



NWSRG WINTER SERVICE GUIDANCE AND FUTURE RESEARCH

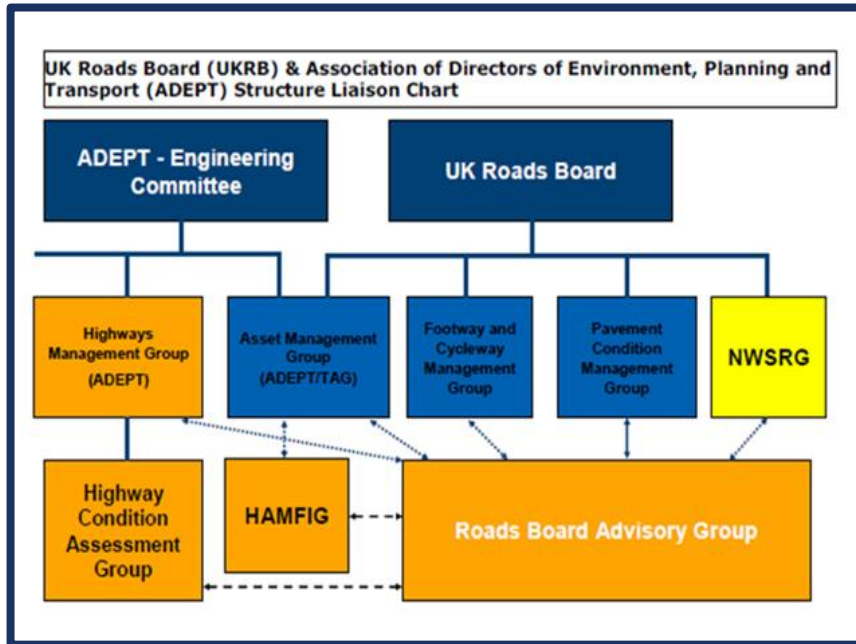
APSE WINTER CONFERENCE 2018

CAROL VALENTINE
NWSRG VICE CHAIR

NWSRG

NATIONAL WINTER SERVICE RESEARCH GROUP

THE NATIONAL WINTER SERVICE RESEARCH GROUP



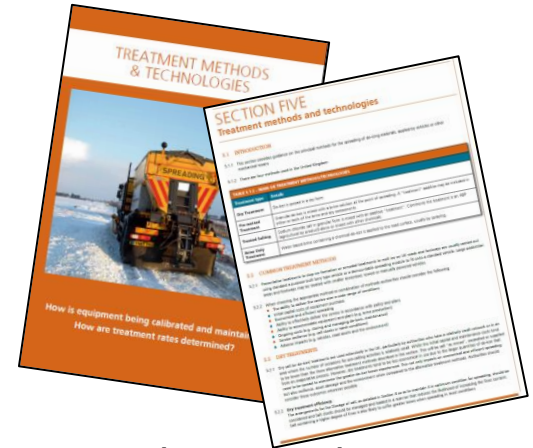
- Membership based organisation
- Funded by members - local and national highway authorities
- Supported by the Winter Service Industry
- Steering Group reports to UK Roads Board

Undergoing transformation ...

- New alliances: Met Office and IHE
- Seeking alternative funding arrangement
- Seeking to accelerate work progress in challenging circumstances
- New ambitions

PLANNED NEW GUIDANCE

- Continuing to use existing sections
- Completely rewritten in different style
- Shorter main text avoiding repetition
- Appendix containing additional supporting science background
- Professionally published with assistance from IHE
- Feedback from Appendix H has been considered and some tolerances increased where possible
- Simplified where possible in core text, but greater versatility given in appendix
- Key underlying science has not changed



STATUS OF REDRAFT

Section	Existing	New format
Treatment methods and Technologies	Published	For SG final approval
Salt Storage	Published	For SG final approval
Spreader Calibration	Published	For SG final approval
Treatments for extreme cold	Published	Text being finalised
Treatments for snow and ice	Published	Draft with members
De-icer types		Draft with members
Foreword and using the guide	Published	To be re-drafted
Salting spread rates	Published	Early draft of revised version
Planning		With working group
Treatment of Footways and Cycleways	Drafted	Being re-drafted with WG
Weather Forecasting and RWIS		Early draft from Met Office
Route Selection and Optimisation		With working group

Using the Guide



NWSRG Practical Guide for Winter Services
Using the Guide 2023/24

NWSRG

NWSRG
NATIONAL WINTER SERVICE RESEARCH GROUP

ROAD MAP TO IMPROVED RESILIENCE

I Risk-based determination of network to be treated

2

Consider your treatment method:

Dry
Treated
Pre-wet
Brine

3

Manage salt moisture content

Covered salt storage

4

Calibrate spreaders to fine increments

Good performance at 1 gsm increments

5

Determine lowest spread rates

Min RST
Wetness
Traffic
Wind

6

Improve decision-making granularity

Whole Domain
Route

TREATMENT METHODS – MATERIAL COMPOSITION

2
 Consider your
 treatment
 method:

 Dry
 Treated
 Pre-wet
 Brine



Dry
 100%
 rock
 salt

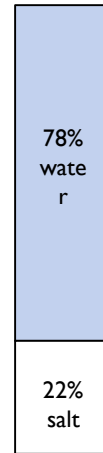


Treated
 97%
 rock salt



Pre-wet
 77%
 salt

30%
 Brine



Brine
 22%
 salt



TREATMENT METHODS – FACTORS TO CONSIDER



The ability to deliver the service over a wide range of conditions



Initial capital costs of equipment purchase



Economical and efficient spreading



Ability to effectively deliver the service in accordance with policy and plans



Ability to accommodate equipment and plant (e.g. brine production)



Ongoing costs (e.g. storing and managing de-icers, maintenance)



Service resilience (e.g. salt stocks in harsh conditions)



Adverse impacts (e.g. vehicles, road assets and the environment)

TREATMENT METHODS – PERFORMANCE COMPARISON

2

Consider your treatment method:

Dry
Treated
Pre-wet
Brine

Table 5.8.1 –Relative technology strengths and weaknesses for precautionary treatments

Condition	Dry	Treated	Pre-wet	DLA
Marginal Temperatures - RST close to 0°C	A	A	A	G
Dry Roads– RST to -7°C	A	G	G	G
Damp Roads – RST to -7°C	A	G	G	G
Wet Roads – RST to -7°C	G	G	A	N to A ¹ & 2
Extreme Cold – RST below -7°C (but above -15°C)	A	A	A to G ¹	N to G ¹
Very light traffic after spreading – RST to -7°C	A	A to G ²	A to G ²	G
High Wind Gusting over 20mph when spreading	A	G	G	A to G ³
High Wind Gusting over 20mph after spreading	A	G	G	G
Hoar Frost and Freezing Fog	G	G	G	G
De-bonding Layer Before Snow	A	G	G	G

G Good performance recommended

A Appropriate

N Not

SALT STORAGE

3
Manage salt moisture content

Covered salt storage

- Can only achieve lower spread rates by managing moisture content
- Tunnelling occurs over 4.5%
- Monitor moisture content
- Excessive change may require recalibration of spreader
- Avoid uncovered open salt stocks
- Moisture range now extended in some situations
- No lower limit for treated or pre-wet



UK rock salt, Marine Salt and imported rock salt (fines under 7.5%)	Dry salting	1.5 to 4%
UK rock salt, Marine Salt and imported rock salt (fines over 7.5%)	Dry salting	2 to 4%
UK rock salt	Pre-wetted	Less than 4%*
UK rock salt	Treated	Less than 4%*

SPREADER MANAGEMENT

4

Calibrate
spreaders to
fine
increments

Good
performance at
1 gsm
increments

- Spreaders must be calibrated to ensure that they are spreading correctly
- Must measure output of salt and brine
- Must visually assess spread pattern
- Must calibrate to salt used
- Must monitor throughout season and recalibrate if necessary
- Result: GOOD FAIR
- Aim for 1 gsm increments to gain maximum benefit

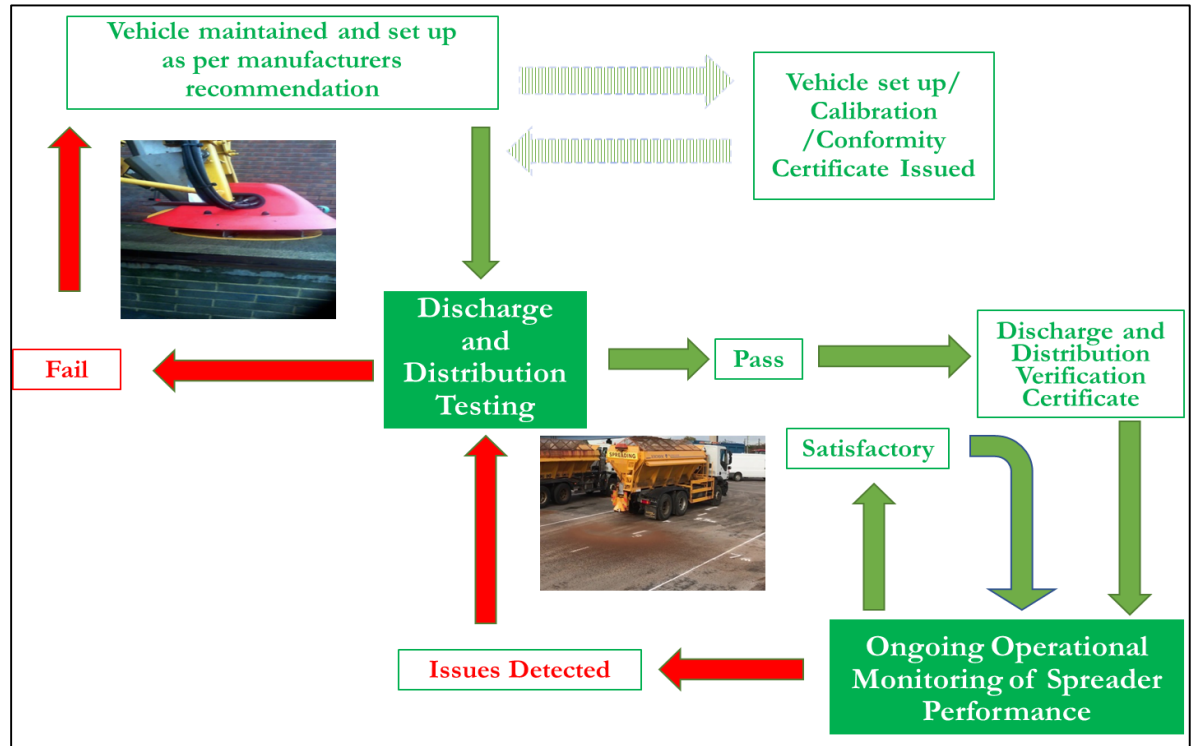


POOR spreaders can use over 50% more salt than GOOD spreaders

SPREADER MANAGEMENT

4
Calibrate
spreaders to
fine
increments

Good
performance at
1 gsm
increments



SPREAD RATES

5
 Determine
 lowest
 spread rates

Min RST
 Wetness
 Traffic
 Wind

- Science shows that very little salt is actually needed to mitigate ice - a gem that will be in the updated guidance!
- Higher spread rates are required to account for losses in the spreading process
- Less losses occur with treated, pre-wet and brine spreading

Amount of salt required on road surface and in solution to prevent ice forming (not the spread rate, as this is higher to account for losses)

Road Surface Temperature (°C)	Road Surface Wetness at Forecast Event	
	Damp	Wet
To -1.0	1g/m ²	2g/m ²
To -2.0	2g/m ²	4g/m ²
To -5.0	5g/m ²	10g/m ²
To -7.0	7g/m ²	13g/m ²
To -10.0	9g/m ²	18g/m ²

SPREAD RATES – REVISED EXAMPLE FOR DRY SALTING

5
 Determine
 lowest
 spread rates

Min RST
 Wetness
 Traffic
 Wind

Recommended Spread Rates – Dry Salting (g/m ²)				
Road Surface Temperature (RST) when frost/ice is predicted	Spreader Capability			
	Fair		Good	
	Dry/Damp Road	Wet Road	Dry/Damp Road	Wet Road
At or above -1.0°C	8	8	8	8
-1.1°C to -2.0°C	8	11	8	8
-2.1°C to -3.0°C	9	17	8	13
-3.1°C to -4.0°C	12	23	9	17
-4.1°C to -5.0°C	14	28	11	21
-5.1°C to -7.0°C	20	39	15	30
-7.1°C to -10.0°C	27	54	20	40
-10.1°C to -15.0°C	38	75	28	56

- **Traffic Flow** : Tables assume Medium Traffic Normal Loss : Medium Traffic High Loss add 20% : ‘Little/No’ Traffic add 25% : High Traffic, use Trunk Road rates
- **High Winds** : prudent to increase rates when mean speed 20mph+

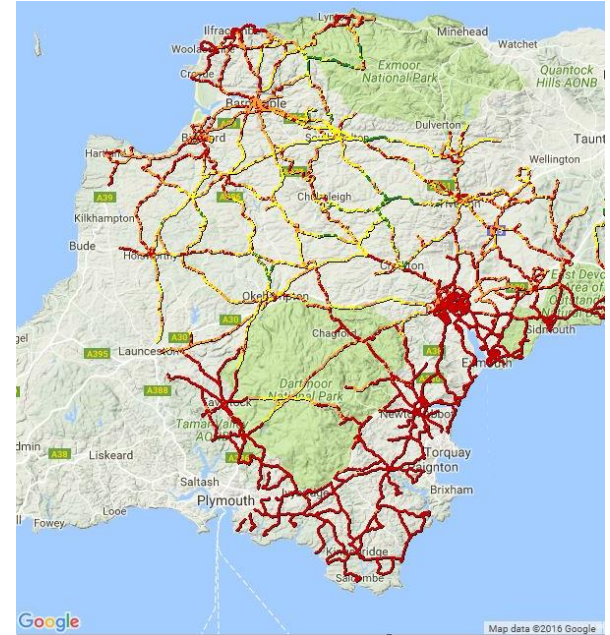
DECISION-MAKING & WEATHER FORECASTING

5

Improve
decision-
making
granularity

Whole
Domain
Route

- Weather will vary across an authority area depending on topography, coast etc
- Decision making by climatic domain will often reduce treatments
- Decision making by route can reduce treatments further
- Forecaster can now provide good domain and route-based forecasts
- Road weather stations can provide a means of monitoring the forecast against a forecast site graph



DECISION-MAKING & WEATHER FORECASTING



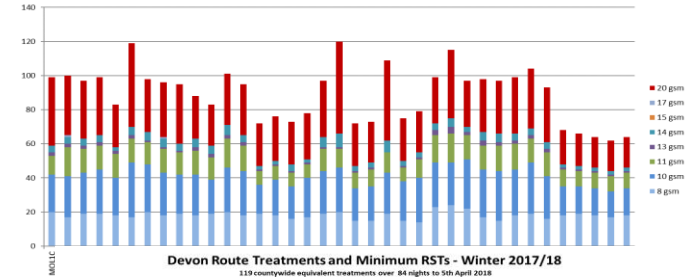
5

Improve decision-making granularity

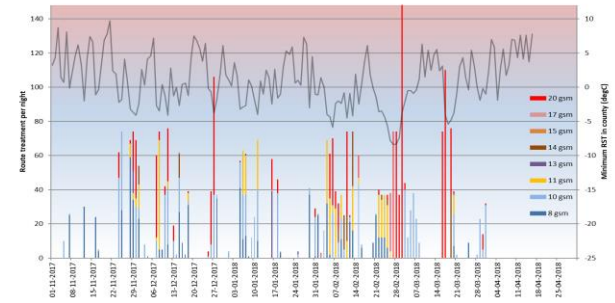
Whole Domain Route

- Determine threshold for decision making
- Determine how risk is being managed
- Determine how variations overnight are being monitored
- Met Office currently developing guidance based on scientific research which will be developed and discussed by NWSRG over the next few months
- Graphs opposite show Devon's treatment last winter and route variation using route-based forecasting

Devon's Salting Treatments by Route - Winter 2017/18



Devon Route Treatments and Minimum RSTs - Winter 2017/18



ROAD MAP TO RESILIENCE – SUMMARY

1 Treated network

Improved resilience through assessing risk

2 Treatment method

Improved resilience through saving salt

3 Salt moisture content

Improved resilience through lower spread rates

4 Calibrate spreaders

Improved resilience through lower spread rates

5 Lowest spread rates

Improved resilience through lower spread rates

6 Improve decision-making

Improved resilience through less treatments

WHY DO RESEARCH.....?



DEVELOPING NEW KNOWLEDGE – RESIDUAL SALT

- Residual salt research:
- Top research priority from survey of NWSRG and wider winter community
- Research workshop to be held on 7th February at CIHT, London
- ‘International knowledge exchange - Practitioners and Academia
- Share problems and ideas
- ‘Creating a Roadmap to a practical solution’





THANKYOU

NWSRG

NATIONAL WINTER SERVICE RESEARCH GROUP