AREA	01/05/2022	28/06/2022
M25 DBFO	A1001	1.006	AREA	01/05/2022	28/06/2022
M25 DBFO	A1023	1.006	AREA	01/05/2022	28/06/2022
M25 DBFO	A1089	1.006	AREA	01/05/2022	28/06/2022
M25 DBFO	A12	1.006	AREA	01/05/2022	28/06/2022
M25 DBFO	A127	1.006	AREA	01/05/2022	28/06/2022
M25 DBFO	A13	1.006	AREA	01/05/2022	28/06/2022
M25 DBFO	A1M	1.006	AREA	01/05/2022	28/06/2022
M25 DBFO	A2	1.006	AREA	01/05/2022	28/06/2022
M25 DBFO	A20	1.006	AREA	01/05/2022	28/06/2022
M25 DBFO	A21	1.006	AREA	01/05/2022	28/06/2022
M25 DBFO	A23	1.006	AREA	01/05/2022	28/06/2022
M25 DBFO	A282	1.006	AREA	01/05/2022	28/06/2022
M25 DBFO	A3	1.09	AREA & ROAD	01/05/2022	28/06/2022
M25 DBFO	A30	1.006	AREA	01/05/2022	28/06/2022
M25 DBFO	A3113	1.006	AREA	01/05/2022	28/06/2022
M25 DBFO	A312	1.006	AREA	01/05/2022	28/06/2022
M25 DBFO	A316	1.006	AREA	01/05/2022	28/06/2022
M25 DBFO	A40	1.006	AREA	01/05/2022	28/06/2022
M25 DBFO	A405	1.006	AREA	01/05/2022	28/06/2022
M25 DBFO	M1	0.974	AREA & ROAD	01/05/2022	28/06/2022
M25 DBFO	M11	1.006	AREA	01/05/2022	28/06/2022
M25 DBFO	M20	1.006	AREA	01/05/2022	28/06/2022
M25 DBFO	M23	1.006	AREA	01/05/2022	28/06/2022
M25 DBFO	M25	1.002	AREA & ROAD	01/05/2022	28/06/2022
M25 DBFO	M26	1.006	AREA	01/05/2022	28/06/2022
M25 DBFO	M3	1.006	AREA	01/05/2022	28/06/2022
M25 DBFO	M4	1.006	AREA	01/05/2022	28/06/2022

Table B.2: Middle season surveys

Area	Road	LECF	Type	Survey period start date	Survey period end date
South West	A30	1.064	AREA & ROAD	28/06/2022	25/08/2022
South West	A303	1.12	AREA & ROAD	28/06/2022	25/08/2022
South West	A36	1.137	AREA & ROAD	28/06/2022	25/08/2022
South West	A38	1.117	AREA & ROAD	28/06/2022	25/08/2022
South West	A4	1.072	AREA	28/06/2022	25/08/2022
South West	A40	0.986	AREA & ROAD	28/06/2022	25/08/2022
South West	A417	1.072	AREA	28/06/2022	25/08/2022
South West	A46	1.072	AREA	28/06/2022	25/08/2022
South West	M32	1.072	AREA	28/06/2022	25/08/2022
South West	M4	1.001	AREA & ROAD	28/06/2022	25/08/2022
South West	M48	1.072	AREA	28/06/2022	25/08/2022
South West	M49	1.072	AREA	28/06/2022	25/08/2022
South West	M5	1.038	AREA & ROAD	28/06/2022	25/08/2022
Area 3	A27	1.165	AREA	28/06/2022	25/08/2022
Area 3	A3	1.168	AREA & ROAD	28/06/2022	25/08/2022
Area 3	A303	1.215	AREA & ROAD	28/06/2022	25/08/2022
Area 3	A308M	1.165	AREA	28/06/2022	25/08/2022
Area 3	A31	1.212	AREA & ROAD	28/06/2022	25/08/2022
Area 3	A34	1.145	AREA & ROAD	28/06/2022	25/08/2022
Area 3	A346	1.165	AREA	28/06/2022	25/08/2022
Area 3	A3M	1.165	AREA	28/06/2022	25/08/2022
Area 3	A404	1.165	AREA	28/06/2022	25/08/2022
Area 3	A404M	1.165	AREA	28/06/2022	25/08/2022
Area 3	M27	1.22	AREA & ROAD	28/06/2022	25/08/2022
Area 3	M271	1.165	AREA	28/06/2022	25/08/2022
Area 3	M3	1.191	AREA & ROAD	28/06/2022	25/08/2022
Area 3	M4	1.092	AREA & ROAD	28/06/2022	25/08/2022
Area 9	A34	1.091	AREA	28/06/2022	25/08/2022
Area 9	A38	1.107	AREA & ROAD	28/06/2022	25/08/2022
Area 9	A38M	1.091	AREA	28/06/2022	25/08/2022
Area 9	A40	1.084	AREA & ROAD	28/06/2022	25/08/2022
Area 9	A4097	1.091	AREA	28/06/2022	25/08/2022
Area 9	A41	1.091	AREA	28/06/2022	25/08/2022
Area 9	A4123	1.091	AREA	28/06/2022	25/08/2022
Area 9	A423	1.091	AREA	28/06/2022	25/08/2022
Area 9	A435	1.091	AREA	28/06/2022	25/08/2022
Area 9	A446	1.091	AREA	28/06/2022	25/08/2022
Area 9	A449	1.091	AREA	28/06/2022	25/08/2022
Area 9	A45	1.179	AREA & ROAD	28/06/2022	25/08/2022
Area 9	A4510	1.091	AREA	28/06/2022	25/08/2022
Area 9	A452	1.091	AREA	28/06/2022	25/08/2022
Area 9	A456	1.091	AREA	28/06/2022	25/08/2022
Area 9	A458	0.986	AREA & ROAD	28/06/2022	25/08/2022
Area 9	A46	1.116	AREA & ROAD	28/06/2022	25/08/2022

Area	Road	LECF	Type	Survey period start date	Survey period end date
Area 9	A483	1.091	AREA	28/06/2022	25/08/2022
Area 9	A49	1.057	AREA & ROAD	28/06/2022	25/08/2022
Area 9	A5	1.098	AREA & ROAD	28/06/2022	25/08/2022
Area 9	A50	1.091	AREA	28/06/2022	25/08/2022
Area 9	A500	0.988	AREA & ROAD	28/06/2022	25/08/2022
Area 9	A5127	1.091	AREA	28/06/2022	25/08/2022
Area 9	A5148	1.091	AREA	28/06/2022	25/08/2022
Area 9	M40	1.086	AREA & ROAD	28/06/2022	25/08/2022
Area 9	M42	1.1	AREA & ROAD	28/06/2022	25/08/2022
Area 9	M5	1.118	AREA & ROAD	28/06/2022	25/08/2022
Area 9	M50	1.055	AREA & ROAD	28/06/2022	25/08/2022
Area 9	M54	1.085	AREA & ROAD	28/06/2022	25/08/2022
Area 9	M6	1.12	AREA & ROAD	28/06/2022	25/08/2022
Area 9	M69	1.091	AREA	28/06/2022	25/08/2022
Area 10	A41	1.133	AREA	28/06/2022	25/08/2022
Area 10	A483	1.133	AREA	28/06/2022	25/08/2022
Area 10	A494	1.133	AREA	28/06/2022	25/08/2022
Area 10	A5036	1.133	AREA	28/06/2022	25/08/2022
Area 10	A5103	1.133	AREA	28/06/2022	25/08/2022
Area 10	A5117	1.133	AREA	28/06/2022	25/08/2022
Area 10	A55	1.133	AREA	28/06/2022	25/08/2022
Area 10	A550	1.133	AREA	28/06/2022	25/08/2022
Area 10	A556	1.133	AREA	28/06/2022	25/08/2022
Area 10	A56	1.133	AREA	28/06/2022	25/08/2022
Area 10	A57	1.133	AREA	28/06/2022	25/08/2022
Area 10	A580	1.133	AREA	28/06/2022	25/08/2022
Area 10	A59	1.133	AREA	28/06/2022	25/08/2022
Area 10	A627M	1.133	AREA	28/06/2022	25/08/2022
Area 10	A628	1.133	AREA	28/06/2022	25/08/2022
Area 10	A663	1.133	AREA	28/06/2022	25/08/2022
Area 10	M53	1.078	AREA & ROAD	28/06/2022	25/08/2022
Area 10	M56	1.113	AREA & ROAD	28/06/2022	25/08/2022
Area 10	M57	1.173	AREA & ROAD	28/06/2022	25/08/2022
Area 10	M58	1.149	AREA & ROAD	28/06/2022	25/08/2022
Area 10	M6	1.087	AREA & ROAD	28/06/2022	25/08/2022
Area 10	M60	1.18	AREA & ROAD	28/06/2022	25/08/2022
Area 10	M602	1.133	AREA	28/06/2022	25/08/2022
Area 10	M61	1.127	AREA & ROAD	28/06/2022	25/08/2022
Area 10	M62	1.159	AREA & ROAD	28/06/2022	25/08/2022
Area 10	M65	1.133	AREA & ROAD	28/06/2022	25/08/2022
Area 10	M66	1.133	AREA	28/06/2022	25/08/2022
Area 10	M67	1.133	AREA	28/06/2022	25/08/2022
Second Severn Crossing	M4	0.985	AREA	28/06/2022	25/08/2022
Second Severn Crossing	M48	0.985	AREA	28/06/2022	25/08/2022

Table B.3: Late season surveys

Area	Road	LECF	Type	Survey period start date	Survey period end date
Area 6	A1	1.118	AREA	25/08/2022	21/10/2022
Area 6	A11	1.086	AREA & ROAD	25/08/2022	21/10/2022
Area 6	A12	1.092	AREA & ROAD	25/08/2022	21/10/2022
Area 6	A120	1.143	AREA & ROAD	25/08/2022	21/10/2022
Area 6	A14	1.136	AREA & ROAD	25/08/2022	21/10/2022
Area 6	A47	1.128	AREA & ROAD	25/08/2022	21/10/2022
Area 6	M11	1.096	AREA & ROAD	25/08/2022	21/10/2022
Area 7	A1	1.157	AREA & ROAD	25/08/2022	21/10/2022
Area 7	A14	1.175	AREA & ROAD	25/08/2022	21/10/2022
Area 7	A38	1.234	AREA & ROAD	25/08/2022	21/10/2022
Area 7	A42	1.173	AREA & ROAD	25/08/2022	21/10/2022
Area 7	A43	1.14	AREA & ROAD	25/08/2022	21/10/2022
Area 7	A45	1.102	AREA & ROAD	25/08/2022	21/10/2022
Area 7	A453	1.147	AREA & ROAD	25/08/2022	21/10/2022
Area 7	A46	1.141	AREA & ROAD	25/08/2022	21/10/2022
Area 7	A5	1.329	AREA & ROAD	25/08/2022	21/10/2022
Area 7	A50	1.175	AREA	25/08/2022	21/10/2022
Area 7	A5111	1.175	AREA	25/08/2022	21/10/2022
Area 7	A516	1.175	AREA	25/08/2022	21/10/2022
Area 7	A52	1.147	AREA & ROAD	25/08/2022	21/10/2022
Area 7	A6	1.175	AREA	25/08/2022	21/10/2022
Area 7	M1	1.192	AREA & ROAD	25/08/2022	21/10/2022
Area 7	M45	1.086	AREA & ROAD	25/08/2022	21/10/2022
Area 7	M6	1.175	AREA	25/08/2022	21/10/2022
Area 7	M69	1.26	AREA & ROAD	25/08/2022	21/10/2022
Area 13	A585	1.07	AREA & ROAD	25/08/2022	21/10/2022
Area 13	A590	1.055	AREA & ROAD	25/08/2022	21/10/2022
Area 13	A595	1.071	AREA & ROAD	25/08/2022	21/10/2022
Area 13	A66	1.084	AREA & ROAD	25/08/2022	21/10/2022
Area 13	A69	1.063	AREA	25/08/2022	21/10/2022
Area 13	A7	1.063	AREA	25/08/2022	21/10/2022
Area 13	A74M	1.063	AREA	25/08/2022	21/10/2022
Area 13	M55	0.99	AREA & ROAD	25/08/2022	21/10/2022
Area 13	M6	1.062	AREA & ROAD	25/08/2022	21/10/2022
Area 14	A1	1.027	AREA & ROAD	25/08/2022	21/10/2022
Area 14	A167	1.061	AREA	25/08/2022	21/10/2022
Area 14	A168	1.061	AREA	25/08/2022	21/10/2022
Area 14	A177	1.061	AREA	25/08/2022	21/10/2022
Area 14	A184	1.061	AREA	25/08/2022	21/10/2022
Area 14	A19	1.061	AREA	25/08/2022	21/10/2022
Area 14	A194M	1.061	AREA	25/08/2022	21/10/2022
Area 14	A195M	1.061	AREA	25/08/2022	21/10/2022
Area 14	A1M	1.1	AREA & ROAD	25/08/2022	21/10/2022
Area 14	A6055	1.061	AREA	25/08/2022	21/10/2022

Area	Road	LECF	Type	Survey period start date	Survey period end date
Area 14	A61	1.061	**AREA**	25/08/2022	21/10/2022
Area 14	A66	1.089	AREA & ROAD	25/08/2022	21/10/2022
Area 14	A66M	1.061	**AREA**	25/08/2022	21/10/2022
Area 14	A68	1.061	**AREA**	25/08/2022	21/10/2022
Area 14	A689	1.061	**AREA**	25/08/2022	21/10/2022
Area 14	A690	1.061	**AREA**	25/08/2022	21/10/2022
Area 14	A696	1.061	**AREA**	25/08/2022	21/10/2022

Calculation of Local Equilibrium Correction Factors for the 2022 skid resistance surveys

National Highways manages skid resistance on their network by carrying out single annual skid resistance surveys. This data is used to identify sites where there is a need for an investigation to identify if a resurfacing treatment would help mitigate the risk of skidding collisions. This data also feeds into the KPI for Pavement Condition. This document discusses the calculation of the correction factors to seasonally correct the 2022 surveys.

Other titles from this subject area

PPR 1031	Calculation of Local Equilibrium Correction Factors for the 2021 Skid resistance surveys. S Brittain. 2022
PPR 990	Calculation of Local Equilibrium Correction Factors for the 2020 Skid resistance surveys. S Brittain. 2021
PPR 951	Calculation of Local Equilibrium Correction Factors for the 2019 Skid resistance surveys. S Brittain. 2020
PPR 906	Calculation of Local Equilibrium Correction Factors for the 2018 Skid resistance surveys. S Brittain. 2019

TRL
Crowthorne House, Nine Mile Ride,
Wokingham, Berkshire, RG40 3GA,
United Kingdom
T: +44 (0) 1344 773131
F: +44 (0) 1344 770356
E: enquiries@trl.co.uk
W: www.trl.co.uk

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