

# Technical Direction

for Road Safety Practitioners

POLICY - GUIDELINES - ADVICE



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April 2004  
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## Management of skid resistance data using SCRIM

### RSL&VM and RNI – Technical procedure

#### Background

Skid resistance testing of road pavements is a multi-disciplinary process requiring involvement from Core Directorate staff as well as Regional Road Safety and Asset Management teams.

The delivery of a skid resistance testing program for road pavements requires a well coordinated and consistent approach to ensure optimisation of resources allocated for subsequent maintenance and road safety remedial works programs.

#### General

Attached is a copy of the new RSL&VM and RNI Technical Procedure for the *Management of Skid Resistance Data*.

This Procedure outlines the roles and responsibilities of Core Directorate and Regional staff in the successful delivery of the annual skid resistance testing program using the Sideways-force Coefficient Routine Investigation Machine (SCRIM). It also outlines a timeframe for delivery of the program as well as a methodology for prioritising maintenance and road safety remedial works programs with respects to skid resistance.

#### Action

This policy is to take effect immediately

Approved for use by:

(signed)

Sue Sinclair  
Director  
Road Safety, Licensing and Vehicle Management

(signed)

Mike Hannon  
Director  
Road Network Infrastructure

For:

- Director Road Network Infrastructure
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# Management of skid resistance data using SCRIM

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## RSL&VM and RNI – Technical procedure

Issue 1

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This is an attachment to Technical Direction TD2004/RS05 -

"Management of skid resistance data using SCRIM - RSL&VM and RNI Technical procedure".

## About this release

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Title: Management of skid resistance data using SCRIM

Approval and Authorisation		
Approved by:	Signature	Date
Sue Sinclair Director, Road Safety, Licensing & Vehicle Management	(signed)	22 December 2003
Mike Hannon Director, Road Network Infrastructure	(signed)	8 April 2004

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# Contents

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Purpose ..... 4

Scope..... 4

Definitions..... 4

Overview..... 5

Procedure ..... 6

References..... 6

Appendix A    Procedure description ..... 9

Appendix B    Subprocedures.....13

# Purpose

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This procedure is based on currently available information and experience in NSW where SCRIM systems are used for monitoring the wet sideways force skid resistance of sealed road pavement networks. It has been developed to ensure that skid resistance data is:

- Collected, processed and analysed in an appropriate, consistent and timely manner;
- Pro-actively applied to determine the inclusion, of sections of road in formal programs of maintenance / remedial work within the constraints of available budgets; and
- Available to verify such programs immediately prior to, or early in their implementation.

# Scope

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The collection, processing, analysis and use of skid resistance data within the RTA relies upon the co-operation of, and liaison between, several business units:

- The Road Safety, Licensing and Vehicle Management (RSL&VM) Directorate, which funds the annual testing program, analyses crash data, and may contribute funding for remedial works;
- The Road Network Infrastructure (RNI) Directorate, which funds and delivers routine road pavement maintenance programs;
- The Client Services Directorate (CSD), which is responsible for undertaking analysis and remedial work on behalf of its corporate clients. This includes both road safety and asset management regional staff; and
- The SCRIM service provider. At the time of issue of this Technical Procedure, the provider is the Asset Support Services Branch of CSD.

# Definitions

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BTN	Blackspot Testing Network.
CTN	Core Testing Network.
Guide	Joint RTA / VicRoads document: Guidelines For The Measurement and Interpretation of Skid Resistance Using SCRIM (1995).
IL	Investigatory Level. This is the level of skid resistance at or below which a site investigation is to be undertaken.
Road section	A length of road or site identified for testing.
SCRIM	Sideways-force Coefficient Routine Investigation Machine.
SCRIM PM	The SCRIM program manager within RSL&VM.
SFC	Sideways Force Coefficient (used as a measure of skid resistance).
STN	Secondary Testing Network.
Treatment	In the context of this Technical Procedure, <i>treatment</i> is regarded as any remedial action that results in an improvement to the skid resistance provided by road pavement.
Warning Signs	Diagrammatic and other signage (refer to Australian Standard AS1742).
Wet surface crash	A crash event that occurred when the road surface was wet.

# Overview

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This section provides an overview of the collection and use of skid resistance data by the RTA.

The annual SCRIM testing network comprises road sections within one of three categories:

- Core Test Network (CTN) which consists of the most heavily trafficked and strategic road sections in the State;
- Secondary Testing Network (STN) which primarily comprises the remaining part of the State road network not covered by the CTN. It is tested on a cyclical basis as determined by RSL&VM. The STN may also include submissions from regional asset management and road safety officers within the CSD; and
- Blackspot Testing Network (BTN) which is of two types:
  - Road sections where RSL&VM officers and regional road safety officers determine investigation to be necessary; and
  - Post-crash investigation sites that arise throughout the year. RSL&VM officers and regional road safety officers identify the post-crash investigation sites that need testing.

All SCRIM testing is conducted in accordance with RTA Test Method T189. The BTN is tested more intensively than the CTN and STN.

Testing is only routinely undertaken in one lane of a carriageway in both the prescribed and counter directions. Within the survey program the lane will have been specified usually on the basis of its carrying the majority of commercial traffic. The specified lane will differ in urban and rural areas. If testing is carried out as a part of a Crash Investigation (i.e. BTN sites), all travel lanes should be tested.

Testing is typically undertaken in the period November to March inclusive each year.

The processing of 'raw' SCRIM data for road sections on the CTN and STN is typically completed by the end of April each year.

Additional data—for example, crash statistics and other pavement condition data such as rutting, cracking and texture data is then analysed with the processed SCRIM data. Subprocedures are then applied, as necessary, to determine whether a road section requires remedial action.

The monitoring of road sections receiving remedial action is undertaken to determine the effectiveness of the action at a location.

## Procedure

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The flowchart in Figure 1 illustrates the processes and responsibilities in the management of skid resistance. The flow chart must be viewed along with:

- Appendix A of this document which provides a written account of requirements and guidance for the development of the annual SCRIM testing network; the undertaking of testing; the processing of test results; and the display and use of SCRIM data with other road network data; and
- Appendix B of this document which provides a written account of the requirements and guidance for the use of the processed data and the undertaking of site investigations.

## References

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RTA, VicRoads (1995) *Guidelines For The Measurement And Interpretation Of Skid Resistance Using SCRIM*

Austrroads (2003) *Guide To The Selection Of Pavement Surfacing*, Austrroads.

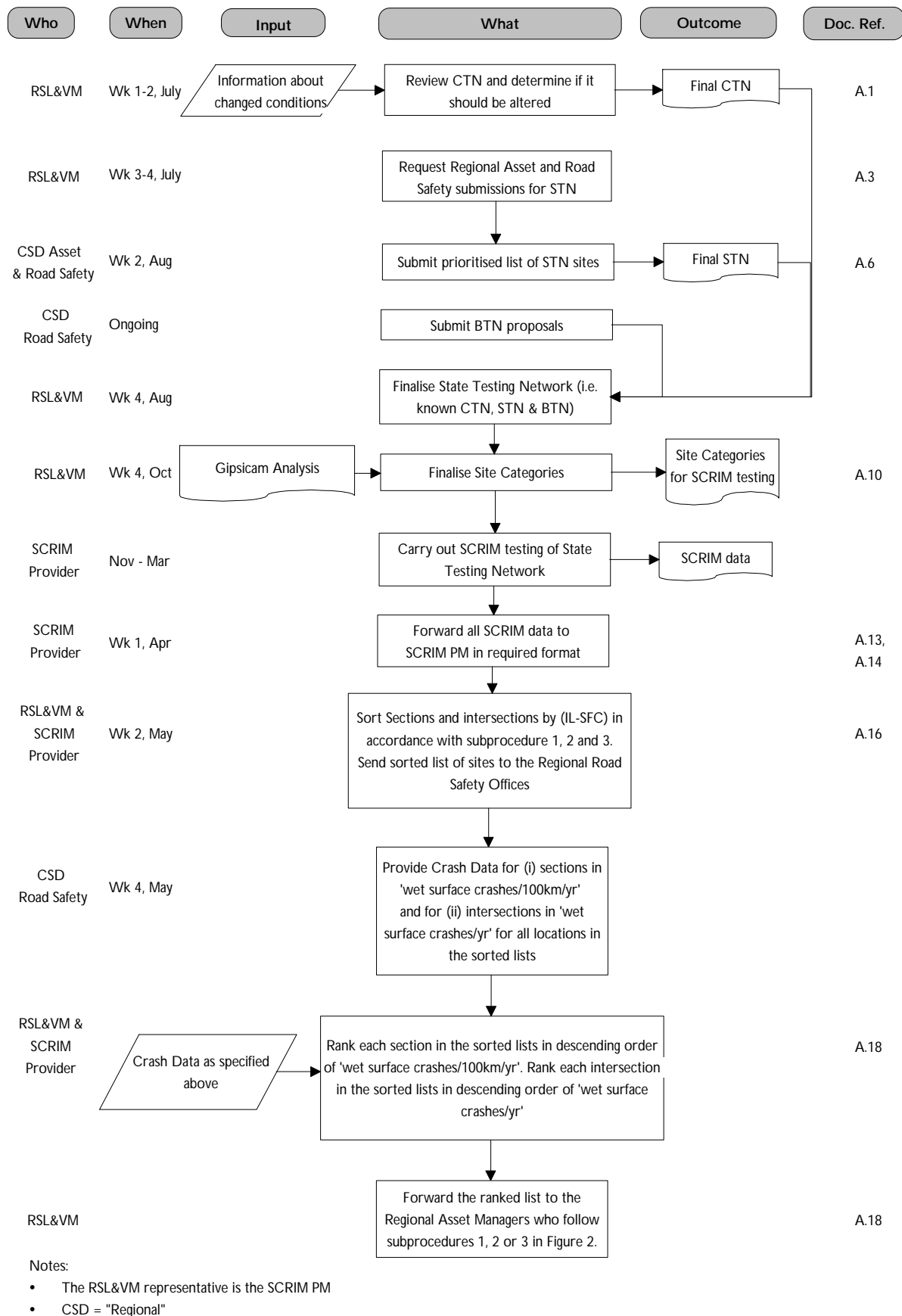
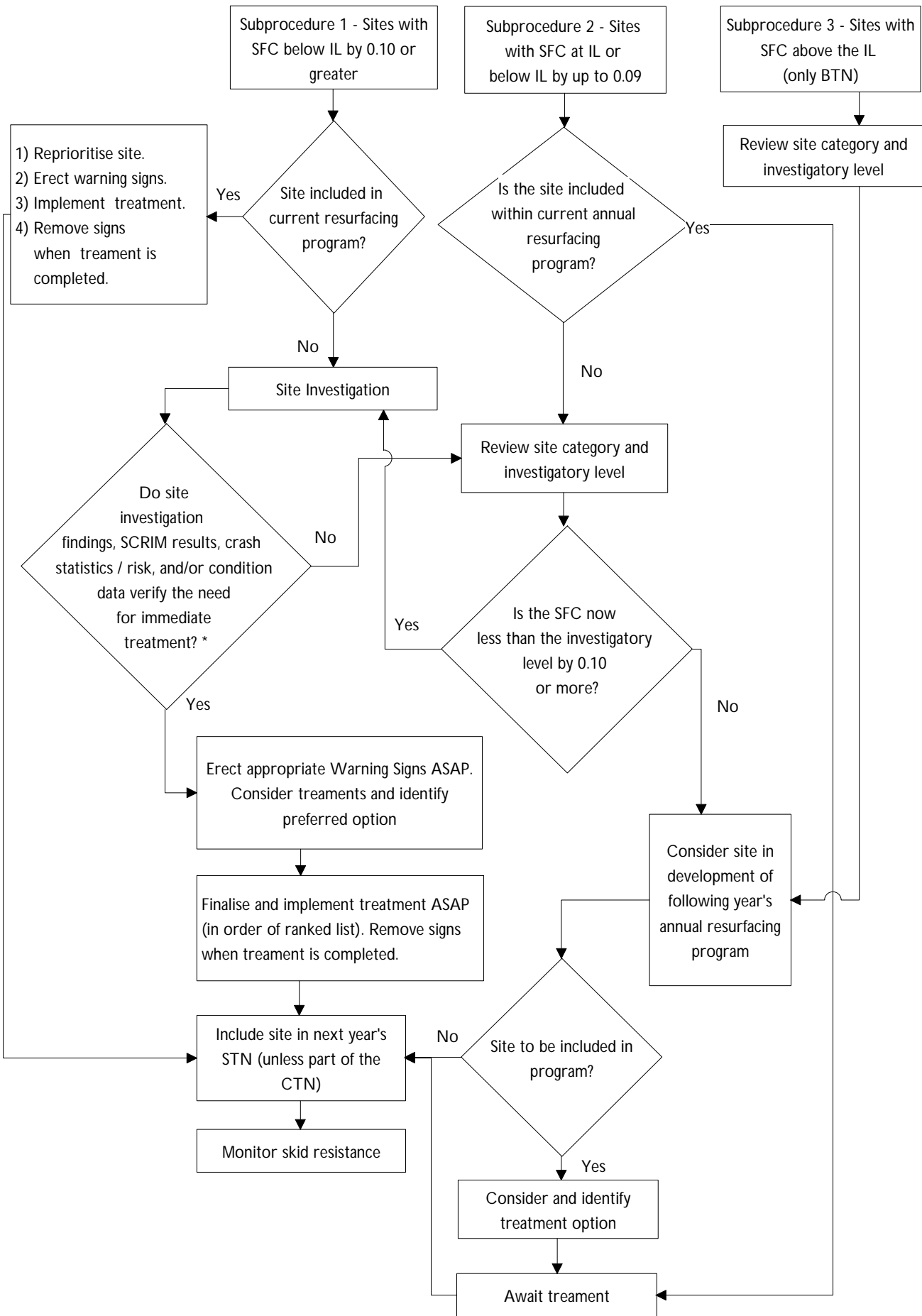


Figure 1: Management of Skid Resistance Process



\* Crash data and site investigation may suggest other treatments Eg cleaning pavement

Figure 2: Subprocedures 1, 2 & 3 for Treatment and Continual Monitoring of Sites

## Appendix A Procedure description

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### Collation and notification of the Annual State Testing Network

- A.1. At the start of July each year, the SCRIM Program Manager shall determine road sections making up the CTN by applying the current RSL&VM CTN inclusion criteria. The criteria are currently based on traffic volume in vehicles per lane per day.
- A.2. Regardless of whether the RSL&VM CTN criteria has remained the same from the previous year's testing, the SCRIM Program Manager shall review the CTN annually to take account of new road sections and other changes such as the introduction of by-passes and so forth.
- A.3. In late July of each year, the SCRIM Program Manager shall seek submissions from the regional asset management and road safety officers for road sections to be included in the annual STN.
- A.4. Requirements and guidance for regional asset management and road safety officers in the identification and proposal of road sections for inclusion in the annual STN is provided in *Annex A1—Development of the STN* of Appendix A.
- A.5. The regional STN submission to the SCRIM Program Manager shall take the form of a prioritised list of the road sections being recommended for testing. The start and finish points, and length of the section proposed are to be clearly indicated along with the reason for its recommendation.
- A.6. The regional asset management and road safety officers shall ensure that their submissions are received by the SCRIM Program Manager by the end of the second full week in August each year. It is the responsibility of the SCRIM Program Manager to ensure that a submission has been received from each of the RTA's regions.
- A.7. The SCRIM Program Manager shall then assess the submissions received and develop a list of road sections to be included in a statewide STN. Guidance for the SCRIM Program Manager on developing the state STN is provided in *Annex A1—Development of the STN* of Appendix A.
- A.8. The SCRIM Program Manager shall ensure that any road sections included in both the CTN and STN are identified to ensure that these are only included in the CTN. Any road sections or intersections identified under the BTN in advance of the collation of the State Testing Network can also be considered for inclusion in that network, so ensuring efficiency of test routing.
- A.9. The SCRIM Program Manager shall ensure that the annual State Testing Network is finalised by the end of August each year and disseminate the network to be tested in an appropriate format to RNI, regional road safety officers, regional asset management officers, and to the SCRIM service provider.

### Assigning site categories

- A.10. The SCRIM Program Manager shall ensure that appropriate site categories are assigned to road sections and intersections in accordance with the Guide, and shall forward this information to the SCRIM service provider by the end of October. This enables the SCRIM service provider to assign appropriate investigatory levels (ILs) and enables the site categories assigned to be verified during testing.

### Testing

- A.11. It is the responsibility of the SCRIM service provider to program and undertake the testing requested by the SCRIM Program Manager in accordance with *RTA Test Method T189*.

## Processing, analysis and presentation of data

- A.12. The SCRIM service provider is responsible for processing the raw SCRIM data collected and the identification and listing of those road sections and intersections where the sideways force coefficient (SFC) obtained is at, or below, the investigatory level set. The SCRIM service provider is also responsible for ensuring that the processed data set has the appropriate GIS referencing and Roadloc details for the start and end of the surveyed section to enable subsequent spatial mapping of the data.
- A.13. The SCRIM service provider shall release the processed SCRIM data in tabular / spreadsheet format containing the following information:
- Test date;
  - Road number;
  - Road name;
  - Link number;
  - GIS coordinates and Roadloc reference;
  - Test direction;
  - Left and right wheelpath SCRIM results;
  - Investigatory level for location;
  - Threshold level for location;
  - Difference between SCRIM results obtained and investigatory level;
  - The 'differential', historical SCRIM results for that section; and
  - Available texture measurements.
- A.14. The SCRIM service provider shall forward to the SCRIM Program Manager without delay, the list of road sections from the CTN and STN, and associated data, where the SFC obtained is equal to or less than the investigatory level set. SFC's for all BTN sites should also be submitted.
- A.15. It is the responsibility of the SCRIM Program Manager to sort the road sections in the list received into the following groups in accordance with Subprocedures 1, 2 and 3:
- (i) Sections/sites where  $IL - SFC \geq 0.10$
  - (ii) Sections/sites where  $0 \leq IL - SFC < 0.10$  and
  - (iii) Sections/sites where  $IL - SFC < 0$  (Note: only BTN sites can be included in this group).
- A.16. The SCRIM Program Manager shall work with the SCRIM service provider to ensure that the sorted lists and associated information can be forwarded to RSL&VM and regional road safety analysts by the end of the second full week in May each year.
- A.17. Upon receipt of the above data, the regional road safety analysts shall obtain *wet surface* crash data for the road sections and intersections within their region appearing in the three sorted lists in accordance with the requirements and guidance provided in *Annex A2—Preparation and Use of Crash Data* of Appendix A. This crash data shall be provided to the SCRIM Program Manager in an appropriate format by the end of May.
- A.18. The SCRIM Program Manager shall then ensure that the *wet surface* crash data is displayed alongside the SCRIM data for road sections and intersections on the list. Each sorted list should then be ranked in descending order of 'wet surface crashes per 100km per year'. As soon as the list has been re-ranked, the SCRIM Program Manager shall forward it to the regional asset management officers.

A.19. An example of the output table has been provided below:

Road Sections										
Sub-group: <i>(please indicate)</i> (i) IL - SFC => 0.10, (ii) 0 < IL - SFC < 0.10, (iii) IL - SFC > 0.10 (BTN only)										
Rank	Region	Route	Start pt*	End pt*	Start coord (x,y)		End coord (x,y)		IL - SFC	Wet Surface Crashes/100km/yr**
					X	Y	X	Y		
1										
2										
3										

Intersections							
Sub-group: <i>(please indicate)</i> (i) IL - SFC => 0.10, (ii) 0 < IL - SFC < 0.10, (iii) IL - SFC > 0.10 (BTN only)							
Rank	Region	Major Road	Minor Road	Coord of intersection (x,y)		IL - SFC	Wet Surface Crashes/yr***
				X	Y		
1							
2							
3							

\* Start and end points would be in Roadloc coordinates.

\*\* This column would be ranked in descending order

\*\*\* Includes all wet surface crashes that occurred at the intersection and within 50m of each approach.

## Annex A.1 – Development of the STN

One of the objectives of the RTA management of skid resistance is to ensure that the most strategic and heavily trafficked road sections in the state are tested for skid resistance at a frequency commensurate with their importance. To this end, the CTN will represent the most substantial component of the annual RTA SCRIM testing program.

However, a facility has been provided allowing regional asset management officers to propose, on an annual basis, a 'limited' number of road sections which fall outside of the CTN to receive SCRIM testing.

The total coverage of the statewide STN will vary from year to year, based on available resources. This means that it is possible that the SCRIM Program Manager will not be able to accommodate all road sections proposed for testing by the regional offices. Therefore, it is essential that each region clearly defines and prioritises their proposal.

The identification of road sections for inclusion in a regional STN is to be based on local network knowledge and sound engineering judgement, as supplemented by the guidance issued below. Any reasons for including road sections in the STN should be documented. It is recommended that in the formulation of a regional STN, regional asset management officers liaise with the regional road safety officers. This has not been made a mandatory requirement as the latter do have a significant input into the SCRIM testing network through the BTN.

Road sections in a regional STN should be related to a specific identified need—that is, the STN is not a blanket testing tool to cover long lengths of road outside of the CTN. The following points are provided as guidance for regional asset management officers when developing a proposed regional STN. This will also be used by the SCRIM Program Manager when finalising the STN component of the annual state testing network.

Consideration should be given to road sections:

- Assessed to have a particularly 'difficult' alignment or gradient, where there is a known or perceived 'above average' level of risk presented to the network user;
- Surfaced with an aggregate type that is exhibiting 'significant' unexplained levels of polishing across the region;
- Where the age of surfacing has exceeded the 'local' nominal resurfacing cycle and where the surfacing is exhibiting significant polishing, bleeding or flushing;
- Where new material types or specification have been adopted and data is required to assess the early-life or whole-life performance of the material.

As stated above, the reasons for including sites in the STN should be documented.

## Annex A.2 – Preparation and Use of Crash Data

The following parameters shall be used to re-rank the sorted lists as described above:

Road Sections	Wet Surface Crashes per 100km per year
Intersections	Wet Surface Crashes per year (using all wet surface crashes that occurred at the intersection and within 50m of each approach)

Verified *wet surface* crash data from the latest available three-year time period for urban areas and five-year time period for rural areas shall be used. However, where it is known that remedial action had been undertaken with respects to pavement skid resistance within this period, then the start date of the crash dataset should be after the completion date of the project. Some examples of remedial action may include pavement reseals or an upgrade in the type of pavement.

The site investigation may identify factors other than pavement skid resistance that may have been contributing to the wet weather crash rate. If such external factors are found then the problem should be referred to the relevant business units of the RTA or Council for further investigation. For example, a large percentage of wet surface crashes may have occurred on a section of road during roadworks and justifiably attributed to the poor traffic control associated with the roadworks. Such cases should be removed from the ranked list and referred to the relevant business unit involved.

Only reported crashes shall be considered. It is recommended within this technical procedure that any knowledge of unreported damage-only crashes and evidence of near misses be used to supplement local and engineering knowledge of a location during the investigation of the road section or intersection.

**Note:** *Where there is any doubt at all as to whether to exclude a crash from analysis or not, the crash shall be included in the analysis.*

Completion of the tables shown above in point A.19 is recommended prior to any site investigation:

## Appendix B Subprocedures

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### The assessment of data

- B1. The final output provided by the SCRIM Program Manager shall be examined and utilised by regional asset management officers without unreasonable delay.
- B2. Three following subprocedures for using data have been developed for regional asset management officers, and regional road safety officers where required and stated. The subprocedures enable the officers to determine road sections and intersections that require priority or programmed remedial treatment and / or signage;
- Subprocedure 1 shall be followed for road sections on the CTN, STN and BTN where the SFC obtained is below the investigatory level by 0.10 or greater; and
  - Subprocedure 2 shall be followed for road sections on the CTN, STN and BTN where SFC obtained is at the investigatory level, or below the investigatory level by up to 0.09; and
  - Subprocedure 3 is exclusive to the BTN and shall only be used where the SFC obtained is above the investigatory level set.
- B3. Further information on Subprocedures 1, 2 and 3 is contained within *Annex B1, B2 and B3—Subprocedures 1, 2 and 3* of Appendix B.
- B4. The SCRIM Program Manager is responsible for addressing the requirements of Subprocedures 1, 2 and 3 for road sections and intersections to be included in the following year's testing program within the STN.

### Post-Crash Investigation Sites

- B5. Where the testing of a post-crash investigation site is requested, the SCRIM Program Manager shall liaise with the SCRIM service provider with respect to the scheduling and undertaking of the testing. It is the responsibility of the SCRIM service provider to ensure that raw SCRIM data obtained is processed as expediently as possible and forwarded to the SCRIM Program Manager, who shall in turn ensure that the processed data is forwarded to the relevant regional asset management officer without delay.

### Annex B.1 Subprocedure 1

- B6. For road sections which fall within their region, regional asset management officers shall determine if the section is included in the current resurfacing program, either over its full length or in part, ensuring the implementation of the following requirements;
- B7. If the full length of the road section or intersection is included in the current resurfacing program and the identified treatment has yet to be implemented, the priority assigned to the treatment must be reviewed taking due account of any deterioration in skid resistance value in the period since the last testing at the location. The erection of Warning Signs shall be arranged as soon as possible with regional road safety officers. The signs shall be retained until the treatment has been completed. Following the treatment, the road section or intersection must be included in the following year's testing network, ie. if the section or intersection is not already part of the CTN, it must be included in the following year's submission for the regional STN. This allows the effectiveness of the treatment to be monitored. Where the full length of a road section is not included in the current resurfacing program, the remaining length shall be assessed according to element B8 below;
- B8. If the road section or intersection is not included in the current resurfacing program, a formal investigation of the location shall be conducted immediately to determine the need for immediate remedial treatment and/or other action. The investigations shall be lead by the regional asset management officer, who may also request the presence and input of a regional road safety officer. Background information and procedural requirements of field investigations are documented **at the end of this Annex**;
- B9. If the investigation of the road section or intersection concludes that no immediate remedial treatment or action is required, then the Site Category and investigatory level set for the road section shall be reviewed, and element B11(ii) onwards of **Subprocedure 2** followed;

- B10. If the investigation determines that immediate remedial treatment and/or other action is required, the erection of Warning Signs shall be arranged as soon as possible with regional road safety officers, whilst the range of remedial options is considered and an option selected and procured as a matter of immediate priority. Signs shall be retained until the remedial option has been completed. The road section or intersection shall be included in the following year's testing network, ie. if the section or intersection is not already part of the CTN, it must be included in the following year's submission for the regional STN. This allows the effectiveness of the treatment to be monitored.

## Annex B.2—Subprocedure 2

- B11. For the identified road sections and intersections which fall within their region, regional asset management officers shall determine if the location is included in the current resurfacing program either over its full length or in part, ensuring the implementation of the following requirements:
- i. If the road section or intersection is included in full in the current resurfacing program, treatment is to be awaited and the only further action required is to ensure that the section is included in the following year's SCRIM testing network, ie. if the location is not part of the CTN, it must be included in the submission for the following year's regional STN. This enables the effectiveness of the treatment to be monitored. Where the full length of a road section is not included in the current resurfacing program, the remaining length shall be assessed according to the bullet point below.
  - ii. If the road section or intersection is not included in the current resurfacing program, then the Site Category and investigative level should be reviewed. If the Site Category and associated investigative level was found to be incorrect to the extent that the SFC is now less than the IL by 0.10 or more (which meets criteria for inclusion in Subprocedure 1) then a site investigation should be carried out and element B8 onwards of **Subprocedure 1** should be followed. If the review of Site Category and investigatory level confirms that the SFC does not meet the criteria for inclusion in Subprocedure 1, then it shall be considered for inclusion in the following year's resurfacing program.
- B12. Regardless of whether the road section or intersection is ultimately included within the following year's resurfacing program, it shall be included within the following year's SCRIM testing network, ie. if the section/intersection is not part of the CTN, it must be included in the submission for the following year's regional STN.

## Annex B.3—Subprocedure 3 (BTN only)

- B13. Where the SFC obtained for the road section or intersection is above the investigatory level for the site category assigned, the SCRIM Program Manager shall then review the site category and investigatory level for the section/intersection. The section/intersection shall also be included in the following year's SCRIM testing network, ie. if the site is not part of the CTN, it must be added to that region's submission for the following year's regional STN.

## Undertaking Field Investigations

The objective of investigating the section or intersection is to determine whether the condition of the road pavement is likely to be contributing to the occurrence of wet surface crashes, and if so, whether the rate of crashes can be reduced by improving skid resistance and/or improving the location in other ways.

As stated above, the investigations should be lead by the regional asset management officers. Regional road safety staff should also be involved where specialist road safety input is required and for investigations of locations identified through the BTN.

Field investigations required under this procedure shall involve a physical visit to the road section or intersection, and the officers undertaking the investigation are to be supplied with road section condition and crash data that was collated prior to leaving the office. A proforma is currently being developed to assist with undertaking site investigations and to facilitate record keeping regardless of whether any resultant action is planned. The aim is to supplement hard data on a site with local network knowledge and professional engineering judgement.

The field investigation shall commence with a review of the SCRIM test results and a review of the site category and investigatory level set for the road section/intersection. Any reasons why the results obtained are not representative of the location should be determined. Also, the appropriateness of the site category and investigatory level should be confirmed.

In general terms, the field investigation will typically lead to one of two outcomes:

- Implementation of cost-effective treatment, ie. where the wet surface crash data for the location indicates a problem and the skid resistance is low and / or continuing to fall; or
- Continuation of the monitoring of the road section/intersection with adjustment to the site category and investigatory level, if deemed appropriate. For example, where the skid resistance is below the investigatory level but the crash data does not indicate a problem at the location and the road section is generally in good maintenance condition.

The following information, wherever it is available, shall be collated prior to visiting a site and then considered whilst at the site:

- Detailed site maps of an appropriate scale showing all the intersections, accesses, crossings, curves and so forth, and where possible, geometric data such as gradients and curve radii;
- Results from previous SCRIM tests. These results are needed to determine the trend in the skid resistance of the road section or intersection. For example, if the skid resistance of the surfacing has reached its equilibrium, is likely to fall further, or for whatever reason has increased;
- Condition data. For example, rutting, cracking and texture data: Locations with low skid resistance and low texture shall be recognised as a particular hazard and may require immediate remedial action. The *Austrroads Guide To The Selection Of Pavement Surfacing* includes indicative investigatory levels (ILLs) for texture of:
  - 0.4mm for freeways and other high class free flowing roads;
  - 0.6mm for highways with a speed limit > 80 km/h and other main roads with a speed limit < 80km/h; and
  - 0.4mm for local sealed roads.

These ILLs must be considered as a guide when viewing the available surface texture at a site.

- Information relating to historical and recent maintenance and improvement activities undertaken at the location, such as resurfacing, patching, drainage provision;
- Crash data and an appropriately scaled map showing the location and type of crashes at the road section/intersection being investigated;
- Any information relating to, or that may demonstrate repeated collisions with street furniture, roadside vegetation and features on adjacent private property;
- Any available traffic flow and traffic speed data;
- Details of any road safety audits or studies conducted at the location in the last 5 years.

Additional factors to be considered include:

- The extent of the road section giving an SFC below investigatory level;
- The Differential Friction Level (DFL), which is the difference between skid resistance values (SFCs) obtained in the left and right wheeltracks. The Guide recommends that the following criteria be used to identify locations requiring further investigation with respects to DFL: (i)  $DFL \geq 0.10$ , where speed limit > 60km/h and (ii)  $DFL \geq 0.20$  where speed limit  $\leq 60$ km/h.
- Whether the road section being investigated is considered a 'difficult' site, ie. whether the use of the nominal RTA site categories and investigatory levels are appropriate, or whether the characteristics and features of the location render it 'difficult', characteristics and features to consider include:
  - Road geometry—carriageway width, alignment, camber / crossfall, superelevation;
  - Traffic flow—number of vehicles, composition, traffic speed, incidences of queuing, seasonal implications, use by vulnerable user groups;
  - The likelihood and nature of vehicular conflict; and
  - The provision of signage at the location.

- Visual evidence of unknown / unreported loss of control crashes at the location, eg. vehicle marks on the road surface, tyre marks on grassed areas adjacent to the highway, vehicle debris, street furniture debris, and damaged / missing trees and vegetation.
- The range of possible remedial options and the advantages and disadvantages of each option.

If the road section being investigated is an approach to an intersection, then the remaining approaches shall also be considered.

The use of photographic and/or video equipment during field investigations is recommended. General 'shots' of the location – showing layout, signage provision and so forth – or close-up 'shots' of specific issues identified, taken at the time of the investigation have been found to be a valuable future resource. Where images are taken, they shall be appropriately archived. The use of appropriate markers of date and chainage shall be used wherever possible when collecting such information.



Further information:



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