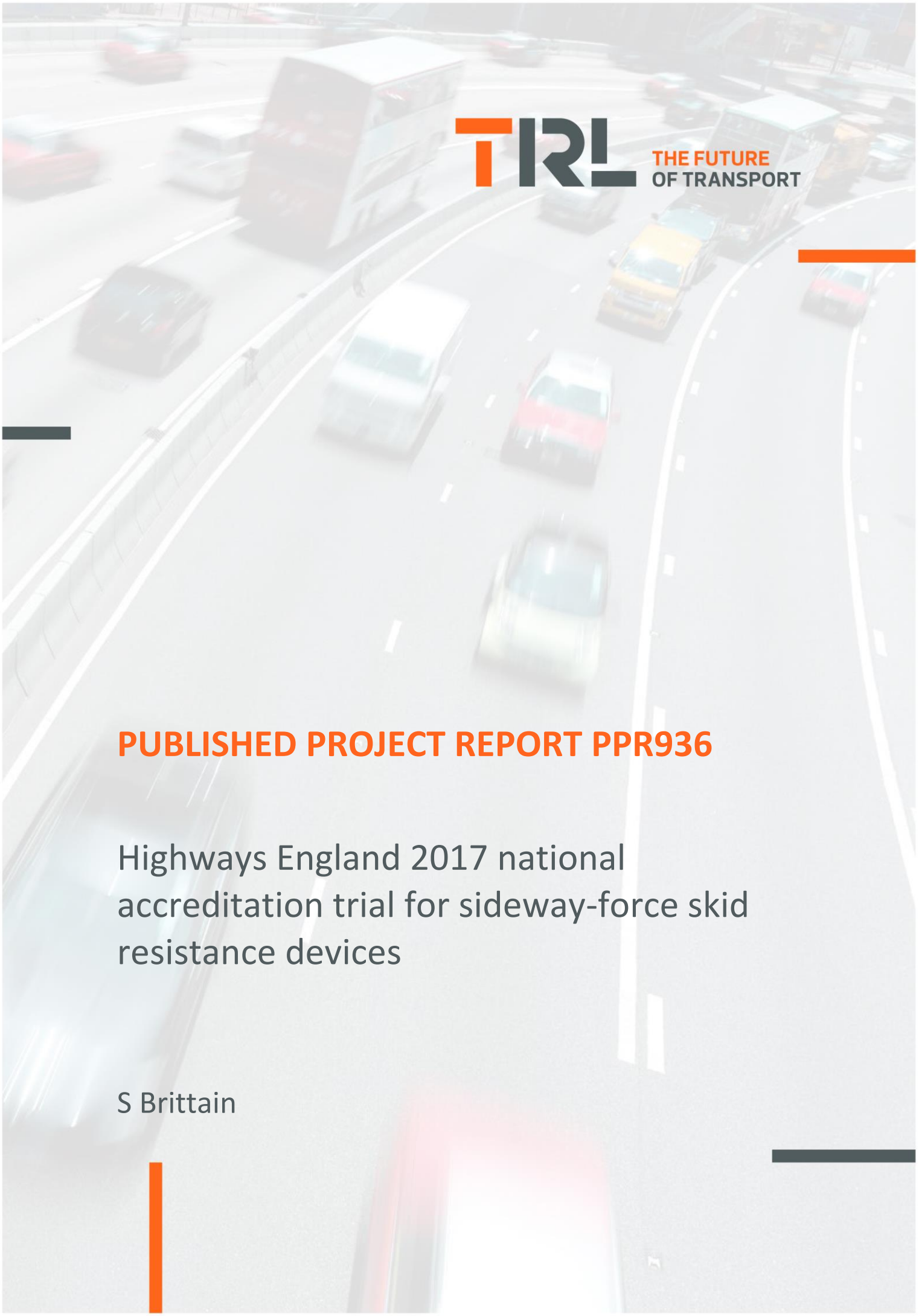

THE FUTURE OF TRANSPORT

PUBLISHED PROJECT REPORT PPR936

Highways England 2017 national accreditation trial for sideway-force skid resistance devices

S Brittain

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Disclaimer

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Executive Summary

The national accreditation trials for sideway-force skid resistance devices are organised annually by TRL, on behalf of Highways England. The purpose of the trials is to verify the performance of all sideway-force skid resistance devices operating on the UK trunk roads so that consistency is maintained throughout the fleet. The measurements by these machines are used to monitor the skid resistance of the motorway and trunk road network in support of Highways England standards HD28/15 (Design Manual for Roads and Bridges, 2015). By examining the results from the machines operating on specified test sections it is possible to assess the performance of individual machines and the consistency of the whole UK fleet.

The 2017 accreditation trial was held during the week beginning 20th March 2017. The trial followed a similar format to one that has been used successfully by TRL in previous years. The accreditation trial criteria are specified in "Accreditation and Quality Assurance of Sideways Force Skid Resistance Survey Devices" (TRL, 2016). Fifteen machines from the UK fleet attended, including one machine from the Republic of Ireland which sometimes caries out surveys in the UK.

The following principal conclusions were drawn in relation to the mandatory tests and assessments.

- All fifteen machines met the criteria for the skid resistance measurements.
- All fifteen machines met the criteria for vehicle speed.
- All fifteen machines met the criteria for distance measurement
- All fifteen machines were within the current tolerance for test wheel weight
- All fifteen machines provided satisfactory water flow and direction.

The following principal conclusions were drawn in relation to the various additional tests and assessments.

- Thirteen machines were assessed for measurement of OSGRs. Ten machines achieved a high performance and three machines a low performance.
- Thirteen machines were assessed for measurement of Altitude. Four machines achieved a high performance, six machines a medium performance, one machine a low performance and two machines were identified as not suitable

Overall, the trials demonstrated that the UK fleet continues to perform at a level suitable for use in supporting skid resistance standards.

The results from the trial are discussed in this report and are provided in the accreditation certificates issued to the trial participants. These certificates are also accessible at:

http://www.ukroadsliaisongroup.org/en/asset-condition/road-condition-information/data-collection/skid-resistance/Sideway_force_skid_resistance_survey_devices/index.cfm.

Contents

1 Introduction

The 2017 accreditation trial for sideway-force coefficient routine investigation machines was held on the HORIBA-MIRA proving ground (referred to as MIRA in the rest of this report) and the Longcross test track, on behalf of Highways England.

The purpose of the trial is to verify the performance of all sideway-force skid resistance devices operating on the UK trunk road network so that consistency is maintained throughout the fleet. This is important because the results of measurements by these machines are used to monitor the motorway and trunk road network in support of the Highways England standards (set out in the Design Manual for Roads and Bridges Vol.7, Chapter 3, HD28).

By examining the results from the machines operating on specified test sections it is possible to assess the performance of individual machines and the consistency of the whole UK fleet.

TRL has been responsible for planning and running the trials since 1995 and the 2017 exercise followed a similar format to one that has been successfully used for several years. The accreditation trial criteria are specified in "Accreditation and Quality Assurance of Sideways Force Skid Resistance Survey Devices" (TRL, 2016).

The trial comprised six general stages:

1. **Preparations**: During the days immediately preceding the trial, the test track, documentation and support facilities were checked and made ready.
2. **Inspection day (MIRA)**. On this day, the incoming machines are inspected and a series of static tests are made to verify vertical wheel weights, force transducer calibration and water flow control. This day also includes surveys of the network route.
3. **Main running trials day 1 (MIRA)**. This is the first main test day, in which all the machines that proved satisfactory in the initial checks run extensive dynamic tests and the results are reviewed as the data are collected.
4. **Main running trials day 2 (MIRA)**. Following the testing on the main trials day 1, survey crews are notified if their machine appears to be an outlier with regards to skid resistance measurement and given an opportunity to investigate their machine. After this investigation time, additional dynamic tests are conducted.
5. **3 Dimensional positional system assessments (Longcross)**. The assessments of the 3 dimensional positional systems are conducted at Longcross. This part of the assessment is only conducted by machines which have 3 dimensional positional systems fitted and are seeking accreditation for these systems. The assessment of the 3 dimensional positional systems also incorporates the survey data collected on the network route (conducted on the inspection day at MIRA).
6. **Follow-up tests**. Sometimes machines are unable to attend the main trial, or problems are identified that cannot be resolved during the main trial. If machines fail to pass the main trial sponsored by Highways England, any necessary modifications and follow-up tests are arranged by and carried out at the expense of the machines'

owners. Depending upon the issues that need to be addressed, these may include a repeat accreditation trial.

The 2017 main trials were held during the week beginning 20th March 2017 and fifteen machines based in the UK and Ireland attended. This included one machine from the Republic of Ireland which sometimes carries out surveys in the UK and is therefore included as part of the UK Fleet.

For convenience, throughout this report machines are referred to using the running number assigned at the trial. For ease of comparison, machines usually retain the same running numbers from one year to the next. To avoid confusion with earlier vehicles, when a machine is replaced or re-built on a new chassis, the new vehicle is assigned a new running number in sequence when it first appears at the trials. Appendix A lists all the machines, their running numbers (ID) and their operating organisations as they were in April 2017.

2 Trial Format

2.1 Pre-trial preparation

Although it has been found generally to not be a large source of variation, small variations in skid resistance measurements can be caused by differences between tests tyres fitted to different machines. For this reason, a set of “matched” tyres were requested from the tyre supplier for use in the trial. These tyres were scrubbed in prior to the trial and the data produced was checked for consistency.

The parts of the MIRA proving ground used in the trial are prepared on the days leading up to the trials. The reference points at the start of each test length are identified using cones and the track was visually inspected.

There is always an element of variability in the measurements that is a result of drivers following different test lines. This manifests itself both in variation between runs with the same driver and in different general lines followed by different drivers. For this reason, the test line to follow is explicitly identified on appropriate parts of the test track. This was achieved by placing cones either side of the lane to create a corridor for the machines to travel within.

2.2 Inspection day – MIRA

The inspection day is used to conduct the following inspections and calibrations of the machines attending the trial, along with a survey of the network route:

1. Water flow checks
2. Wheel weight checks and vertical calibration
3. Distance calibration

During the inspection day a new check on the test wheel angle was trialled, with the aim of including it as part of the checks/assessments in future accreditation trials.

2.3 Main running trial days – MIRA

The main running trials are designed to test, firstly, whether individual machines are operating consistently and, secondly, whether different machines obtain comparable readings over a range of skid resistance levels.

Each crew is given instructions and a copy of the planned running order and organisation of the machines, so that they know approximately when they are running, with which tyre, and with which other machines. Due to unexpected events such as minor problems with vehicles or operating errors this running order is occasionally amended in situ.

All machines are operated with the dynamic vertical load measurement system turned on, which is the default condition in which they operate on the network. In addition, the machines are set up to report the average skid readings at 10m intervals. After each set of tests the data is collected and checked to verify that the location referencing codes have been inserted correctly by the operator.

2.4 3 Dimensional positional system assessment – Longcross and network route

The 3 dimensional positional systems are assessed on the network route (near MIRA) and on the Longcross test track. This assessment determines if the machines identify the correct position of section marker points (identified with retro-reflective markers and cones), in addition to accurately plotting the route between these markers. After each test lap the data is collected and checked to verify that the location referencing codes have been correctly identified (either via automatic detection if fitted, or by manual entry if not).

3 Test sections

The trial uses two areas of the MIRA proving ground (the Twin Straights and the Straight Line Wet Grip Area), along with a network route in the surrounding area. In addition the Longcross test track is also used for the machines which are undergoing the 3 dimensional positional systems assessment.

3.1 Twin straights

This area is used for distance calibration, the location referencing tests (including speed measurement), and for skid resistance testing. The overview of the Twin Straights and the position of the marker points A-H are given in Figure 3.1.

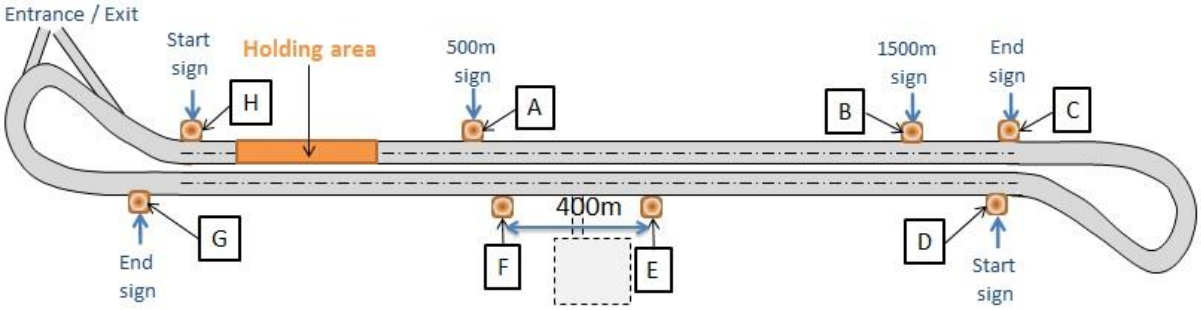

Figure 3.1 Overview of Twin Straights and position of marker points

The skid resistance data is assessed on the length between markers E and G, and utilises the Highways England calibration site. Six sections on this length have been selected for analysis. The position of these sections is shown in Figure 3.2. Details of the surfaces are given in Table 3.1.

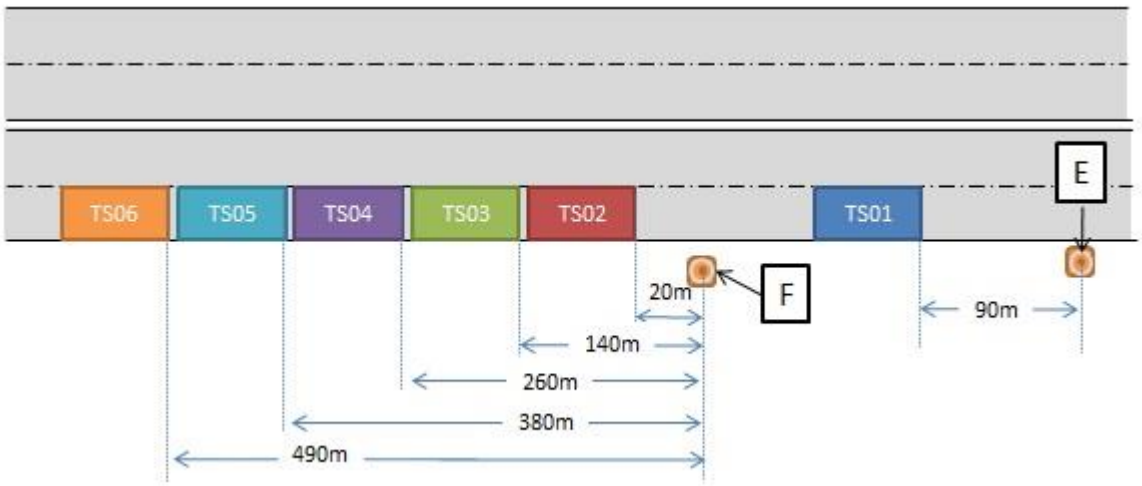

Figure 3.2 Skid resistance test sections on Twin Straights

Table 3.1 Skid resistance test sections on Twin Straights

Section	Length (m)	Surface description
TS01	130	Normal track surface, thin surfacing applied in October 2013
TS02	100*	A proprietary thin surfacing material using 6 mm coarse aggregate and polymer-modified bitumen. The small-size particles are closely packed and the texture is formed by large numbers of relatively narrow and shallow gaps between them. This type of surfacing generates very low levels of traffic noise but it has a relatively lower texture depth (compared with other thin surfacings with coarser aggregates). Laid in October 2010.
TS03	100*	A proprietary thin surfacing material using 10 mm coarse aggregate and a fibre-reinforced bitumen. This is typical of low-noise asphalt materials laid on many roads. Laid in October 2010.
TS04	100*	A proprietary thin surfacing material using 14 mm coarse aggregate. It has a rather more open grading, and hence greater texture depth, than the surfacings with the smaller aggregate. Laid in October 2010
TS05	50*	A hot-rolled asphalt mat into which 20 mm chippings that have been lightly pre-coated with bitumen are rolled while the asphalt is still hot. This is the "traditional" material used commonly on UK main roads until the introduction of thin surfacings from about 1990. Laid in October 2010
TS06	100	Normal track surface, thin surfacing applied in October 2013

* The trial lengths on the Calibration Site did not include the full length of each surfacing in order to exclude the transitions between the different surfaces.

3.2 Straight Line Wet Grip area

The Straight Line Wet Grip area on the MIRA proving ground is utilised to provide lengths with low skid resistance levels. The position of the sections are given in Figure 3.3 and details of the sections are given in Table 3.2

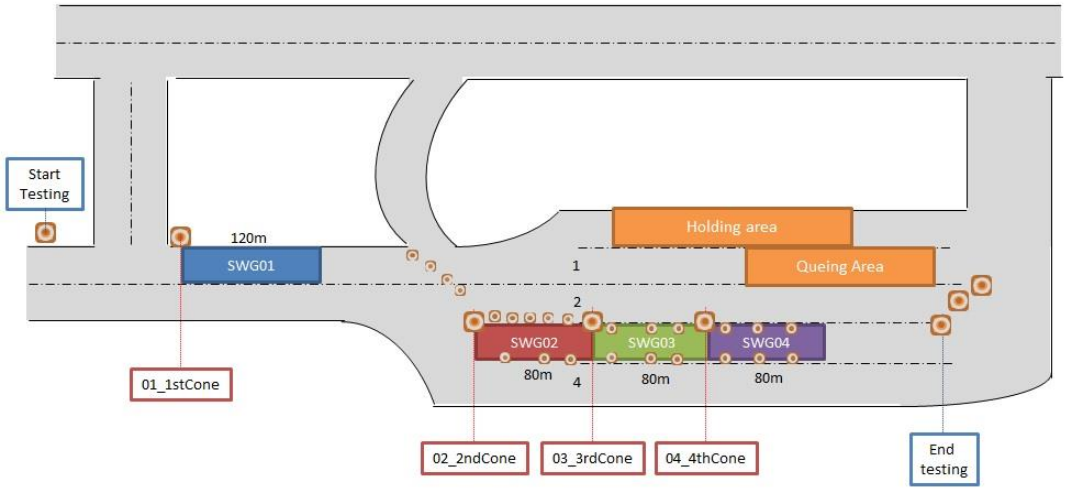

Figure 3.3 Skid resistance test sections on the Straight Line Wet Grip area

Table 3.2 Skid resistance test sections on the Straight Line Wet Grip area

Section	Length (m)	Surface description
SWG01	100	Transverse grooved Portland cement concrete
SWG02	60*	Worn bitumen macadam
SWG03	60*	Bridport gravel (with quartzite) exposed aggregate concrete
SWG04	60*	Smooth asphalt concrete

* The trial lengths on the wet grip area did not include the full length of each surfacing in order to exclude the transitions between the different surfaces.

3.3 Network route to Sheepy Magna

A network route has been included in the accreditation trial to provide supporting data for the assessment of skid resistance and location referencing. The first marker of the route is at the entrance of MIRA, the route then loops round to Sheepy Magna and returns to MIRA as shown in Figure 3.4. Details of the route are given in Table 3.3.

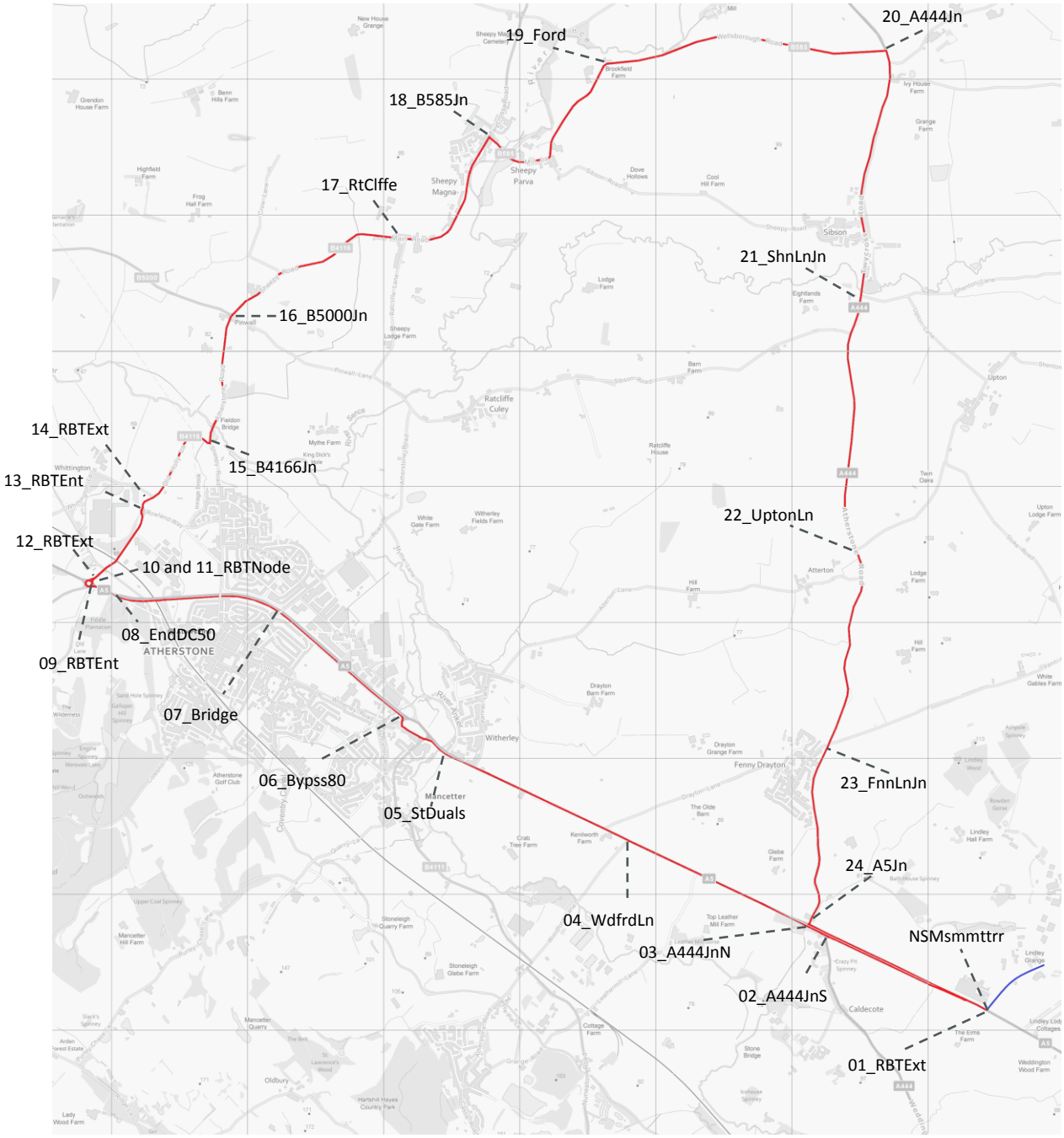

Figure 3.4 Network route to Sheepy Magna

Table 3.3 Details of network route, including marker positions

Survey distance (km)	Section length (m)	Markers	Marker position	Driving Instructions
n/a	n/a	**NSMsmmttrr**	Entry to MIRA roundabout	Turn right at the MIRA exit roundabout (A5 WB)
0	1260	**01_RBTExt**	Node at exit of MIRA roundabout	Continue on A5, testing in Lane 1
1.26	192	**02_A444JnS**	Node at entry to gyratory at junction with A444 south	Continue on A5
1.45	1454	**03_A444JnN**	Node at exit of gyratory at Junction with A444 North	Continue on A5
2.91	1379	**04_WdfrdLn**	Node at centre of Junction with Woodford lane (has sign for Dobbie's Garden world)	Continue on A5
4.28	543	**05_StDuals**	Start of duals	Dual carriageway commences. Take right lane and continue to second exit on to A5 Atherstone by-pass towards Tamworth.
4.83	1199	**06_Bypss80**	Mancetter circulatory system exit	Return to testing on Lane 1 for exit of circulatory system on to A5.
6.03	1249	**07_Bridge**	Centre of 1st road bridge going over A5	Continue on A5
7.28	178	**08_EndDC50**	Node at end of dual carriageway	Continue testing for approx 200m on approach to roundabout
7.45	128	**09_RBTEnt**	Entry to roundabout junction with B4116	Test roundabout as per HD28
7.58	147	**10_RBTNode**	Roundabout "Node"	Continue survey of roundabout
7.73	111	**11_RbtNode**	Roundabout "Node"	7.73
7.84	640	**12_RBTExt**	Roundabout exit	Take exit, B4116 towards Twycross.
8.48	30	**13_RBTEnt**	Roundabout (access to Aldi distribution depot)	Take second exit (straight on)
8.51	836	**14_RbtExt**	Roundabout exit	Continue testing on B4116
9.35	970	**15_B4166Jn**	At T-junction	Turn left and continue testing on B4116 towards Twycross
10.32	1486	**16_B5000Jn**	Junction with B5000 (on left) at the Red Lion	Continue testing on B4116
11.80	1100	**17_RtClffe**	Centre of junction with Ratcliffe Ln (on right)	Continue on B4116 and enter Sheppy Magana
12.90	1333	**18_B585Jn**	At exit of T-Junction	Turn right on to B585 (Mill Lane) towards Market Bosworth.
14.24	2108	**19_Ford**	Centre of junction with sign post for ford.	Continue on B585
16.34	1847	**20_A444Jn**	At junction with A444	Turn right onto A444 towards Nuneaton.
18.19	1910	**21_ShnLnJn**	At Junction with Shenton Lane (signposted Upper Shenton)	Continue on A444
20.10	1476	**22_UptonLn**	At junction with Upton Lane (on left, is sign posted for Upton)	Continue on A444
21.58	1385	**23_FnnLnJn**	At junction with Fenn Lanes (on left, is sign posted for Bosworth Battlefield)	Continue on A444
22.96	n/a	**24_A5Jn**	Centre of A444/A5 Junction	Turn left on to A5 towards Hinkley. Continue along the A5. On dual carriageway in Lane 1 This marks the end of the route.

Fourteen 100m lengths of varying skid resistance levels are selected from the network route for the analysis. These lengths have been selected for homogeneity of skid resistance within the length and low indications of variation due to test line. As parts of the route may be maintained between accreditation trials, the lengths used in the analysis are reviewed in each accreditation trial and modified as necessary. Therefore the locations of these lengths (and the typical skid resistance values) may vary between trials.

3.4 Longcross test track

This site includes more corners and tree coverage than the sites used on the MIRA proving ground, providing a more challenging test environment for the assessment of the 3 dimensional positional systems. The site contains eight marker points and five assessment sections (highlighted in red) as shown in Figure 3.5 and Table 3.4.

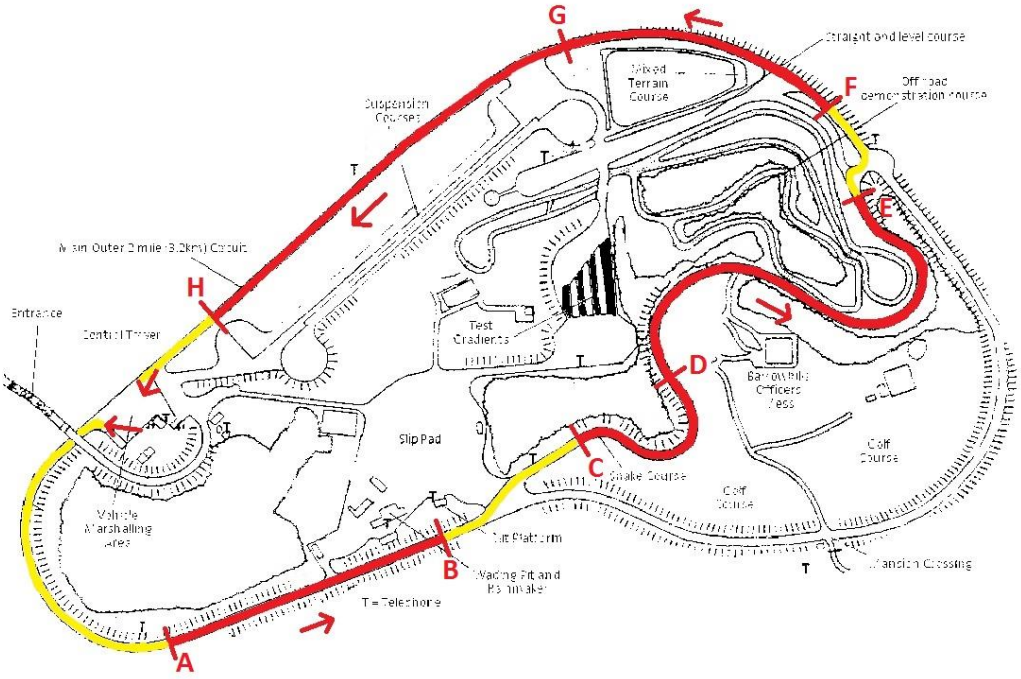

Figure 3.5 Longcross test track site map

Table 3.4 Details of Longcross test track, including marker positions

Section	Length (m)	Easting	Northing	Section identifier
Start to A	>200	N/A	N/A	Run-in
A to B	290.1	498377.2642	165348.1812	AB
B to C	240.2	498643.7988	165462.5819	BC
C to D	246.3	498837.2110	165596.6619	CD
D to E	637.8	498961.4243	165672.3736	DE
E to F	155.8	499199.0944	165908.3410	EF
F to G	367.0	499150.9436	166034.2452	FG
G to H	472.6	498806.0321	166098.0752	GH
to End	>200	498440.6401	165803.5887	Run-out

4 Assessment criteria

The accreditation trial criteria are specified in "Accreditation and Quality Assurance of Sideways Force Skid Resistance Survey Devices" (TRL, 2016). This document is a live document (i.e. is subject to change) and the July 2016 version of the document was used for the trial. The relevant section of the document is reproduced verbatim below (section 4.1). Note in the text below, "Equipment" is a defined term and refers to the overall machine being assessed, incorporating the measuring systems and the survey vehicle. "System" refers to an individual measurement system installed on the Equipment, e.g. the sideway-force measurement system, GPS, distance measurement system, etc. "Employer" refers to the organisation that commissions the Survey Contractor to complete a survey and will generally be the final user of the data provided. "Owner" refers to the organisation or individual to which Equipment belongs and to whom Accreditation Certificates are awarded.

4.1 Trial criteria from the Accreditation and QA document

E.3 Equipment inspection

E3.1 Equipment will be inspected to ensure that they are in a suitable condition to conduct the tests. Contractors will be provided with an inspection check sheet to complete and provide to the Auditor in advance of the Trial.

E3.2 Inspections will include:

- Water flow System (including verification of flow rate, nozzle alignment and general condition)
- Calibration of the Vertical load System and Horizontal load system
- Verification of the test wheel weight
- checking that a Contractor's pre-test inspection report has been provided and correctly filled in; and
- Verifying that the Equipment is in good general mechanical order.

E.4 Running Trials

E4.1 Overview

E4.1.1 As detailed in in Appendix B, trials will be carried out on a test site separated into test stations, and laid out such that laps of the set of test sections can be undertaken by the Fleet for the purposes of repeating the measurements.

E4.2 Skid resistance testing – Mandatory Requirement

E4.2.1 The assessment for skid resistance measurements is described below, and a worked example is provided in Appendix C.

E4.2.2 Some Equipment may have skid resistance measurement Systems fitted to both the nearside and offside of the Equipment. If fitted then these systems should be assessed independently and given independent Accreditation results. This requires that suitable reference data is collected for both wheel paths or that the Equipment

test on offset driving lines so that the test wheel traffics the same part of the test surface. The Auditor may specify that only one side of the Equipment will be assessed.

E4.2.3 The Equipment will undertake laps so that the following criteria are met:

- At least 3 laps are undertaken that comply with the requirements for Reference Data (see Appendix B, App B.3).
- Survey data will be collected at the target test speed.

E4.2.4 The Contractor will supply the skid resistance measurements for their Equipment from each test lap in the file formats specified by the Auditor.

E4.2.5 The Auditor will calculate:

- The mean values for the Equipment for each 100m length test section or the length of the test section if shorter (averaging together the repeat measurements).
- The standard deviation of these mean values for the Fleet and for all of the Equipment at the trial, referred to as the Fleet between-Equipment standard deviation (BESD) and the Trial BESD. These values will be used to assess the consistency of the Equipment at the Trial.
- The standard deviation of the skid resistance values between runs for the Equipment for 100m lengths (or the length of the test section if shorter). This data is referred to as the between-run standard deviation (BRSD). These values will be used to assess the repeatability of each individual Equipment.

E4.2.6 The BRSD assessment criterion is given in Table 1. Where the BRSD criterion is exceeded, the data will be examined for any obvious error, for example as a result of significant variation in test line and if necessary individual runs on that section may be excluded from subsequent analysis. If Equipment consistently records data with unacceptable between-run standard deviation, the data from that Equipment will be regarded as unacceptable.

E4.2.7 The Trial BESD is acceptable if it is below the criterion given in Table 1. If the Trial BESD exceeds this criterion then the data will be further examined to identify outlying Equipment. This will include examining the fleet BESD and data from individual Equipment. Outlying Equipment will be rejected and the data reassessed until the performance is acceptable.

E4.2.8 In addition, any Equipment that deviates by more than 3 times the BESD criterion from the Fleet mean will be rejected. Any Equipment that is between two and three times the BESD criterion from the all-Equipment mean will be subject to further investigation.

E4.2.9 The data from any Equipment rejected due to the BRSD, BESD or otherwise identified as an outlier will not be used in the calculation of the Reference Data (App B.3.1).

Table 1 – Acceptance Criteria for Skid resistance measurements

Parameter	Acceptability Limit
Between run standard deviation (BRSD)	Investigate if >3 SR on 100m lengths
Between Equipment standard deviation (BESD) on closed site (e.g. test track)	≤2.7 SR
Between Equipment standard deviation (BESD) on live site (e.g. network route)	≤2.8 SR

E4.3 Vehicle Speed – Mandatory Requirement

E4.3.1 The assessment of vehicle speed is split into two parts:

- The speed recorded by the Equipment compared with the independently measured speed
- The speed recorded by the Equipment compared with the required target survey speed.

E4.3.2 The test will be carried out on at least 3 test laps at each target survey speed

E4.3.3 The acceptance criteria for vehicle speed measurement are given in Table 2.

Table 2 – Acceptance Criteria for Vehicle Speed Measurement

Parameter	Acceptability Limit
Vehicle Speed recorded by the Equipment compared to independent measure	80% within ± 1km/h of the independently measured speed
Vehicle speed recorded by the independent measure compared to the target speed	80% within ± 3km/h of required target speed

E4.1 Location Referencing – Distance Criteria

E4.1.1 The Accreditation of distance measurement will be carried out using at least 6 measurements of distance made using the Equipment.

E4.1.2 There are three mechanisms for recording location referencing points in the survey data during testing:

- Push button entry relies on the survey operator pushing a button to enter the location of the point manually.
- Automatic markers uses a system which automatically detects the markers.
- OSGR fitted utilises the coordinate data to identify the elapsed chainage of the location reference points within the survey data.

E4.1.3 The push button entry approach will include some operator error and therefore it is expected that Equipment using this approach will be less accurate than the other methods. The criteria applied to the test measurements for these two approaches are given in Table 3.

Table 3 – Criteria for measurement of distance travelled for repeatability and reproducibility

Parameter	Push button entry	Automatic markers (where available)	OSGR fitted (where available)
Distance measured	80% within 5m	80% within 2m	80% within 2m

E4.1.4 If the Survey Contractor will be supplying data to a Customer with OSGR fitted location reference points then they must meet the criteria for the OSGR fitted distance measurement.

E4.2 Test wheel weight

E4.2.1 The Accreditation of test wheel weight will be carried out using at least 3 measurements. There can be a tendency for the shaft bearings to stick slightly when the wheel is first lowered (without the shaking action that would be experienced on the moving vehicle at the start of a survey run). For this reason, the assessment will be carried out after the bearings have been released (achieved by applying foot pressure to the wheel arm bearing and "bouncing" the back-plate against the suspension damper and spring). For this assessment the test wheel will be raised/lowered and bounced before each measurement. The measurements made will be averaged together and the criteria applied are given in Table 4.

Table 4 – Criteria for test wheel weight

Parameter	Acceptability Limit
"Bounced" test wheel weight	200±8kg

E4.3 Water flow

E4.3.1 The water delivery system will be inspected and checked to confirm that the Equipment is delivering water at an acceptable rate and to the correct position on the road surface. The water flow delivery system should achieve a target water film thickness of 0.5mm at 50km/h. Due to differences in design (e.g. position of the nozzle) the target flow rate to achieve this will differ between Equipment. The target flow rate for each Equipment should be determined (through consultation between the Auditor and the Developer). Each Equipment will then be tested to confirm that the flow rate supplied is within the criteria given in Table 5. In the cases where the Equipment incorporates a speed controlled water flow system, the flow rate will be assessed using 50km/h and 80km/h test pulses.

Table 5 – Criteria for water flow rate

Parameter	Acceptability Limit
Water flow rate	Within 10% of the target flow rate

E.5 Additional Tests

E5.1 Overview

E5.1.1 This sub-section describes the additional criteria which are assessed to provide additional information on the capabilities of the Equipment. These criteria are assessed as High, Medium and Low levels of performance. These criteria typically include the assessment of Systems not fitted to all Equipment and/or tests which are not as mature as the mandatory assessments. In future revisions to this document some or all of these criteria may become mandatory criteria.

E5.1.2 Some Employers may require a specific level of performance in some or all of these additional tests to carry out Accredited Surveys on their Network.

E5.2 Location Referencing – OSGR data

E5.2.1 As noted in E4.1.2 there are two mechanisms for recording the location of location referencing points. The differences in these approaches results in different criteria for OSGR assessment on closed test sections. In addition, data collected on a network or live traffic route may be fitted to network sections using reference OSGR points. These two approaches also have corresponding test criteria. The Auditor should record on the Accreditation Certificates the type of assessment undertaken.

E5.2.2 OSGR data collected from the closed test sections will be assessed using the criteria given in Table 6.

Table 6 – Closed test section: Criteria for OSGR data of individual 10m data points

Performance level	Push button entry	Automatic markers (where available)	OSGR fitted (where available)
High	90% within 5m 95% within 7m 100% within 20m	90% within 2m 95% within 4m 100% within 20m	90% within 2m 95% within 4m 100% within 20m
Medium	80% within 5m 90% within 7m 100% within 20m	80% within 2m 90% within 4m 100% within 20m	80% within 2m 90% within 4m 100% within 20m
Low	80% within 8m 100% within 20m	80% within 5m 100% within 20m	80% within 5m 100% within 20m
Not suitable	Otherwise	Otherwise	Otherwise

E5.2.1 If the Survey Contractor will be supplying data to a Customer with OSGR fitted location reference points then they must meet the criteria for the OSGR fitted data. E5.2.2 OSGR data collected from a live traffic route will be assessed using the criteria given in Table 7

Table 7 – Live traffic route: Criteria for OSGR data of individual 10m data points

Performance level	Push button entry	OSGR fitted (where available)
High	90% within 12m 100% within 25m	90% within 6m 100% within 20m
Medium	90% within 17m 100% within 25m	90% within 12m 100% within 25m
Low	100% within 25m	100% within 25m
Not suitable	Otherwise	Otherwise

E5.2.3 If multiple test sites are used for the assessment of the OSGR Component of the Equipment, the lowest performance achieved across the sites will be reported by the Auditor.

E5.2.4 If the Survey Contractor will be supplying data to a Customer with OSGR fitted location reference points then they must meet the criteria for the OSGR fitted data.

E5.3 Location Referencing – Altitude data

E5.3.1 Altitude data collected will be assessed using the criteria given in Table 8.

Table 8 –Criteria for Altitude data of individual 10m data points

Performance level	Criteria
High	90% within 2m 95% within 5m 100% within 20m
Medium	80% within 4m 90% within 6m 100% within 20m
Low	100% within 20m
Not suitable	Otherwise

E.6 Checking of file formats

E6.1.1 Some Employers require the production of data in specific data formats, for example Highways England requires data to be produced as Raw Condition Data (RCD) and Base Condition Data (BCD). Where required, Owners will be asked to deliver accreditation data files in the required format. These will be assessed to determine whether the data are being correctly processed.

5 Machine inspections

5.1 Water flow rate checks

After minor adjustments to some machines, it was deemed that all machines had satisfactory water flow and direction.

5.2 Left test wheel weight checks

Each machine was weighed when the level of water in its tank was half full. The results of these checks are given in Table 5.1.

Table 5.1 Acceptance Criteria for test wheel weight

Machine	Average static wheel weight							
	"Un-bounced"				"Bounced"			
	Check 1	Check 2	Check 3	Mean	Check 1	Check 2	Check 3	Mean
1	201.5	201.0	201.5	201.3	202.0	202.0	202.0	202.0
3	201.6	202.2	202.4	202.1	202.2	202.4	202.2	202.3
14	206.0	206.0	207.0	206.3	207.5	207.5	208.5	207.8
16	203.0	203.0	202.5	202.8	204.0	204.0	204.0	204.0
17	196.0	196.0	196.4	196.1	199.8	199.8	199.8	199.8
19	197.5	198.0	198.0	197.8	202.5	202.5	202.5	202.5
21	196.0	196.0	196.0	196.0	197.8	198.0	198.0	197.9
22	197.8	197.8	197.8	197.8	200.0	200.0	199.8	199.9
23	198.5	198.5	198.5	198.5	203.0	203.0	203.5	203.2
24	198.0	198.0	198.5	198.2	204.0	204.0	204.0	204.0
25	199.5	199.5	200.0	199.7	205.0	205.0	205.0	205.0
26	196.0	196.0	196.0	196.0	204.0	204.0	204.0	204.0
28	195.0	195.0	195.0	195.0	200.6	200.0	200.0	200.2
29	205.5	205.5	205.5	205.5	207.5	207.0	207.5	207.3
31	197.0	196.0	196.5	196.5	205.0	205.5	205.0	205.2

It can be seen in Table 5.1 that all of the "bounced" mean weights of the machines fell within the tolerances given in section 4.1. There is a noticeable difference in the bounced and un-bounced wheel weight values for some of the machines (e.g. Machine 26 and 31). The owners of these machines should be aware that this may be an indication of some deterioration in shaft assembly and may cause issues at a future date.

In 2009, British Standards published a CEN Technical Specification for these devices (British Standards Institution, 2009). This is a Draft for Development (DD) document that can be used voluntarily over a period so that experience can be gained before being accepted and introduced (if appropriate) as a full EN (European Norme). This is one of a series of documents for skid resistance measurement devices intended to encourage consistent standards in use of similar machines in different European countries. It is envisaged that the requirements in this document will eventually supersede those in the current British Standard (British Standards Institution, 2006).

This DD was developed from BS 7941-1 so it is already largely consistent with current UK practice. However, some aspects were revised to take account of wider experience of use of

similar devices in Europe and one of these is the reduction of the tolerance for static wheel weight to ±1 kg.

All of the machines were well within the current ±8 kg tolerance. However, had the CEN TS requirement been applied to the fleet this year, only three machines would have been acceptable at ±1 kg. In future trials it may be appropriate to review this aspect more closely, both in terms of how the weight is measured and the tolerances that are practically achievable (or necessary where dynamic vertical load is measured), so that the British Standards Committee that deals with these matters can be advised of the practical experience and take this into account in their deliberations and their discussions when the CEN document is due for review.

5.3 Vertical and horizontal load calibration

During the static wheel weight checks, the vertical load calibration check was also carried out, followed by a full vertical load calibration and a further vertical load calibration check. Vertical calibrations were successfully carried out on all machines.

The crews were also asked to conduct a horizontal calibration during the inspection day before conducting the network route tests. These were also completed successfully.

5.4 Distance calibration

All crews undertook a distance calibration of their machine on a defined length at the test site. No issues were reported during this process.

5.5 Speed

The assessment of speed (the attainment of the target speed and the accurate recording of speed in the survey data) was carried out using data collected during the tests on the Twin Straights.

The time taken for the machines to travel between markers E and F, along with the distance between these two markers, was used to determine an independent measure of the average speed of the machines over this length. The elapsed time was recorded using a set of timing gates which recoded the time in seconds to 2 decimal places.

The differences between the survey data and the independent measure are shown in Table 5.2. The differences between the independent measure and the target speed are shown in Table 5.3. Instances where the value exceeds the criteria levels in section 4.1 are highlighted in bold red text. It was not possible to record valid independent data on all runs therefore some data are missing from the tables.

Table 5.2 Difference between speed recorded in data and independent measure

ID	Speed recorded in data – independent measure of speed										% within criteria
	Target speed 50km/h					Target speed 80km/h					
	Run 1	Run 2	Run 3	Run 4	Run 5	Run 1	Run 2	Run 3	Run 4	Run 5	
1	.	.	.	-0.52	-0.20	-0.25	-0.30	-0.34	-0.18	-0.15	100%
3	.	.	.	0.15	0.12	0.35	0.27	0.27	0.27	0.22	100%
14	.	.	.	0.12	0.10	-0.19	-0.29	-0.36	-0.38	-0.25	100%
16	.	.	-0.83	-0.83	.	-0.72	-0.81	-0.85	-0.90	-0.92	100%
17	.	.	.	0.28	0.28	-0.18	-0.31	-0.36	-0.31	-0.36	100%
19	.	.	.	-0.09	-0.10	0.33	0.24	0.19	0.19	0.15	100%
21	.	.	.	0.21	0.19	0.90	0.67	0.66	0.53	0.70	100%
22	.	.	.	0.12	0.09	0.46	0.31	0.28	0.21	.	100%
23	0.35	0.33	0.33	0.31	0.30	0.57	0.37	0.53	0.48	0.48	100%
24	0.14	0.08	0.07	0.02	0.12	0.08	0.13	0.12	0.11	0.12	100%
25	0.41	-0.28	-0.27	**1.24**	0.52	0.08	0.40	0.35	0.49	0.12	90%
26	-0.90	0.56	-0.19	0.18	-0.07	-0.19	0.53	0.13	0.06	0.34	100%
28	0.12	-0.17	-0.19	-0.20	**-1.03**	0.35	0.35	0.31	0.27	0.27	90%
29	0.30	0.19	0.29	0.31	0.62	-0.63	0.53	0.04	0.33	0.05	100%
31	0.18	-0.07	-0.08	0.22	0.17	0.04	0.17	0.49	0.35	0.57	100%

Table 5.3 Difference between independent measure and target speed

ID	Independent measure of speed- target speed										% within criteria
	Target speed 50km/h					Target speed 80km/h					
	Run 1	Run 2	Run 3	Run 4	Run 5	Run 1	Run 2	Run 3	Run 4	Run 5	
1	.	.	.	-0.55	-0.80	-0.75	-0.97	-1.05	-1.82	-0.92	100%
3	.	.	.	-0.68	-0.12	-0.35	-0.27	-0.27	-0.27	-0.22	100%
14	.	.	.	-0.12	-0.10	0.27	0.31	0.36	0.40	0.45	100%
16	.	.	0.83	0.83	.	0.76	0.81	0.85	0.90	0.94	100%
17	.	.	.	0.72	0.72	0.18	0.31	0.36	0.31	0.36	100%
19	.	.	.	0.09	0.10	0.67	0.76	0.81	0.81	0.85	100%
21	.	.	.	-0.21	-0.19	-0.27	-0.40	-0.35	-1.31	-0.31	100%
22	.	.	.	-0.07	-0.14	0.00	-1.14	-1.14	-0.09	**3.04**	86%
23	-1.35	-1.33	-0.33	-0.31	-1.30	-0.57	-1.57	-1.53	-1.53	-1.48	100%
24	-0.02	-0.48	-0.90	-0.14	-0.46	-0.62	-0.62	-0.44	-0.35	-0.22	100%
25	-1.07	-0.72	-1.17	-1.53	-0.34	-0.18	-0.40	-0.35	-0.49	-0.53	100%
26	0.51	-0.52	0.19	-0.28	0.24	-0.40	-0.75	-0.35	-0.40	-0.44	100%
28	-0.12	0.17	0.19	-0.80	0.03	-0.35	-0.35	-0.31	-0.27	-0.27	100%
29	-0.03	-0.02	-0.58	-0.67	-0.79	-0.40	-1.35	-1.14	-1.18	-1.05	100%
31	-0.28	-0.28	-0.26	-0.24	-0.24	-0.04	-0.44	-0.66	-0.40	-0.57	100%

From these tables it can be seen that all machines achieved at least 80% of their data within the criteria. Therefore all machines are deemed acceptable with regards to measurement of survey speed.

5.6 Test wheel angle

As noted in Section 2.2 a new check was trialled at the accreditation trial with the aim of including it as part of the checks/assessments in future accreditation trials. The equipment used involved two frames and a horizontal bar, and is shown in use in Figure 5.1 and Figure 5.2.

Figure 5.1 Test wheel angle equipment in use part 1

Figure 5.2 Test wheel angle equipment in use part 2

The two frames were aligned to the test wheel and rear wheel as shown in the images, and the wheel angle was determined by measuring the lengths of the points where the beam crosses the plate on the rear wheel frame, and applying trigonometry. The results and notes from the testing are shown in Table 5.4.

Table 5.4 Measured wheel angles

ID	Measured angle	Within BS criteria	Notes
1	19.29	No	Vehicle required raising on ramps, rear wheel frame resting on tyre not hub
3	20.62	Yes	
14	-	-	Rear wheel separation to large
16	-	-	Bar on test wheel enclosure obstructs test
17	20.17	Yes	Rear wheel too small for frame (resting on tyre not hub)
19	20.08	Yes	Vehicle required raising on ramps, rear wheel too small for frame (resting on tyre not hub)
21	19.48	No	
22	19.84	Yes	
23	19.71	Yes	
24	18.96	No	Rear wheel too small for frame (resting on tyre not hub)
25	19.34	No	Vehicle required raising on ramps, rear wheel too small for frame (resting on tyre not hub)
26	20.35	Yes	Rear wheel too small for frame (resting on tyre not hub)
28	19.65	Yes	
29	-	-	Bar on test wheel enclosure obstructs test. Rear wheel too small for frame (resting on tyre not hub)
31	19.34	No	Vehicle required raising on ramps, rear wheel too small for frame (resting on tyre not hub)

It can be seen from Table 5.4 that four machines do not appear to meet the angle criteria given in the British standard (between 19.5˚ and 21˚). However, there were problems with implementing this test due to the differences in the vehicles not accounted for in the design of the equipment. In addition the staff conducting the test found it difficult at times (due to the shape of the wheels and the equipment) to be certain that the test equipment was aligned correctly. It is therefore recommended that the equipment/test process is reviewed and refined. This modified equipment/process should be tested at the next accreditation trial, with the aim to include it as a mandatory test in later trials.

6 Skid resistance measurements

Skid resistance measurements were taken on three sites (Twin Straights, Straight Line Wet Grip, and on the network route). The assessment of skid resistance measurements falls into two parts; machine repeatability and variation between machines (see section 4.1).

6.1 Amendments to survey machines

At the end of the main running trials day 1, survey crews are given preliminary feedback using a red/amber/green scale on the performance of their machines based on the results from the first set of tests on the straight line wet grip area. They are then given an opportunity to investigate their machines before additional testing takes place. These categories are defined as:

- **Green** – the machine is producing skid resistance values within the required criteria for skid resistance based on the current fleet average.
- **Amber** – the machine is producing skid resistance values within the required criteria but close to the thresholds.
- **Red** – the machine is producing skid resistance values outside of the criteria for accreditation for skid resistance.

During the network route tests minor issues were found with the horizontal calibrations of two of the machines. These issues were resolved on the inspection day and they re-tested the network route after the resolution of the issues. The data discussed below is from the tests after the issues were resolved.

At the end of day 1 all machines were identified as being in the green category, as such no repairs were undertaken after the day 1 testing.

6.2 Machine repeatability

The between run standard deviation (BRSD) data for the survey data is given in Appendix B. On examination of the between run standard deviation and plots of the individual runs the following conclusions were made:

- The data from the network route shows several instances where the data lies between 1 and 2 times the BRSD criteria, and several instances greater than this. However, it is expected that the between run standard deviation will be greater than the thresholds more often on the network route. Two Machines were found to have consistently high BRSD values (Machine 1 and 16).
- The data from the first set of tests on the Straight Line Wet Grip shows a slightly higher BRSD on SWG04. It has been found from previous trials that the BRSD is typically higher for SWG04. No machines were consistently above the BRSD criteria for these tests.
- The second set of tests on the Straight Line Wet Grip also shows a slightly higher BRSD on SWG04. No machines were identified from this testing as having a high BRSD.

- The BRSD data from the Twin Straights is consistent with only one machine exceeding the 3SR criteria for the average of the site (Machine 3 at 80km/h).

No machine consistently exceeds the BRSD criterion during the trial and therefore all of the machines are performing acceptably with regards to between run variation.

6.3 Variation between machines

The average SR values produced by the machines for each of the test sites are shown in the tables below (Table 6.1 to Table 6.5). At the base of each table is the average calculated for the fleet indicated as "Fleet mean", and the Between Equipment Standard Deviation for the fleet as "Fleet BESD".

All of the machines taking part in the trial had a valid accreditation at the date of the trial and therefore are all considered as part of the "Fleet" (the reference devices) for this assessment.

Machine SR values are highlighted in green if they lie within 2 times the BESD criteria (see section 4.1) of the reference mean, in orange if they lie between 2 and 3 times the BESD criteria, and in red if they are greater than 3 times the BESD criteria. The "Fleet BESD" values are highlighted in green if they are below the BESD criteria, in orange if they are below 1.5 times the BESD criteria and in red if they exceed this value.

6.3.1 Inspection day tests

Table 6.1 Average SR from the network route surveys

ID	Average SR for network route sections														
	01	02	03	04	05	06	07	08	09	10	11	12	13	14	Avg
1	60.3	84.1	76.5	78.0	79.1	56.8	69.8	79.0	66.4	56.1	73.1	50.0	48.3	58.0	66.8
3	61.9	84.4	80.5	81.0	81.7	62.6	74.7	86.2	72.1	59.6	77.1	54.4	51.9	64.8	70.9
14	60.5	81.3	77.8	78.2	79.0	59.8	73.2	83.6	66.9	56.7	72.7	50.2	46.4	61.7	67.7
16	65.8	87.7	82.4	83.0	84.0	62.1	74.1	87.2	69.8	59.1	77.4	52.4	46.1	62.1	70.9
17	60.5	84.9	78.1	79.2	81.9	61.5	75.2	85.1	72.4	59.5	74.9	54.1	52.6	66.9	70.5
19	56.8	78.3	74.0	74.6	76.3	56.7	69.4	82.1	67.8	57.3	73.1	49.3	46.2	59.5	65.8
21	62.6	84.7	79.5	80.9	82.7	63.7	76.2	84.3	71.6	61.4	79.0	53.8	51.2	63.3	71.1
22	64.3	86.4	81.7	82.8	82.6	65.4	78.0	86.2	74.2	62.7	79.1	54.0	49.5	67.8	72.5
23	57.3	78.3	73.5	75.0	76.5	55.9	69.9	78.3	66.9	56.6	70.3	47.7	45.6	59.6	65.1
24	63.4	86.9	82.4	83.5	83.6	61.6	77.0	86.2	72.1	60.9	77.0	52.6	50.0	62.7	71.4
25	59.5	84.3	78.6	80.3	80.8	59.9	75.9	84.6	73.9	60.1	76.3	52.6	50.9	64.1	70.1
26	58.7	82.0	75.8	78.1	78.4	59.7	72.0	80.2	69.3	58.8	74.0	50.0	47.7	61.8	67.6
28	56.7	77.8	73.1	73.7	74.4	56.2	69.5	79.0	65.2	53.7	68.6	48.9	46.8	59.3	64.5
29	62.2	88.3	81.9	83.2	83.2	63.2	75.4	86.3	75.8	62.8	79.9	56.5	52.8	67.0	72.7
31	63.5	82.1	78.2	80.0	81.0	60.0	74.2	83.6	71.7	58.7	74.9	52.0	48.1	65.1	69.5
Fleet mean	60.9	83.4	78.3	79.4	80.3	60.3	73.6	83.5	70.4	58.9	75.2	51.9	48.9	62.9	69.1
Fleet BESD	2.79	3.39	3.19	3.18	2.94	2.93	2.88	3.02	3.22	2.53	3.26	2.46	2.50	3.03	2.69

On examination of the data collected on the network route (Table 6.1) we can see that the Fleet BESD for the average of the sections meets the criterion for the network route (see Section 4.1).

6.3.2 *Main running trial day 1 tests*

Table 6.2 Average SR from the 50km/h tests on the Twin Straights

ID	Average SR for 50km/h tests on Twin Straights						
	TS01	TS02	TS03	TS04	TS05	TS06	Avg
1	78.6	92.6	84.0	80.9	80.2	65.9	80.3
3	82.4	96.4	87.7	83.9	83.2	69.7	83.9
14	80.3	93.8	84.7	81.9	81.1	68.7	81.7
16	86.0	98.2	87.6	85.9	84.9	70.8	85.7
17	78.7	91.8	83.5	80.6	79.8	68.1	80.4
19	82.8	94.3	84.9	84.7	82.9	72.2	83.7
21	83.9	96.4	86.8	83.6	83.3	70.4	84.1
22	83.0	95.7	86.9	85.4	84.1	70.9	84.3
23	73.1	86.9	78.8	77.8	76.3	64.7	76.1
24	79.1	94.2	84.0	82.2	80.6	67.7	81.3
25	79.0	91.5	84.2	81.4	80.3	67.6	80.6
26	77.5	93.5	84.0	81.6	81.6	68.6	80.9
28	73.8	86.4	78.5	76.4	75.2	63.3	75.5
29	83.9	98.6	90.2	87.2	85.7	72.5	86.3
31	81.9	94.4	87.1	85.0	83.1	70.4	83.6
Fleet mean	80.3	93.6	84.9	82.6	81.5	68.8	81.9
Fleet BESD	3.69	3.52	3.15	2.97	2.94	2.66	3.12

Table 6.3 Average SR from the 80km/h tests on the Twin Straights

ID	Average SR for 80km/h tests on Twin Straights						
	TS01	TS02	TS03	TS04	TS05	TS06	Avg
1	67.4	83.5	77.0	76.7	76.1	61.0	73.1
3	72.6	91.8	83.9	80.8	79.8	63.7	78.4
14	67.6	87.0	80.6	79.2	79.2	64.0	75.6
16	70.7	88.6	81.1	81.8	80.9	65.7	77.6
17	67.6	85.0	79.9	79.8	78.8	64.0	75.2
19	68.2	85.0	80.7	79.2	78.1	63.8	75.3
21	68.7	88.2	82.6	81.3	81.2	66.1	77.3
22	71.9	90.9	83.9	82.9	82.5	66.3	79.2
23	66.0	85.3	79.3	77.4	77.2	63.3	74.1
24	70.9	92.4	85.4	83.1	82.9	66.5	79.5
25	72.0	90.4	84.3	81.8	82.5	67.0	79.1
26	68.6	92.6	85.5	82.8	82.4	67.8	79.2
28	65.6	85.0	80.1	78.3	77.4	62.7	74.2
29	75.0	96.3	90.5	88.3	87.6	71.5	84.2
31	69.1	89.3	84.1	81.9	81.1	66.5	78.0
Fleet mean	69.5	88.8	82.6	81.0	80.5	65.3	77.3
Fleet BESD	2.63	3.66	3.32	2.84	2.93	2.54	2.84

On examination of the data collected from the Twin Straights (Table 6.2 and Table 6.3) we can see that the Fleet BESD for the average of the sections exceeds the criterion (see Section 4.1). However, historically it has been found that the data from the Twin Straights are more variable than those for the Straight Line Wet Grip site. This is due to fact that the site has not had much traffic since it was laid. The data for this site has improved however, as it stands, it is currently used only to provide supporting information for the skid resistance measurement part of the accreditation process. Although the data may suggest some machines as possible outliers at each speed (e.g. 23 and 28 at 50km/h and 29 at 80km/h) no machine was an outlier at both speeds.

Table 6.4 Average SR from the 1st set of tests on the Straight Line Wet Grip

ID	Average SR on Straight Line Wet Grip				
	SWG01	SWG02	SWG03	SWG04	Avg
1	65.4	87.2	25.2	64.0	60.7
3	66.3	88.7	25.3	63.7	61.3
14	68.0	90.0	27.6	68.3	63.7
16	71.3	94.1	27.2	69.0	65.7
17	67.3	89.4	26.8	66.5	62.7
19	66.3	89.4	25.2	66.7	62.1
21	69.3	93.4	28.6	67.3	64.9
22	69.2	92.5	28.4	67.5	64.6
23	63.4	85.2	24.5	63.9	59.5
24	67.4	89.9	26.6	65.1	62.5
25	66.3	89.8	24.8	66.0	62.0
26	65.5	87.8	26.4	63.3	61.0
28	63.0	84.3	25.9	61.6	58.9
29	72.4	96.2	28.4	70.1	67.1
31	68.6	91.2	26.8	67.0	63.7
Fleet mean	67.3	89.9	26.5	66.0	62.7
Fleet BESD	2.62	3.21	1.34	2.36	2.28

The first set of tests on the Straight Line Wet Grip area (Table 6.4) show that the fleet BESD is met for the average of the site.

At the end of the first main running trial day all machines were identified as being in the green category (see section 6.1).

6.3.3 *Main running trial day 2 tests*

Table 6.5 Average SR from the 2nd set of tests on the Straight Line Wet Grip

ID	Average SR on Straight Line Wet Grip				
	SWG01	SWG02	SWG03	SWG04	Avg
3	65.9	84.4	26.7	61.3	59.9
14	66.0	86.8	26.0	59.6	59.9
16	66.2	86.5	27.0	62.0	60.7
17	69.3	89.3	27.3	67.3	63.6
18	64.0	84.2	26.9	61.6	59.4
19	64.6	85.0	24.1	61.4	59.1
21	67.6	89.5	26.7	62.6	61.9
22	67.8	89.2	27.2	65.1	62.6
23	62.4	83.6	24.5	60.5	58.0
24	64.2	83.7	23.8	63.4	59.1
25	67.6	88.1	26.6	65.2	62.2
26	61.1	79.5	22.9	57.7	55.6
28	61.4	81.8	24.4	56.5	56.3
29	67.9	88.1	26.6	65.2	62.2
31	59.7	79.7	22.4	55.3	54.6
Fleet mean	65.0	85.3	25.5	61.6	59.7
Fleet BESD	2.89	3.32	1.67	3.40	2.69

The second set of tests on the Straight Line Wet Grip area (Table 6.5) show that the fleet BESD is met for the average of the site.

6.4 Summary of skid resistance testing

All machines produced suitable results with regards to repeatability of skid resistance measurement (BRSD criterion, see Section 4.1).

All machines produced suitable results with regards to reproducibility of skid measurement (BESD criterion, see 4.1).

7 Location referencing

7.1 Distance measurement

For this assessment there are separate criteria for the push button entry of markers and for the entry of markers via automatic detection of retro-reflective posts or via OSGR fitted markers (given in section 4.1). The criteria for the push button entry are more lenient to allow for the additional uncertainty added by the reaction times of the operator. However it has been noted that the additional buffer added to the push button criteria make it easier to pass the push button criteria than the automatic marker detection criteria (i.e. it could be beneficial to switch off the automatic marker detection and manually enter the markers). Therefore to maintain the required level of performance for Highways England surveys, the following clause was added to the accreditation criteria:

E4.1.4 If the Survey Contractor will be supplying data to a Customer with OSGR fitted location reference points then they must meet the criteria for the OSGR fitted distance measurement.

Due to this split in requirements, all machines were assessed for distance measurement on the Twin Straights site. In addition, all of the machines providing BCD files (OSGR fitted data) were also assessed for OSGR fitted distance on the Longcross test site. The results from these two assessments and the summary conclusions are provided below.

7.1.1 Twin Straights

To provide data for the assessment of distance measurement, the survey vehicles performed ten passes of the Twin Straights (5 passes at 50km/h and 5 passes at 80km/h), marking positions A-H as shown in Figure 3.1. This data was then assessed against the reference data collected from an optical survey of the site.

The results of this assessment (including the criteria used) are shown in Table 7.1.

During this testing it was found that Machine 21 initially produced poor results. The crew were notified and given the opportunity to repeat their distance calibration and repeat the distance assessment. The data shown for Machine 21 in Table 7.1 is from the second set of tests for this machine.

Table 7.1 Distance measurement assessment on Twin straights

ID	Percentage of data within				Assessment criteria used	Met criteria
	1m	2m	5m	10m		
1	33%	88%	98%	100%	Push	Yes
3	38%	93%	98%	100%	Push	Yes
14	58%	78%	100%	100%	Push	Yes
16	78%	97%	97%	97%	Automatic	Yes
17	78%	100%	100%	100%	Automatic	Yes
19	90%	98%	100%	100%	Automatic	Yes
21	35%	68%	85%	95%	Push	Yes
22	38%	77%	100%	100%	Push	Yes
23	28%	80%	100%	100%	Automatic	Yes
24	88%	98%	100%	100%	Automatic	Yes
25	88%	100%	100%	100%	Automatic	Yes
26	81%	100%	100%	100%	Automatic	Yes
28	70%	100%	100%	100%	Automatic	Yes
29	36%	59%	98%	100%	Push	Yes
31	90%	100%	100%	100%	Automatic	Yes

7.1.2 Longcross

To provide data for the assessment of OSGR fitted distance measurement, the survey vehicles performed six passes of the Longcross test track (3 passes at 50km/h and 3 passes at 80km/h), marking positions A-H as shown in Figure 3.5. This data was then assessed against the reference data collected from an optical survey of the site.

Table 7.2 Distance measurement assessment at Longcross (OSGR fitted data)

ID	Percentage of data within				Assessment criteria used	Met criteria
	1m	2m	5m	10m		
1	57%	77%	97%	100%	OSGR Fitted	No
17	47%	90%	100%	100%	OSGR Fitted	Yes
19	47%	83%	100%	100%	OSGR Fitted	Yes
22	23%	70%	100%	100%	OSGR Fitted	No
23	67%	90%	100%	100%	OSGR Fitted	Yes
24	47%	80%	100%	100%	OSGR Fitted	Yes
25	63%	90%	100%	100%	OSGR Fitted	Yes
26	70%	93%	100%	100%	OSGR Fitted	Yes
28	50%	60%	93%	100%	OSGR Fitted	No
29	43%	80%	100%	100%	OSGR Fitted	Yes
31	53%	77%	93%	100%	OSGR Fitted	No

From Table 7.2 it can be seen that four machines (Machines 1, 22, 28 and 31) do not meet the OSGR fitted criteria. However, it is likely that the OSGR fitted criteria is too demanding as it incorporates both the error on the distance measurement system and the error on the OSGR system. Therefore these machines were reassessed using the same criteria using the

original survey data (i.e. using the automatic markers assessment). The results are shown below in Table 7.3.

Table 7.3 Distance measurement assessment at Longcross (automatic markers assessment)

ID	Percentage of data within				Assessment criteria used	Met criteria
	1m	2m	5m	10m		
1	77%	97%	100%	100%	Automatic	Yes
22	40%	87%	100%	100%	Automatic	Yes
28	30%	70%	97%	100%	Automatic	No
31	60%	80%	100%	100%	Automatic	Yes

From this assessment it can be seen that three of these machines can achieve 80% of the data within 2m. Therefore these machines were awarded a "Pass*" for distance measurement with the following comment on the certificate:

Distance assessed against automatic markers criteria. It did not meet the OSGR fitted criteria; a review is being conducted on the data and the test process. Pending the outcome of this review this machine is deemed satisfactory for distance measurement.

The remaining machine (Machine 28) showed a poor level of performance on one particular section. This poor performance could be due to the driving line taken on this section. This conclusion is reinforced by the good performance of this machine on the Twin Straights (see Section 7.1.1), and the performance on the other sections on the Longcross track.

Table 7.4 Distance measurement assessment at Longcross (automatic markers assessment) after removal of section DE

ID	Percentage of data within				Assessment criteria used	Met criteria
	1m	2m	5m	10m		
28	50%	87%	100%	100%	Automatic	Yes

Therefore this machine was also awarded a "Pass*" with the comment shown above in blue text added to the certificate.

7.1.3 Summary of distance measurement assessment

The awarded performance for distance measurement (and the criteria applied) is shown in Table 7.5.

Table 7.5 Distance measurement assessment Summary

ID	Assessment criteria used	Distance measurement
1	Automatic	Pass*
3	Push	Pass
14	Push	Pass
16	Automatic	Pass
17	OSGR Fitted	Pass
19	OSGR Fitted	Pass
21	Push	Pass
22	Automatic	Pass*
23	OSGR Fitted	Pass
24	OSGR Fitted	Pass
25	OSGR Fitted	Pass
26	OSGR Fitted	Pass
28	Automatic	Pass*
29	OSGR Fitted	Pass
31	Automatic	Pass*

7.2 3 dimensional spatial coordinates data

The assessment of 3 dimensional spatial coordinates is mandatory for any device that is to be used on the central Highways England survey contract and optional for the other devices. Thirteen machines took part in these tests: Machines 1, 14, 16, 17, 19, 22-26, 28, 29, and 31.

The assessment is carried out on the Longcross test track and the network route near MIRA. The reference data from the Longcross test track was obtained from a static GPS survey of the site, and the network route reference data was supplied by Highways England's HARRIS2 survey vehicle.

The results from the OSGR and altitude assessments and the criteria applied are given in Appendix C and are summarised in Table 7.6 and

Table 7.7. Performance assessed using the push button criteria are shown with grey italic text. The assessment criteria are given in section 4.1.

Table 7.6 Summary of OSGR assessments

ID	Longcross		Network Route		Awarded Performance
	Criteria	Performance	Criteria	Performance	
1	OSGR Fitted	Low	OSGR Fitted	High	Low
14	Push	*High*	Push	*High*	*High*
16	Automatic	High	Push	*High*	High
17	OSGR Fitted	Low	OSGR Fitted	High	Low
19	OSGR Fitted	High	OSGR Fitted	High	High
22	OSGR Fitted	High	OSGR Fitted	High	High
23	OSGR Fitted	High	OSGR Fitted	High	High
24	OSGR Fitted	High	OSGR Fitted	High	High
25	OSGR Fitted	High	OSGR Fitted	High	High
26	OSGR Fitted	High	OSGR Fitted	High	High
28	OSGR Fitted	High	OSGR Fitted	High	High
29	OSGR Fitted	Low	OSGR Fitted	High	Low
31	OSGR Fitted	High	OSGR Fitted	High	High

Table 7.7 Summary of Altitude assessments

ID	Longcross Performance	Network route Performance	Awarded Performance
1	Medium	High	Medium
14	Not Suitable	Not Suitable	Not Suitable
16	Not Suitable	High	Not Suitable
17	High	Medium	Medium
19	High	High	High
22	Medium	Medium	Medium
23	High	High	High
24	Medium	High	Medium
25	High	High	High
26	High	High	High
28	Medium	Medium	Medium
29	Medium	Medium	Medium
31	Medium	Low	Low

8 File formats

All of the machines supplied suitable ".S10" and ".loc" files. There is a mandatory requirement that any device that is to be used on the central Highways England contract shall provide RCD and BCD data.

The following machines provided RCD files:

- Machine 1
- Machine 14
- Machine 17
- Machine 19
- Machine 22
- Machine 23
- Machine 24
- Machine 25
- Machine 26
- Machine 28
- Machine 29
- Machine 31

The following machines provided BCD files:

- Machine 1
- Machine 17
- Machine 19
- Machine 22
- Machine 23
- Machine 24
- Machine 25
- Machine 26
- Machine 28
- Machine 29
- Machine 31

Examination of the supplied RCD and BCD found that the data formatting was suitable.

9 Conclusions

The 2017 sideway-force skid resistance accreditation trials were held during the week beginning the 20th March 2017. The trials were held on and around the MIRA proving ground and at the Longcross test track. Fifteen machines from the UK fleet attended.

The following conclusions were drawn in relation to the various mandatory tests and assessments:

(i) Skid resistance measurement

All fifteen machines met the criteria for the measurement of skid resistance at the trial.

(ii) Vehicle Speed attainment and recording

All fifteen machines met the criteria for vehicle speed attainment and recording.

(iii) Distance measurement

All fifteen machines met the criteria with regards to the measurement of distance.

(iv) Left test wheel weight

All fifteen machines met the current ±8 kg tolerance for test wheel weight. However, it is noted that there is a draft for development CEN technical specification for these devices which would tighten the tolerance to ±1 kg. Three of the fifteen machines meet this tighter tolerance.

(v) Water flow

All fifteen machines were found to provide satisfactory water flow and direction.

The following conclusions were drawn in relation to the various additional tests and assessments (note: OSGR and Altitude is mandatory for machines operating on the central Highways England survey contract and optional for others):

(vi) Measurement of OSGRs

Thirteen machines fitted with 3 dimensional spatial coordinate systems were assessed for the measurement of OSGRs. Ten machines achieved a high performance and three machines a low performance.

(vii) Measurement of Altitude

Thirteen machines fitted with 3 dimensional spatial coordinate systems were assessed for the measurement of altitude. Four machines achieved a high performance, six machines a medium performance, one machine a low performance and two machines were identified as not suitable.

(viii) File formats

All fifteen machines supplied suitable .s10 and .loc files. Twelve machines provided suitable RCD files and eleven machines provided suitable BCD files.

A summary of the machines that attended the 2017 accreditation trial and the criteria that they met can be found in Appendix A.

References

British Standards Institution. (2006). *BS 7941-1. Methods for measuring the skid resistance of pavement surfaces - Sideway-force coefficient routine investigation machine.* London: BSi.

British Standards Institution. (2009). *DD CEN/TS15901-6:2009. Road and airfield surface characteristics. Procedure for determining the skid resistance of a pavement surface by measurement of the sideway force coefficient (SFCS).* BSi.

Design Manual for Roads and Bridges. (2015, July). *Volume 7 Section 3 Part 1, HD28/15, Skidding Resistance*. London: The Stationery Office.

TRL. (2016). *Accreditation and Quality Assurance of Sideways Force Skid Resistance Survey Devices.* http://www.ukroadsliaisongroup.org/en/asset-condition/road-condition-information/data-collection/skid-resistance.cfm.

Appendix A Machine identification and performance

Table A.1 Machine identification and performance summary

ID	Current Owner	Registration number	Performance Summary							
			Skid resistance measurement	Speed	Distance travelled[1]	OSGR[1]	Altitude	S10 and loc file	RCD file	BCD file
1	PTS Ltd	W965 SVG	Pass	Pass	Pass	Low	Medium	Satisfactory	Satisfactory	Satisfactory
3	DRDNI	IKZ 2203	Pass	Pass	Pass	-	-	Satisfactory	-	-
14	PMS	01 KK 1138	Pass	Pass	Pass	High	Not Suitable	Satisfactory	Satisfactory	-
16	Highway Surveyors Ltd	S66 HSL	Pass	Pass	Pass	High	Not Suitable	Satisfactory	-	-
17	WDM Ltd	S800 WDM	Pass	Pass	Pass	Low	Medium	Satisfactory	Satisfactory	Satisfactory
19	WDM Ltd	S900 WDM	Pass	Pass	Pass	High	High	Satisfactory	Satisfactory	Satisfactory
21	Surrey CC	KX07YXH	Pass	Pass	Pass	-	-	Satisfactory	-	-
22	PTS Ltd	KX07YVH	Pass	Pass	Pass	High	Medium	Satisfactory	Satisfactory	Satisfactory
23	WDM Ltd	S11 WDM	Pass	Pass	Pass	High	High	Satisfactory	Satisfactory	Satisfactory
24	WDM Ltd	S12 WDM	Pass	Pass	Pass	High	Medium	Satisfactory	Satisfactory	Satisfactory
25	WDM Ltd	S13 WDM	Pass	Pass	Pass	High	High	Satisfactory	Satisfactory	Satisfactory
26	WDM Ltd	S14 WDM	Pass	Pass	Pass	High	High	Satisfactory	Satisfactory	Satisfactory
28	Operated by TRL on behalf of Highways England	WX60 AXN	Pass	Pass	Pass	High	Medium	Satisfactory	Satisfactory	Satisfactory
29	PTS Ltd	YD02 XSN	Pass	Pass	Pass	Low	Medium	Satisfactory	Satisfactory	Satisfactory
31	WDM Ltd	S16 WDM	Pass	Pass	Pass	High	Low	Satisfactory	Satisfactory	Satisfactory

[1] Machines are assessed on different criteria for distance travelled and OSGR measurements depending on the equipment fitted. Please see the corresponding part of this report or the test certificate for the machine to see which criteria were applied for the assessment.

Appendix B Between run standard deviation

Values that are within the BRSD criteria (see section 4.1) are shaded in green. Values up to 1 standard deviation greater than the criteria are shaded in orange, values greater than this are shaded in red.

Table B.1 Machine repeatability for the Network route

ID	Between run SD														
	01	02	03	04	05	06	07	08	09	10	11	12	13	14	Avg
1	4.99	6.57	7.50	6.65	7.06	3.23	5.40	3.20	3.85	1.29	3.15	2.17	1.68	2.91	4.71
3	0.26	2.38	1.57	0.18	0.88	2.40	1.27	1.48	1.87	1.38	0.14	0.01	0.39	1.10	1.34
14	1.06	0.68	0.42	0.07	0.41	0.37	1.19	1.43	2.27	1.55	1.13	0.69	2.21	0.40	1.19
16	4.95	4.73	5.47	5.25	4.77	4.40	3.47	3.70	2.55	2.29	4.18	2.31	1.54	1.84	3.90
17	3.44	1.76	3.44	3.98	2.13	2.93	5.49	3.78	2.51	2.17	2.16	1.28	1.79	5.09	3.24
19	2.22	2.28	3.39	2.08	2.29	1.70	3.32	1.51	0.99	2.83	1.66	1.68	0.97	3.73	2.34
21	4.20	3.59	3.66	3.16	3.83	2.35	4.95	2.40	2.25	1.35	3.21	1.08	0.43	3.14	3.08
22	2.19	0.91	1.06	0.84	0.22	0.90	1.35	3.36	1.24	1.47	3.14	1.09	1.60	4.06	1.99
23	1.31	0.67	0.47	0.61	0.71	0.67	1.81	0.97	0.49	0.38	0.73	0.02	0.37	1.57	0.91
24	1.19	1.14	1.03	1.99	2.16	0.97	0.88	1.60	2.58	0.39	1.62	0.33	1.13	1.14	1.43
25	1.24	2.92	4.25	2.40	1.70	1.98	1.79	2.41	2.95	2.11	2.39	0.89	0.84	1.78	2.29
26	1.26	1.21	2.07	0.96	1.69	1.66	1.73	2.38	3.81	4.38	2.48	0.99	2.63	2.16	2.31
28	1.34	0.61	1.17	1.43	0.67	1.44	0.24	1.31	1.60	2.14	1.69	0.26	0.20	1.85	1.29
29	1.47	1.61	1.80	1.79	2.12	1.78	1.10	2.55	2.99	3.02	1.29	1.85	1.08	2.38	2.01
31	0.37	1.17	0.41	1.25	0.82	0.45	2.25	0.41	0.87	2.25	1.62	1.37	1.12	1.92	1.32
Avg	2.58	2.70	3.21	2.83	2.76	2.11	2.92	2.38	2.40	2.17	2.29	1.28	1.38	2.63	2.46

Table B.2 Machine repeatability for the 1st set of tests on the Straight Line Wet Grip

ID	Between run SD				
	SWG01	SWG02	SWG03	SWG04	Avg
1	1.24	0.93	0.67	2.98	1.69
3	1.41	0.83	1.14	2.82	1.71
14	1.09	0.56	1.41	3.69	2.03
16	2.33	0.42	1.79	2.32	1.91
17	2.17	1.72	1.57	4.15	2.59
19	0.46	0.51	0.56	3.44	1.73
21	0.73	1.28	0.66	1.36	1.04
22	1.21	1.21	1.15	2.83	1.73
23	0.80	0.56	1.89	2.07	1.46
24	0.65	2.18	1.66	1.22	1.50
25	0.56	0.70	1.40	2.45	1.45
26	1.50	1.10	1.57	1.71	1.49
28	0.89	1.38	0.62	3.34	1.85
29	0.44	0.29	1.80	2.15	1.39
31	0.78	0.61	0.72	2.35	1.30
Avg	1.22	1.08	1.33	2.72	1.69

Table B.3 Machine repeatability for the 2nd set of tests on the Straight Line Wet Grip

ID	Between run SD				
	SWG01	SWG02	SWG03	SWG04	Avg
1	1.81	3.51	1.91	2.02	2.39
3	1.77	2.01	2.29	1.47	1.90
14	0.87	1.17	1.03	1.57	1.17
16	2.33	1.44	2.12	1.55	1.92
17	1.66	1.30	1.19	1.30	1.39
19	0.61	1.01	0.47	1.39	0.93
21	0.54	1.53	0.78	1.58	1.17
22	0.60	1.02	0.96	2.53	1.44
23	1.50	1.98	0.80	4.51	2.56
24	1.51	1.41	1.36	4.12	2.37
25	0.72	1.57	1.87	2.10	1.61
26	2.12	1.12	1.96	3.93	2.48
28	1.53	0.95	1.42	1.31	1.33
29	0.54	1.21	1.21	1.94	1.29
31	0.85	0.87	1.04	1.05	0.95
Avg	1.40	1.60	1.46	2.41	1.75

Table B.4 Machine repeatability for the 50k/h tests on the Twin Straights

ID	Between run SD						
	TS01	TS02	TS03	TS04	TS05	TS06	Avg
1	2.07	1.22	0.51	1.59	1.03	0.82	1.37
3	0.86	1.83	1.63	1.01	0.94	0.92	1.26
14	1.88	2.02	1.55	1.47	1.37	1.35	1.66
16	2.91	0.90	1.06	0.69	0.87	0.77	1.56
17	2.57	2.04	1.69	0.70	0.45	1.67	1.80
19	1.73	1.31	0.81	0.89	1.72	1.54	1.37
21	2.82	1.58	1.08	0.94	1.06	1.49	1.73
22	3.10	1.93	0.77	0.69	1.34	1.10	1.82
23	1.30	1.92	0.91	0.74	1.06	1.07	1.24
24	2.04	1.82	2.39	1.38	1.57	0.90	1.78
25	5.05	1.98	1.83	0.66	1.03	0.86	2.67
26	1.38	0.14	1.47	1.03	1.56	2.19	1.42
28	0.86	0.70	1.08	1.08	0.70	0.63	0.87
29	1.49	1.93	1.71	0.61	0.85	0.82	1.37
31	2.33	1.40	1.55	1.40	1.12	1.11	1.61
Avg	2.39	1.61	1.42	1.04	1.16	1.22	1.62

Table B.5 Machine repeatability for the 80km/h tests on the Twin Straights

ID	Between run SD						
	TS01	TS02	TS03	TS04	TS05	TS06	Avg
1	1.94	2.28	1.81	1.25	1.17	0.88	1.68
3	4.83	5.09	2.82	2.47	1.85	1.74	3.58
14	1.66	3.68	2.12	1.55	1.98	1.23	2.18
16	2.32	2.65	1.68	1.57	1.45	1.44	1.96
17	1.54	1.45	1.21	0.99	1.48	0.92	1.28
19	2.68	2.07	2.38	0.99	2.55	2.07	2.19
21	1.63	2.35	1.87	1.51	1.38	1.57	1.77
22	2.56	3.05	2.50	2.48	1.33	0.65	2.32
23	0.67	0.70	0.75	0.35	0.36	0.25	0.57
24	1.02	1.81	0.56	0.43	0.53	0.36	0.96
25	2.43	0.87	0.42	0.66	1.13	0.71	1.32
26	1.51	1.85	1.59	0.91	1.05	0.47	1.35
28	0.69	0.94	1.32	1.70	1.58	0.25	1.14
29	0.70	1.23	1.05	0.69	0.66	0.44	0.85
31	0.82	0.75	1.21	0.64	0.78	0.42	0.81
Avg	2.09	2.37	1.70	1.37	1.40	1.06	1.76

Appendix C Assessment of 3 dimensional spatial coordinates data

C.1 OSGR data

Performance assessed using the push button criteria are shown with grey italic text.

Table C.1 Assessment of OSGR measurements against the reference: Longcross Test track

ID	Assessment type	10m data points on test track: % within							Performance level
		2m	4m	5m	7m	8m	20m	25m	
1	OSGR Fitted	79%	98%	99%	100%	100%	100%	100%	Low
14	Push	*83%*	*98%*	*100%*	*100%*	*100%*	*100%*	*100%*	*High*
16	Automatic	90%	100%	100%	100%	100%	100%	100%	High
17	OSGR Fitted	79%	98%	99%	100%	100%	100%	100%	Low
19	OSGR Fitted	92%	100%	100%	100%	100%	100%	100%	High
22	OSGR Fitted	90%	99%	100%	100%	100%	100%	100%	High
23	OSGR Fitted	100%	100%	100%	100%	100%	100%	100%	High
24	OSGR Fitted	95%	100%	100%	100%	100%	100%	100%	High
25	OSGR Fitted	94%	99%	100%	100%	100%	100%	100%	High
26	OSGR Fitted	97%	100%	100%	100%	100%	100%	100%	High
28	OSGR Fitted	91%	100%	100%	100%	100%	100%	100%	High
29	OSGR Fitted	57%	96%	100%	100%	100%	100%	100%	Low
31	OSGR Fitted	94%	100%	100%	100%	100%	100%	100%	High

Table C.2 Assessment of OSGR measurements against the reference: Network route

ID	Assessment type	10m data points Network route: % within							Performance level
		3m	6m	12m	17m	20m	25m	30m	
1	OSGR Fitted	75%	98%	100%	100%	100%	100%	100%	High
14	Push	*77%*	*94%*	*100%*	*100%*	*100%*	*100%*	*100%*	*High*
16	Push	*88%*	*96%*	*100%*	*100%*	*100%*	*100%*	*100%*	*High*
17	OSGR Fitted	100%	100%	100%	100%	100%	100%	100%	High
19	OSGR Fitted	99%	100%	100%	100%	100%	100%	100%	High
22	OSGR Fitted	95%	99%	100%	100%	100%	100%	100%	High
23	OSGR Fitted	99%	100%	100%	100%	100%	100%	100%	High
24	OSGR Fitted	99%	100%	100%	100%	100%	100%	100%	High
25	OSGR Fitted	98%	100%	100%	100%	100%	100%	100%	High
26	OSGR Fitted	100%	100%	100%	100%	100%	100%	100%	High
28	OSGR Fitted	99%	100%	100%	100%	100%	100%	100%	High
29	OSGR Fitted	73%	98%	100%	100%	100%	100%	100%	High
31	OSGR Fitted	100%	100%	100%	100%	100%	100%	100%	High

C.2 Altitude data

Table C.3 Assessment of altitude measurements against the reference: Test track

ID	10m data points on test track: % within					Performance level
	2m	4m	5m	6m	20m	
1	66%	95%	99%	100%	100%	Medium
14	0%	0%	0%	0%	0%	Not Suitable
16	0%	0%	0%	0%	0%	Not Suitable
17	94%	100%	100%	100%	100%	High
19	93%	100%	100%	100%	100%	High
22	70%	100%	100%	100%	100%	Medium
23	100%	100%	100%	100%	100%	High
24	85%	100%	100%	100%	100%	Medium
25	98%	100%	100%	100%	100%	High
26	99%	100%	100%	100%	100%	High
28	76%	100%	100%	100%	100%	Medium
29	67%	100%	100%	100%	100%	Medium
31	87%	100%	100%	100%	100%	Medium

Table C.4 Assessment of altitude measurements against the reference: Network route

ID	10m data points on Network route Section start and end points on test track: % within					Performance level
	2m	4m	5m	6m	20m	
1	92%	100%	100%	100%	100%	High
14	0%	0%	0%	0%	0%	Not Suitable
16	94%	100%	100%	100%	100%	High
17	60%	100%	100%	100%	100%	Medium
19	97%	100%	100%	100%	100%	High
22	81%	100%	100%	100%	100%	Medium
23	99%	100%	100%	100%	100%	High
24	98%	100%	100%	100%	100%	High
25	99%	100%	100%	100%	100%	High
26	100%	100%	100%	100%	100%	High
28	86%	100%	100%	100%	100%	Medium
29	88%	100%	100%	100%	100%	Medium
31	0%	7%	58%	95%	100%	Low

Highways England 2017 national accreditation trial for sideway-force skid resistance devices

A key element in the successful maintenance of a road network is the availability of accurate, reliable and consistent survey data. To this aim, Highways England commission annual accreditation trials for Sideways Force Skid Resistance devices supported by ongoing QA for the devices. In order to undertake accredited surveys, the survey devices are required to meet the mandatory criteria of the trial.

This report covers the 2017 trial run by TRL and held on the Horiba-MIRA proving ground between 21st and 23rd March 2017 and on the Longcross test track on 20th March 2017.

Other titles from this subject area

PPR 937	Highways England 2016 national accreditation trial for sideway-force skid resistance devices. S Brittain. 2020
PPR 938	Highways Agency 2015 national accreditation trial for sideway-force skid resistance devices. S Brittain. 2020
CPR 1874	Highways Agency 2014 national accreditation trial for sideway-force skid resistance devices. S Brittain. 2020
CPR1448	SCRIM accreditation transitional trial. P Roe, S Brittain, P D Sanders. 2011

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