Essex Highways

Essex Highways Skid Resistance Strategy

Managing Skid Resistance on the Road Network

2024

RINGWAY JACOBS | Essex County Council

Skid Resistance Strategy: Managing Skid Resistance on the Road Network

Foreword - Supporting Road Safety: Vision Zero

Welcome to the Essex Highways Skid Resistance Strategy. Skid Resistance is the term given to the frictional properties of the road surface in wet conditions - it is the contribution of the road surface to the overall friction available between the tyre and the road surface.

This Strategy supports the principles within the overarching Essex County Council Highways Maintenance Policy, published on the Essex Highways website, and describes the Council's risk-based approach to managing skid resistance on the road network.

This Strategy takes account of the recommendations and best practice set out in the October 2016 'Well-managed Highway Infrastructure: A Code of Practice', published by the United Kingdom Roads Leadership Group (UKRLG, formerly called the United Kingdom Roads Liaison Group).

The establishment, monitoring, and maintenance of appropriate skid resistance standards on the road network has a positive impact on road safety and therefore contributes to Road safety: Vision Zero. Vision Zero is the aspiration that there should be no deaths or serious injuries on the roads by 2040.

Cllr. Tom Cunningham

Portfolio Holder for Highways, Infrastructure and Sustainable Transport

Essex Highways' assets are currently managed via the Essex Highways strategic partnership, which is a collaboration between ECC and contractor Ringway Jacobs, which was formed on the 1st of April 2012.

This Strategy is a supplementary strategic document to the Highways Infrastructure Asset Management Plan (HIAMP) which forms the keystone of the Essex Highways Strategic Partnership whose objective is to deliver the Council's strategic priorities.

Both Essex County Council and Ringway Jacobs are committed to long term efficient and cost-effective management of Highways' assets, to deliver a transport system that supports sustainable economic growth and promotes the very best quality of life for the residents of Essex.

Tom Blackburne-Maze
Director Highways and Transport

Simon Butt
Operations Director

Skid Resistance Strategy: Managing Skid Resistance on the Road Network

Contents

1 Introduction

1.1 This Essex County Council (ECC) Skid Resistance Strategy has been introduced by maintenance engineers, inspectors, and other practitioners to take account of the recommendations and best practice set out in the October 2016 ‘Well-managed Highway Infrastructure: A Code of Practice’ and subsequent amendments (which hereafter will be referred to as ‘the Code of Practice’).

1.2 Neither legislation nor the Code of Practice has set out or prescribed the minimum standards to be employed. The Code of Practice is designed to promote the adoption of an integrated asset management approach to highway infrastructure based on the establishment of local levels of service through risk-based assessment. It is up to each Authority to establish and implement their own levels of service to suit their circumstances.

1.3 This Strategy supports the principles within the overarching Essex County Council Highways Maintenance Policy, published on the Essex Highways website, and describes the Council’s risk-based approach to managing skid resistance on the road network.

1.4 Skid Resistance is the term given to the frictional properties of the road surface in wet conditions. It is the contribution of the road surface to the overall friction available between the tyre and the road surface. The skid resistance of a wet or damp road surface can be substantially lower than the same surface when dry and is more dependent on the condition of the surfacing material.

1.5 This Strategy also takes into account the Skid Resistance standards published in the Design Manual for Roads and Bridges (DMRB), under CS228 which describes the requirements for the provision and management of appropriate levels of skid resistance on UK motorway and all-purpose trunk roads.

1.6 This Strategy supports the overarching Essex County Council Highways Maintenance Inspections Strategy which sets out and describes the service levels relating to its risk-based approach to managing how it organises,

inspects and maintains the Carriageway, Footway and Cycleway Network for which it is responsible.

1.7 This Strategy is a supplementary, strategic document of the Essex County Council Essex Highways Infrastructure Asset Management Plan (HIAMP) which is published on the Essex Highways website.

1.8 This Strategy covers the following key areas:

- the road network to which it applies;
- the test equipment to be used;
- the method of survey;
- quality assurance procedures for data collection;
- frequency of surveys;
- the approach to setting investigatory levels, including the range of investigatory levels which are to be used for different categories of site;
- frequency of re-assessment of investigatory levels;
- competence levels of staff authorised to set or approve investigatory levels;
- the approach to be followed in site investigation;
- intervention criteria;
- how remedial works will be prioritised in relation to available funding in the
  overall context of the Asset Management Framework;
- ECC's approach to early life skid resistance;
- a realistic/achievable timetable for delivery of each part of the Strategy;
- responsibilities for delivering each part of the strategy; and
- the documentation to be retained to enable implementation of the Strategy to be demonstrated (in court if necessary).

1.9 Where this Strategy makes reference to 'engineer' this refers to an officer suitably qualified and competent in Skid Resistance Management (refer to 'Section 11. Competence Levels of Staff Authorised to set or approve Investigatory Levels (ILs)' for more information). The term 'engineer' may also refer to more than one suitably qualified, competent officer.

2 Skid Resistance Standards

2.1 Skid Resistance standards are published in the Design Manual for Roads and Bridges (DMRB), under CS228, which describes the requirements for the provision and management of appropriate levels of skid resistance on UK motorway and all-purpose trunk roads. It is not intended to inform management of skid resistance on Local Authority Roads, which are more diverse in nature, but Local Authorities can use the principles of CS228 as a guide to assist with managing skid resistance.

This Essex County Council Skid Resistance Strategy has been determined in accordance with many of the principles set out in CS228, although it departs from CS228 where this is deemed appropriate. Where departures from CS228 are deemed significant, this is stated in the Strategy, but it should be noted that minor variances may not be indicated to avoid proliferation of references.

2.2 The DMRB CS228 also includes reference to HD 36/15 which refers to surfacing materials to address skid resistance. Similarly, HD 36/15 may be referenced by Local Authorities as a guide when selecting treatments to address skid resistance.

The HD 36/15 document, as well as any newer version or equivalent if withdrawn, may also be considered by our engineers when deciding upon treatments and corresponding materials to address skid resistance. The engineer may also consider other, resurfacing information that complies with standards accredited nationally within the industry, such as DMRB CD 236 Surface Course Materials for Construction, updated December 2022, specifically Tables 3.3a and 3.3b within the Skid Resistance Standards section, which sets out advice on surfacing material characteristics necessary to deliver specific skid resistance properties.

3 Purpose of this Skid Resistance Strategy

3.1 This document sets out the Essex County Council's Skid Resistance Strategy concerning the management of skid resistance on the road network. It is specific to those parts of the road network which are subject to routine skid

resistance measurement (refer to ‘Section 4. The Road Network to which this Strategy Applies’ for more information).

3.2 The purpose of this Strategy is to inform and provide a level of skid resistance appropriate to the nature of the road environment at each location on the road network which is subject to routine skid resistance measurement.

3.3 The purpose of this Strategy is also to maintain a consistent approach to the provision of skid resistance across the part of the road network that is subject to routine, skid resistance measurement, so that road users find appropriate friction characteristics when accelerating, braking, and cornering.

3.4 This Strategy covers only the assets that are managed or maintained by Essex County Council. This Strategy is **not** applicable to footways and cycleways.

4. The Road Network to which this Strategy applies

4.1 Not all roads are routinely subject to skid resistance measurement. ECC’s road network hierarchies comprise Priority/Primary Route 1 (PR1) roads (the strategically most important roads, which are largely high-speed roads), PR2 Roads (which feed the PR1 Roads), and Local Roads (largely estate roads). Only the PR1 roads are subject to routine skid resistance measurement. The PR1 roads are comprised of Department for Trasport (DfT) A Class roads and B Class roads, but also include some C Class Roads and a small number of Unclassified Roads. The PR1 network has been defined as the network subject to routine skid resistance measurement, as it is the network which is regarded as of highest strategic importance. Please note, however, that the PR1 network is subject to review to maintain its relevance.

4.2 It is anticipated, through the specification of road surfacing materials and aggregates, that roads that are not subject to routine skid resistance measurement will have a skid resistance that is consistent with the risks associated with the site. However, routine analysis of injury collisions, such as studies into loss of control and other contributory factors, may highlight sites where the skid resistance of the road surface may warrant consideration for an investigation. Where these sites are not subject to routine skid

resistance measurement, they may be added on an ad hoc basis to the programmed routes for ‘ad hoc skid resistance measurement’ which is managed as an entirely separate matter. Requests for ad hoc skid resistance measurement must be submitted to the Asset Management Inbox: Asset.Management@essexhighways.org. These requests will be programmed for ad hoc skid resistance measurement in accordance with the number of ‘ad hoc skid resistance measurement sites’ purchased for the year in question. The number of sites may vary year on year according to the availability of Council funding.

5. The Skid Resistance Test Measurement Equipment Employed

5.1 Measurement of skid resistance requires specialist testing equipment. Skid Resistance on roads in Essex is measured using a Sideways-force Skid Resistance Survey Machine. This specialist survey is undertaken by a reputable survey contractor using survey vehicles which conform to standards approved within the industry.

6. The Skid Resistance Survey Method

6.1 Essex employs the Single, Annual Skid Survey (SASS) Method of skid resistance measurement, which uses measurements from the preceding three years to characterise the long-term skid resistance of the network, based upon a single annual survey. The Single Annual Skid Survey Method is described in the DMRB CS228.

6.2 The skid resistance of road surfaces can fluctuate within a year and between successive years, while maintaining a similar general level over a longer period. By smoothing these fluctuations caused by seasonal effects, through the application of a correction factor during data processing, sites exhibiting lower skid resistance can be identified more accurately.

6.3 The skid resistance survey and subsequent data processing, calculates the Characteristic Skid Coefficient (CSC). The CSC is an estimate of the underlying skid resistance once the effect of seasonal variation and between

year variation has been taken into account. The CSC value is taken to represent the state of skid resistance of the road surface for the sites subject to routine skid resistance measurement.

7. The Quality Assurance Procedures for Data Collection

7.1 Data quality assurance is provided by the survey contractor in the form of an accreditation certificate for the testing equipment employed, demonstrating compliance with the standards approved within the industry.

7.2 Prior to the survey, the survey contractor will be supplied with the routes (road network section lengths) which are to be subject to skid resistance measurement. The survey contractor will be asked to provide to ECC Essex Highways, accurate, tabular measurements of the route lengths for which the survey has been completed, including exception reports that detail routes for which the survey was not completed, together with the reason for non-completion.

7.3 Routes which are routinely subject to skid resistance measurement, which have had resurfacings carried out in the last three years, will **not** be removed from the calculation procedure for the correction factors. It has been estimated that the proportion of network affected would be significant (>=40%), and it has been decided by the engineer that excluding this proportion of the network would not be appropriate as the correction factor would otherwise fail to reflect the prevailing average measurements on much of the network. This means that road surfaces less than twelve months old may be subject to survey. These matters reflect departures from CS228.

7.4 The long-term value of skid resistance shall be used, with the mean network skid resistance in the current year, to calculate a correction factor which is applied to the current year's data to make current values consistent with the long-term average. The calculation of the correction factor is undertaken and applied by the survey contractor.

7.5 The survey contractor will provide processed, corrected skid resistance measurements (Characteristic Skid Coefficient) for the route lengths subject to routine, skid resistance measurement. The engineer will verify that the receipted data tallies with the route lengths provided to the survey contractor, and tallies with the accurate, tabular measurements provided by the survey contractor relating to the route lengths for which the survey has been completed.

7.6 The Essex PR1 network is regarded as a single locality and will not be sub divided into additional localities. This may be regarded as a departure from CS228.

7.7 The processed, corrected skid resistance measurements (Characteristic Skid Coefficient) provided by the survey contractor, will be loaded, and geospatially referenced, to an asset management system that complies with industry standards. The asset management system will be utilised to generate tabular and map-based information to identify section lengths that are at or below the investigatory level. The tabular data will be subject to the data checks referenced in 7.5 for purposes of data assurance and audit; i.e. the section lengths of CSC will be reconciled to the route lengths provided to the survey contractor, to the contractor's report relating to the sections for which survey was completed, and to the receipted CSC data. Any variances will be investigated fully, and the outcomes of the investigations will be recorded and held on file.

8. Frequency of Surveys

8.1 Surveys shall be undertaken annually, and planned such that in successive years each road section length that is subject to routine, skid resistance measurement, is tested in the early, middle, and late parts of the season of the network. This is in accordance with the requirements of the SASS method of survey. The early period is from 1st May to 27th June; the middle period is from 28th June to 24th August; the late period is from 25th August to 20th October.

9. Setting Levels of Skid Resistance – Investigatory Levels (ILs)

9.1 An investigatory level (IL) is an assigned level of skid resistance (standard of skid resistance) appropriate for the site in question. A ‘site’ may be viewed as a road section; i.e. junction to junction, or junction to roundabout, or section around a roundabout etc.

9.2 The provision of appropriate levels of skid resistance is treated primarily as an asset management issue rather than one of road safety engineering, although the collision risk is assessed in order to determine an appropriate level of skid resistance for each site.

9.3 With reference to skid resistance measurement, Investigatory Levels (ILs) represent a limit, above which the skid resistance is considered satisfactory, but at or below may indicate a requirement for an investigation of the skid resistance requirements (refer to ‘Section 12 The Investigation and Prioritisation Process’, for more information).

9.4 An Investigatory Level (IL) shall be defined for those parts of the road network which are subject to routine skid resistance measurement, by determining which Site Category is most appropriate to each location and then selecting an appropriate IL from within the range for that Site Category. Site categories are assigned based on broad features of the road type and geometry plus specific features of the individual site.

9.5 The current recommended ILs are detailed in Table 1.1 below. This information has been determined through a review process undertaken in 2022/23 by an appropriate specialist contractor. The specifications relating to the approach to be undertaken for the review process were agreed at a series of workshops attended by the specialist contractor staff who would be undertaking the review process, together with appropriate ECC Highways Asset Management and Road Safety staff. The approach to be undertaken referenced the requirements detailed in CS228, and the specifications agreed are held on file and are retained for purpose of audit. Note that Table 1.1 below may represent a departure from CS228 in some instances, where this was assessed during the review process as necessary for ILs to remain relevant for Essex roads.

Table 1.1 – Skid Resistance Site Categories and Investigatory Levels - ***unit of measurement = Characteristic Skid Coefficient Measurement Required (Standard of Skid Resistance Measurement Required) at 50km/h***

Site Category	Definition	Investigatory Level at 50km/h				
		0.35	0.40	0.45	0.50	0.55
B	Non-event Dual Carriageway	✔ D	✔			
C	Non-event Single Carriageway (including 1-way streets)		✔ D	✔		
K	Approaches to pedestrian crossings, traffic lights and other high-risk situations				✔ D	✔
Q	Approaches to and across minor and major junctions and approaches to Urban roundabouts			✔ D	✔	
Qr	Approaches to Rural (>=50mph) roundabouts				✔ D	
R	Roundabout			✔ D	✔	
G1	Gradient 5-10% longer than 50m			✔ D	✔	
G2	Gradient >10% longer than 50m				✔ D	✔
S1	Bend radius <500m – dual carriageway			✔ D	✔	
S2	Bend radius <500m – single carriageway				✔ D	✔

Table 1.1 – Site Categories

9.6 The recommended IL for the category in question varies depending on the characteristics of the site in question and the subsequent level of risk of a wet skidding incident occurring. The default setting is represented by the letter 'D' and is the IL which will be applied in the first instance for the Site Category in question, unless analysis of the risk assessment for a site leads to a decision by the engineer that a lower IL can be set or that a higher IL is required.

9.7 Sites with the same site category can have different levels of risk of a wet skidding incident occurring, therefore there is the flexibility to set different ILs for different sites within the same category, which allows sites where the risk of skidding is potentially higher to have a higher IL.

9.8 An IL higher or lower than those indicated may be assigned if justified by local risk assessment, or through assessment of results of any wider analysis undertaken by organisations using methods approved nationally within the industry.

9.9 Additional Site Categories and corresponding ILs may be added to Table 1.1 if the engineer believes this will have a positive outcome on the management of skid resistance on the road network.

9.10 Skid resistance management includes a risk assessment review process relating to the standard of skid resistance required at sites, therefore the ILs detailed in Table 1.1 may be subject to change.

9.11 Essex Skid Resistance Survey Results, are reported as the proportion of surveyed network which is, in summary:

- Sound (where skid resistance measurement 'X' is above the Investigatory Level set for the sites in question: 'X' > IL)
- At the Investigatory Level (where skid resistance measurement 'X' is equal to the Investigatory Level set for the sites in question: 'X' = IL)
- Below Investigatory Level (where skid resistance measurement 'X' is less than the Investigatory Level but not equal to or more than 0.2 below the investigatory level: 'X' < IL but 'X' is < 0.2 below IL for the sites in question)
- Significantly Below Investigatory Level (where skid resistance measurement 'X' is equal to or greater than 0.20 below the Investigatory Level set for the sites in question: 'X' is >= 0.2 below IL)

Note that annually the Council reports to the Department for Transport (DfT) in accordance with 'NI 130-03: Skidding resistance data for principal roads' (DfT A Class roads). The Council also reports to the DfT annually for Skidding resistance relating to Non-Principal Roads (DfT B Class, C Class and Unclassified Roads). In each case, the elements listed below are reported:

- The *single lane (slow lane) network length for the DfT road class in question.
- The *single lane (slow lane) network length surveyed for the DfT road class in question for the year in question.

- The *single lane (slow lane) network length for the DfT road class in question found to be at or below investigatory level (combines below investigatory level and significantly below investigatory level).

** For most roads, this will be the leftmost permanent lane*

10. Frequency of Review of Site Categories and Investigatory Levels (ILs)

10.1 All Investigatory Levels (ILs) will be reviewed on a risk-based priority, at a frequency not greater than once every 3 years, or at a reduced frequency if the Council deems this more practicable and affordable. This reflects a departure from CS228.

10.2 The review will have regard to giving priority to sites which have been subject to a level of change which is likely to increase the risk of a wet skidding collision occurring. Collision data where loss of control was a contributory cause will be of particular relevance, but prioritisation will include reference to all injury collisions as well as any other relevant information such as safety reports, police complaints, observations by officers, or damage to roadside furniture.

10.3 The review process will include verification that the Site Category is appropriate, although Site Category is generally less liable to change. Review of Site Categories and Investigatory Levels may be programmed over the chosen review period; there is not a requirement for all sites only to be reviewed within and by the end of the final year of the chosen period.

10.4 Investigatory Levels (ILs) will also be reviewed whenever a significant change to the network is made, for example the installation of traffic lights, a pedestrian crossing, or roundabout.

10.5 Investigatory Levels (ILs) will also be reviewed following the outcome of any ongoing, continued risk assessment process for identifying specific site risks within defined categories, identified during the review process referenced in 9.5 above.

10.6 The purpose of the review process is to verify that the Site Category and the IL are assigned appropriately in accordance with this Strategy. The outcome of the review may be no change, or a change to the Site Category or to the IL or change to both.

10.7 The review process may include reference to the Investigatory Levels applied on routes shared by neighbouring authorities, for example the A127, where this is deemed helpful for skid resistance management. There will not be a presumption, however, that Essex ILs for these shared routes will match those of neighbouring authorities.

11. Competence Levels of Staff Authorised to set or approve Investigatory Levels (ILs)

11.1 All activities and decisions relating to skid resistance management shall be carried out by personnel with suitable experience/training and/or qualifications.

11.2 Note that the term ‘qualifications’ is not defined in CS228 and will be assessed on a case-by-case basis. The assessment will be carried out by an engineer who has achieved an appropriate level of skid resistance proficiency. For example, XAIS Asset Management Ltd. combines the expertise of the Road Surface Treatment Association to provide a two-day training course to enable staff to gain a competency in skid resistance management and be able to demonstrate this competency to auditors. A pass certificate for attending this course is deemed adequate. Other examples of appropriate qualifications include, but are not limited to, Member of Society of Road Safety Auditors (*MSoRSA*) which includes an Annual Review and/or the National Highways Certificate of Competency in Road Safety Audit. Also included, but not limited to, are officers who meet criteria relating to ‘Audit Team Member’ / ‘Audit Team Leader’, as detailed in the ‘DMRB GG 119 Road Safety’ document, which details requirements for Road Safety Audit for highway schemes. Also included, but not limited to, are officers who meet criteria relating to ‘Highways Practice Note 039 Procedure for Road Safety Audit’ which is based on ‘DMRB GG119 Road Safety’ but is

tailored to Local Authority Roads and is subject to change to maintain relevance.

12. The Prioritisation and Investigation Process

12.1 The CSC value, calculated for the appropriate averaging length, shall be compared against the IL. Note that the appropriate averaging length is normally 100m or the length of a feature if it is shorter, where the length is continuous and within the same network section label, and where the Site Category and IL are the same. The exception to this is for roundabouts, where the averaging length is 10m.

12.2 Where skid resistance is measured at or below the IL on specific sites, these are initially investigated via a desk top study, with reference to collision data and any other relevant information. Other information may include road condition information, such as texture depth, rutting, and ride quality as well as structural and localised defects. It may also include road geometry and traffic count data. The engineer will determine from the initial investigation, if a second, more detailed investigation is required.

12.3 Investigation may also be required if there are significant changes to the site characteristics or environment, or in accordance with the review process described in ‘Section 10. Frequency of Review of Site Categories and Investigatory Levels (ILs)’ above, or if concerns arise via safety reports, police complaints, observations by officers, or damage to roadside furniture. In each case, the engineer will determine if a detailed site investigation is required. This may be regarded as a departure from CS228.

12.4 The prioritisation process may include reference to texture depth data, as low texture depth will influence the manner in which water drains from the road surface, and accumulations of surface water will increase the risk of a wet skidding incident occurring. The engineer will determine the level at which texture depth will be regarded as ‘low’ relative to the surface material of the site in question and the methodology employed in the assessment of the texture depth. ECC currently employs SCANNER road condition assessment, which measures texture depth. However, the DfT is working with service providers with a view to extending the range of permitted road condition

assessment methodologies, therefore the use of SCANNER to measure texture depth may change in the future.

12.5 Detailed investigations include a visit to the site to record specific information to assist with risk evaluation and the identification of any subsequent risk mitigation. These are planned on a risk-based priority, so that greater priority is given to completing investigations for sites that are substantially below the IL or where the injury collision history indicates that there is a higher risk of wet skidding collisions occurring, although all injury collisions may be taken into account.

12.6 The prioritisation process relating to analysis of collision data may include analysis of 'cluster sites'. An example of 'cluster collision analysis' is shown below, but criteria is subject to review and subsequent change to ensure it remains relevant, therefore the example below is merely indicative and not absolute.

1. *On all roads (20, 30, 40, 50 and National Speed Limit), Casualty Reduction Sites (CRS) will be selected on the basis of 3 or more personal injury collisions within a 250m radius, with a minimum of one fatal or serious injury collision within the last 3 full calendar years.

   This reduces emphasis on injury collisions where there have only been only slight injuries (i.e., injuries of a minor character such as sprains, bruises, shock, or cuts which are not severe or do not require medical treatment).
   Additional analysis will identify if there is an identifiable pattern of the cause of the incidents and if there is an engineering solution for treating the identified cause. Contributory factors to collisions such as wet skidding or loss of control, are also investigated to assess the relevance regarding skid resistance.

*This approach supports 'Vision Zero', which is the aspiration that there should be no deaths or serious injuries on the roads by 2040. Vision Zero is the ethical position that deaths and serious injuries are not an acceptable consequence of human error on public roads.

12.7 The prioritisation criteria include a risk score process, whereby sites where more injury collisions occur are awarded a higher score. The severity of the injury collision also has relevance, with higher scores being awarded based on severity. However, the process may include additional filtering and scoring criteria to highlight high risk sites. Those sites of highest collective scores are regarded as highest risk of a wet skidding injury collision occurring and therefore of highest priority for detailed investigation. The risk score process is subject to review, to ensure that it remains relevant, therefore detail is not provided here as it is subject to change.

12.8 The detailed investigation process will include the collation and assessment of the information available for each site, in order to reach a decision about the best course of action. This process will be decided by the engineer but will include a visit to the site to undertake detailed assessment. All detailed investigations and site visits must be led by a suitably competent officer. Officer safety is paramount, however, so if the site visit risk assessment for the site in question concludes that a site visit is unsafe, a site visit will not be undertaken, in which case a decision as to the best course of action for the site will be made based on all alternative, available information.

12.9 The results of the detailed investigation will determine whether a surface treatment is justified to reduce the risk of vehicles experiencing a wet skidding incident, whether some other form of action or remedial measure is required or whether no action is currently required. Where it is deemed that treatment is required then sites will be added to the capital forward works programme.

12.10 Where the number of sites requiring detailed investigation exceeds availability of funding and other resources, 20 of the highest priority sites (twenty) will be subject to detailed investigation annually, unless the Council deems a smaller number more practicable and affordable. This is a departure from CS228.

12.11 Greater priority shall be given to completing detailed investigations for sites that are substantially below the IL or where the injury collision history indicates that there is a higher risk of wet skidding collisions occurring. Those sites notified through concerns via safety reports, police complaints, observations by officers, or damage to roadside furniture, will be included in the prioritisation process to identify the sites of highest priority.

12.12 This investigation and prioritisation process details a departure from CS228 which advocates a ‘crash model’ to assist with identifying sites for detailed investigation and potential wet skidding risk mitigation measures. The ‘crash model’ is deemed by the specialist contractor who was employed to undertake the review process (refer to 9.5) as not suitable for local authority roads.

13 Intervention Criteria

13.1 It is important to note that this Strategy is an ‘investigatory Strategy’ not an ‘intervention Strategy’; i.e. where skid resistance of the road surface is suspected as a potential issue it will be investigated, but there will be no presumption that this will result in surface treatment or any other form of action or remedial measure.

14 How Remedial Works Will be Prioritised

14.1 Sites identified for remedial treatment will be added to the forward capital works programme on a risk-based priority. The capital works programme to address skid resistance is funded separately from the capital works programme to address road condition improvement, as it has been observed that sites to address road condition do not always coincide with sites where there are requirements to address skid resistance.

14.2 The availability of funding to address skid resistance, and the availability of funding to address road condition, will be reviewed annually. The remedial works for skid resistance may be subject to an economic assessment of the costs and benefits before proceeding, to promote the best use of maintenance budgets within the context of the Asset Management Framework.

15 Early Life Skid Resistance

15.1 The relevant National Application Annex to CS228 does not make specific reference to early life skid resistance. However, there has been a view held for some while within the industry that some new asphalt surfaces when laid do not immediately provide the level of skid resistance associated with the treatment. For some years it has been known that new asphalt surfaces have different skid resistance properties to surfaces that have been in service for some time. This is believed to be due to the presence of a film of bitumen binder on the new surface that is eventually removed by weathering and traffic.

15.2 With reference to the publication 'Early life skid resistance - an assessment of accident risk', published in 2008 by Authors M. J. Greene and L. Caudwell, available from the Transport for Research Laboratory (TRL) website. Also with reference to Early life skid resistance - an assessment of accident risk (2003-2006) by authors F Coyle and M J Greene, published in 2018.
The information from the anecdotal report suggests that early life skid resistance issues are not widespread either on the HA (Highways Agency) or other UK Highway Authority Networks. However, it would appear that it could be a contributory factor in a small proportion of accidents, that occur mainly on bends.

15.3 In view of this, this Strategy advises that while there will **not** be a presumption that 'Slippery Road' warning signs be erected for all new, asphalt road surfaces laid to address skid resistance issues, it will be decided on a case-by-case basis by the engineer in question, having regard to assessment of the level of risk posed by the site and the new surfacing material laid. However, the reason for the decision will be documented and held on file (refer to 'Appendix A: The Documentation to be retained to enable implementation of the Strategy to be demonstrated, 23.18' for more information).

16 Slippery Warning Signs

16.1 'Slippery Road' warning signs are intended for use where the danger of vehicles skidding is greater than normal. They indicate a need for special caution by road users. In this case, the reason for the sign will be because

the skid resistance is below the required standard of skid resistance; the implication being that this could result in an increased risk of a wet skidding incident occurring. The engineer will not make a decision regarding the potential placement of ‘slippery road’ warning signs for every site that is below the IL. However, during the investigation and prioritisation process, the engineer will review the information available, in particular the collision data and other relevant information such as safety reports, police complaints, observations by officers, or damage to roadside furniture, to consider if placement of ‘slippery road’ warning signs at sites of higher risk is a necessary requirement. The engineer’s decision will be made on a case-by-case basis. This is a departure from CS228.

16.2 Where treatment of road network sites for skid resistance has been agreed, following observance of the processes within this Strategy, consideration will be given to each site in question by the engineer to erecting ‘slippery road’ warning signs prior to works being carried out. However, this will be decided on a case-by-case basis by the engineer with regard to the level of risk posed by the site in question. There will **not** be a presumption that ‘slippery road’ warning signs will be erected at all sites where treatment has been agreed. This is a departure from CS228.

16.3 Where slippery road warning signs are placed on the network, the position of placement will be checked to ensure that it accurately reflects the position identified by the engineer. In certain circumstances it may be necessary to amend the location, either because the original location was in error or due to a revised location identified by the engineer due to a change in risk assessment.

16.4 A schedule relating to Slippery Road warning signs will be maintained, which will include the site of placement, the identity of the engineer who made the decision to place the sign, the reason for the decision, and the date the sign was placed, together with the next review date.

16.5 Slippery Road warning signs will be removed when no longer required. This will be after the remedial action has been undertaken and the engineer is satisfied that skidding resistance levels have been returned to an appropriate level. In some cases, this will not be immediately after treatment if the engineer has concerns for early life skid resistance of newly laid asphalt

surfaces (refer to ‘Section 15 Early Life Skid Resistance’ for more information).

16.6 The slippery road warning sign shall conform to the specifications detailed in CS228 and any subsequent amendments; i.e. currently, (Diagram 557) in conjunction with an appropriate supplementary plate (Diagram 570) must be used in accordance with the SI 2016/362 [Ref 5.N] and Chapter 4 of the Traffic Signs Manual TSM Chapter 4 [Ref 6.N].

17 Equestrians

17.1 There have been reports that equestrian users can experience difficulty on some road surfaces due to the lack of grip between the road surface and the metal horseshoe. Additional treatments can be applied to mitigate the risk of horses slipping on new surfaces. This will be taken into account by the engineer when deciding upon road resurfacing treatments and material, having regard for the local riding community and the level of risk posed by the site, but there will **not** be a presumption that all routes on the road network which are used by horse riders will be subject to additional treatments. This may be regarded a departure from CS228.

17.2 All reports by equestrians concerning slippery road issues will be investigated fully as per 17.1 above, and the outcome of the investigations will be held on file.

18 High Friction Surfacing (HFS)

18.1 On some site locations on the road network, especially for high priority routes, there may be a requirement for a relatively high standard of skid resistance. For example, approaches to traffic signal junctions or crossings. For these sites, consideration may need to be given to the application of HFS material if more conventional materials are believed not to provide the level of skid resistance required for the site in question. Where high friction surfacing is required, the choice of material and treatment to be applied will be at the discretion of the engineer for the site in question.

18.2 Where HFS material is applied, the length of road to which it is applied will nominally be 50 metres (fifty metres), although where queuing is deemed to increase the risk of a wet skidding incident occurring, the length may be increased at the discretion of the engineer. It is also acknowledged that some approach lengths may be less than fifty metres in length due simply to the length of the road in question, in which case the nominal length cannot be applied. However, for roads with speed limits of above 50mph, the engineer will consider extending the length of HFS.

19 Temporary Road Surfaces

19.1 Where it is necessary to run traffic over a temporary road surface, the skid resistance of the road surface ultimately may be less than desired, but the engineer for the site may employ a number of measures to address this risk, some of which are listed below:

- The use of ‘temporary road surface’ signs
- The use of ‘slippery road’ warning signs
- The use of speed limits

19.2 The implementation of any of the measures above will be recorded and held on file (refer to ‘Appendix A: The Documentation to be retained to enable implementation of the Strategy to be demonstrated, 23.18’ for more information).

20 New Construction

20.1 Any changes to the road network such as additions to the network or ‘stopping up’ (reductions) of the network, shall be reflected in the geospatially referenced asset register for roads. For newly constructed roads that are to be included in the routine skid resistance measurement, a Site Category and Investigatory Level will be determined and applied. Where ‘stopping up’ significantly changes the road environment such that it has implications for risk of a wet skidding incident occurring, for routes which are included in the routine, skid resistance measurement, the Site Category and Investigatory

Level will be reviewed. Similarly, a review will be undertaken where construction works significantly alter the road environment. For example, where safety audits identify new junction bell mouths that do not include any improvements to the 'existing network in proximity'.

21 Chamber Tops and Gully Tops for Road Drainage and Services

21.1 Chamber tops and gully tops (gully grates) for drainage and services can sometimes become worn or polished and present a concern for skid resistance. It is also possible that white lines, road studs and other road surface assets can present similar concerns. In these cases, this Strategy advocates that risk assessment and priority of response for these assets will follow the latest version of Essex Highways 'Maintenance & Inspections Strategy, Carriageways, Footways and Cycleways' which is published on the Essex Highways website. These matters will also be investigated when safety audits for newly designed schemes are undertaken.

22 The A130 (A12 – A127) Design, Build, Finance and Operate (DBFO) Contract

22.1 This Strategy document covers only the assets that are managed or maintained by ECC. Responsibilities for the maintenance of all highway assets in Essex is delivered by the following organisations:

- Essex County Council
- Department for Transport (DfT) – National Highways (A12, A120, M11, M25)
- CountyRoute (A130, between A12 & A127) on behalf of ECC.
- The unitary authorities of Southend and Thurrock
- Private roads (various owners such as housing associations, housing developments and residents.)

22.2 The standards and inspection regime for the A130 (A12 – A127) are included in the DBFO contract that was awarded to CountyRoute in 1999. This part of the Essex network, however, will be included in the Site Category and

Investigatory Level review process (refer to ‘Section 10 Frequency of Review of Site Categories and Investigatory Levels (ILs)’ for more information).

Appendix A: The Documentation to be retained to enable implementation of the Strategy to be demonstrated.

23.1 Each record to be retained, referenced below, will be held in a secure system with access limited only to those who have right of access. The time period will be year on year; i.e. ongoing maintenance of records for purpose of audit. In the case of decisions, it will also include the identity of the engineer(s) making the decision, together with the date the decision is made and the reason for the decision. It will also include any review date where applicable.

23.2 Staff skid resistance competency evidence; i.e. copies of qualifications, course training pass certificates, course attendance certificates, and any other related documentation or files which show attendance of events for purpose of formal information sharing and learning.

23.3 The network to which this Strategy applies, geospatially referenced to a mapping source, including the Site Category and Investigatory Level identified for each site.

23.4 The gradient and bend radii data for the network referenced in 23.3, to assist with identification and review of Site Categories and Investigatory Levels.

23.5 The outcome of reviews to Site Categories and Investigatory Levels. This will include the identification and implementation of a Site Category and Investigatory Level relating to newly constructed road, which is to be included in routine, skid resistance measurement. Similarly, it will include sites where construction works alter the road environment such that it is suspected it will result in an increase in risk of a wet skidding incident occurring. It will also include the outcome of any investigations into the skid resistance management of the DBFO contract with CountyRoute relating to the A130 (refer to ‘Section 22 The A130 (A12 – A127) Design, Build, Finance and Operate (DBFO) Contract’ for more information).

23.6 The routes subject to routine, annual skid resistance measurement, geospatially referenced to a mapping source, provided to the survey contractor prior to survey. This will include the relevant survey time period commensurate with the Early, Mid, Late cycle dictated by the Single Annual Skid Survey approach.

23.7 The test equipment accreditation certificate(s), where applicable, to ensure compliance with industry standards.

23.8 The survey contractor reports relating to the routes where skid resistance survey measurement has been completed, including any exception reports relating to routes which were not completed together with the reason.

23.9 The outcome of the engineer's investigations into the exception reports referenced in 23.8, together with any subsequent amendments to the routes, to include the identity of the engineer implementing the change together with the date of change and reason for the change.

23.10 The processed, appropriately corrected skid resistance measurement 'Characteristic Skid Coefficient' (CSC) data provided by the survey contractor.

23.11 The processed and appropriately corrected skid resistance measurement (CSC) data provided by the survey contractor, loaded to an asset management system, geospatially referenced to a mapping source.

23.12 Map based and tabular reports of the skid resistance measurements generated by the asset management system to which the data was loaded, specifically to compile a list of sites that are at or below the investigatory level, for purpose of fulfilling the annual DfT data request NI130-03 for sites at or below the investigatory level, and to identify sites for purpose of investigation and prioritisation to identify sites requiring a detailed investigation.

23.13 A tabular reconciliation of the skid resistance route lengths provided to the survey contractor (23.6) with the survey contractor reports (23.8), with the CSC data provided by the survey contractor (23.10), with the CSC data loaded to the asset management system (23.11), and with the reports generated by the asset management system to which the CSC data was loaded (23.12), for purpose of data assurance and audit.

23.14 Relevant accreditation certificates for the asset management system referenced in 23.11.

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23.15 The outcomes of the investigation and prioritisation process which highlight sites for a site investigation, together with a record of the data employed, such as injury collisions, and other relevant information such as safety reports, police complaints, observations by officers, or damage to roadside furniture.

23.16 The information collected from site investigations.

23.17 The outcome of the site investigations, such as what measures are to be undertaken if any and the reasons why, including what treatments if any are to be applied and whether slippery road warning signs need to be erected and if not required the reason why not required.

23.18 The date ‘slippery warning’ sign(s) were placed on site. This will include any ‘slippery road’ warning signs implemented during the use of temporary road surfaces. It will also include the recording of any other measures implemented during the use of temporary road surfaces, together with the date implemented (refer to ‘Section 19 Temporary Road Surfaces’ for more information).

23.19 With reference to 23.18, the outcome of a review of the placement of the ‘slippery warning ‘sign(s), to ensure it has been placed in the correct location. This will include any amendments to the location.

23.20 A record of what measures to mitigate skid resistance at a site are undertaken and the date undertaken. In the case of any resurfacing treatment, this will include the engineer’s decision with regard to early life skid resistance. It will also include any additional treatments to assist equestrians.

23.21 A record of any requests from Equestrians to address skid resistance, together with the outcome of the request, including any additional treatments or other measures subsequently applied.

23.22 A record of the removal of any slippery warning signs post treatments, together with an annual review of other slippery warning signs.

Appendix B: Timetable and Responsible Role for Delivery of each part of the Strategy – please see below for Timetable parts 1 and 2 of 2.

Timetable for Delivery of the Strategy & Responsible Role, Part 1 of 2

Strategy Reference	Date Range	Activity Description	Delivery Date	Responsible Post	Comments
23.2	Non specific	Maintain staff skid resistance competency evidence; i.e. copies of qualifications, course training pass certificates and the like.	Ongoing	Asset Management Senior Engineer/Asset Strategy & Policy Manager	Information will be held on file and will also be added to staff competency matrix
23.3	Non specific	Maintain records of the network to which this Strategy applies, geospatially referenced to a mapping source, including the Site Category and Investigatory Level identified for each site.	Ongoing	Asset Management Asset Systems Specialist	The network, Site Category and Investigatory Levels are subject to review, and therefore are subject to change.
23.4	Non specific	Maintain the gradient and bend radii data for the network to which routine skid resistance measurement is applied, to assist with identification and review of Site Categories and Investigatory Levels.	When data available via road condition surveys	Asset Management Asset Systems Specialist	Historically this has been available via SCANNER road condition surveys, but source could change in the future
23.5	Non specific	Implement Activity and Maintain records relating to the outcome of reviews to Site Categories and Investigatory Levels. This will include the identification and implementation of a Site Category and Investigatory Level relating to newly constructed road network which is to be included in routine, skid resistance measurement. Similarly, it will include sites where new construction works alter the road environment such that it is suspected it will result in an increase in a wet skidding incident occurring. It will also include the outcome of any investigations into the skid resistance management of the DBFO contract with CountyRoute relating to the A130 (refer to 'Section 22 The A130 (A12 – A127) Design, Build, Finance and Operate (DBFO) Contract' for more information).	All Site Categories and Investigatory Levels will be reviewed at a frequency not greater than once every three years, or at reduced frequency if the Council deems this more practicable and affordable. There will also be ad hoc site reviews following newly constructed road network or significant changes to the road environment	Asset Management Senior Engineer/Asset Management Asset Systems Specialist/Asset Strategy & Policy Manager	Could occur throughout the year.
23.6	Refer to comments	Identify and Maintain the routes subject to routine, annual skid resistance measurement, and provide to the survey contractor prior to survey, geospatially referenced to a mapping source. This will include the relevant survey time period commensurate with the Early, Mid, Late cycle dictated by the Single Annual Skid Survey approach.	Refer to comments	Asset Management Asset Systems Specialist	Surveys shall be planned such that in successive years each road length is tested in the early, middle, and late parts of the season of the network. The early period is from 1st May to 27th June; the middle period is from 28th June to 24th August; the late period is from 25th August to 20th October.
23.7	Non specific	Maintain records relating to the test equipment accreditation certificate(s), where applicable, to ensure compliance with industry standards.	Annually, prior to survey	Asset Management Asset Systems Specialist	To be requested from the survey contractor
23.8	Non specific	Implement Activity and Maintain records relating to the survey contractor reports relating to the routes where skid resistance survey measurement has been completed, including any exception reports relating to routes which were not completed together with the reasons for non completion.	In accordance with the survey period (Early, Mid, Late)	Asset Management Asset Systems Specialist	To be requested from the survey contractor
23.9	Non specific	Implement Activity and Maintain records relating to the outcome of the engineer's investigations into the survey contractors exception reports, together with any subsequent amendments to the routes	Annually, prior to survey	Asset Management Asset Systems Specialist	None
23.10	Annually	Implement Activity and Maintain records relating to the processed, appropriately corrected skid resistance measurement (CSC) data provided by the survey contractor, geospatially referenced to a mapping source.	November/December depending on survey cycle period	Asset Management Asset Systems Specialist	To be requested from the survey contractor.

Timetable for Delivery of the Strategy & Responsible Role, Part 2 of 2

Strategy Reference	Date Range	Activity Description	Delivery Date	Responsible Pos	Comments
23.11	Annually	Implement Activity and maintain records relating to the loading of the processed, appropriately corrected skid resistance measurement (CSC) data provided by the survey contractor, to an asset management system, geospatially referenced to a mapping source.	November/December depending on survey cycle period	Asset Management Asset Systems Specialist	Asset management system must comply with industry standards
23.12	Annually	Implement Activity and Maintain records relating to the map based and tabular reports of the skid resistance measurements generated by the asset management system to which the CSC data has been loaded, specifically to compile a list of sites that are at or below the investigatory level, for purpose of fulfilling the annual DfT data request NI130-03, and to identify sites for purpose of investigation and prioritisation.	November/December depending on survey cycle period	Asset Management Senior Engineer/Asset Management Asset Systems Specialist	The DfT data request is routinely in September/October.
23.13	Annually	Implement Activity and Maintain records relating to a tabular reconciliation of the skid resistance route lengths provided to the survey contractor (23.6) with the survey contractor reports (23.8), with the CSC data provided by the survey contractor (23.10), with the CSC data loaded to the asset management system (23.11), and with the reports generated by the asset management system to which the data was loaded (23.12), for purpose of audit.	November/December depending on survey cycle period	Asset Management Senior Engineer/Asset Management Asset Systems Specialist	To comply with ECC internal audit procedures
23.14	Non specific	Maintain a record of relevant accreditation certificates for the asset management system referenced in 23.11 to ensure compliance with industry standards.	Annually	Asset Management Asset Systems Specialist	United Kingdom Pavement Management System (UKPMS) accreditation certificate to be requested from system provider.
23.15	Annually	Implement Activity and Maintain records relating to the outcomes of the investigations and prioritisation process which highlight sites for a site investigation, together with a record of the data employed, such as collisions statistics, and other reports.	January to February	Asset Management Senior Engineer/Team Leader Road Safety Engineering	None
23.16	Annually	Implement Activity and Maintain records relating to the information collected from site investigations.	January to March	Asset Management Senior Engineer/Asset Management Asset Systems Specialist/Asset Schemes Validation Engineer	Team Leader Road Safety Engineering may request a competent colleague to be included in the site visits
23.17	Annually	Implement Activity and Maintain records relating to the outcome of the site investigations, such as what measures are to be undertaken if any and the reasons why, including what treatments if any are to be applied and whether slippery road warning signs need to be erected and if not required the reason why not required.	January to March	Asset Management Senior Engineer/Asset Management Asset Systems Specialist/Asset Schemes Validation Engineer	Team Leader Road Safety Engineering may request a competent colleague to be included in the decision making
23.18	Non specific	Implement Activity and Maintain schedule relating to the date slippery warning sign(s) were placed on site. This will include any 'slippery road' warning signs implemented during the use of temporary road surfaces. It will also include the recording of any other measures implemented during the use of temporary road surfaces, together with the date implemented (refer to 'Section 19 Temporary Road Surfaces' for more information).	Ongoing	Asset Strategy & Policy Manager	None
23.19	Non specific	Implement Activity and Maintain records relating to the review of the placement of the slippery warning sign(s), to ensure sign(s) are placed in the correct location.	Following the placement of a slippery road warning sign	Asset Strategy & Policy Manager	None
23.20	Non specific	Implement Activity and Maintain a record of what measures to mitigate skid resistance at a site have been undertaken and the date undertaken. In the case of any resurfacing treatment, this will include the engineer's decision with regard to early life skid resistance. It will also include any additional treatments to assist equestrians.	Ongoing	Asset Strategy & Policy Manager	None
23.21	Non specific	Implement Activity and Maintain a record of any requests from Equestrians to address skid resistance, together with the outcome of the request, including any additional treatments or other measures subsequently applied.	Ongoing, ad hoc in nature	Asset Strategy & Policy Manager	None
23.22	Non specific	Implement Activity and Maintain a record of the removal of any slippery warning signs post treatments, together with the annual review of other slippery warning signs.	Annually, or following completion of measures to improve skid resistance where a slippery road sign has been erected	Asset Strategy & Policy Manager	None

Note: the role responsible may devolve task to a competent colleague

Appendix C Glossary of Terms

Terms used within this Strategy document are defined in the Glossary below.

CS228: The Skid Resistance standards published in the Design Manual for Roads and Bridges (DMRB), which describes the requirements for the provision and management of appropriate levels of skid resistance on UK motorway and all-purpose trunk roads.

CSC: Characteristic Skid Coefficient (CSC).

Desk Top Study: a study involving analysis of data only, not including a visit to site.

DfT: central government Department for Transport

DMRB: Design Manual for Roads and Bridges. The DMRB details design, construction and maintenance standards which apply to motorways and trunk roads. These standards apply to roads managed by National Highways, not roads maintained by Local Authorities.

DMRB CD 236 Surface Course Materials for Construction: advice on surfacing material characteristics necessary to deliver specific skid resistance properties.

HD 36/15: Refers to surfacing materials to address skid resistance.

NI 130-03: National Indicator which is reported by the Council to the Department for Transport (DfT) annually; it relates to the skidding resistance data for roads

Investigatory Level: the level of skid resistance required for the site, above which the skid resistance is adequate but at or below which an investigation of the skid resistance is required.

PR1: the PR1 road network is the Council's highest priority road network (these carry a large volume of high-speed traffic through and around Essex).

PR2: the PR2 roads feed the PR1 roads.

Local Roads: generally estate roads.

Seasonal variation: The variation in the skid resistance measured during the course

of the year due to weathering and polishing cycles.

Site Category: one of the levels within a broad classification of the road network according to the risk of a wet skidding incident occurring.

Skid resistance: the contribution of the road surface to the overall friction available between the tyre and the road surface is known as skid resistance.

Survey contractor: the contractor appointed to provide skid resistance survey measurements

"Well-managed Highway Infrastructure: A Code of Practice", published October 2016 (including updates published in 2017). The Code is designed to promote the adoption of an integrated asset management approach to highway infrastructure based on the establishment of local levels of service through risk-based assessment. It also includes guidance on some additional topics.