How to allow for seasonal effects when using Skid Resistance data

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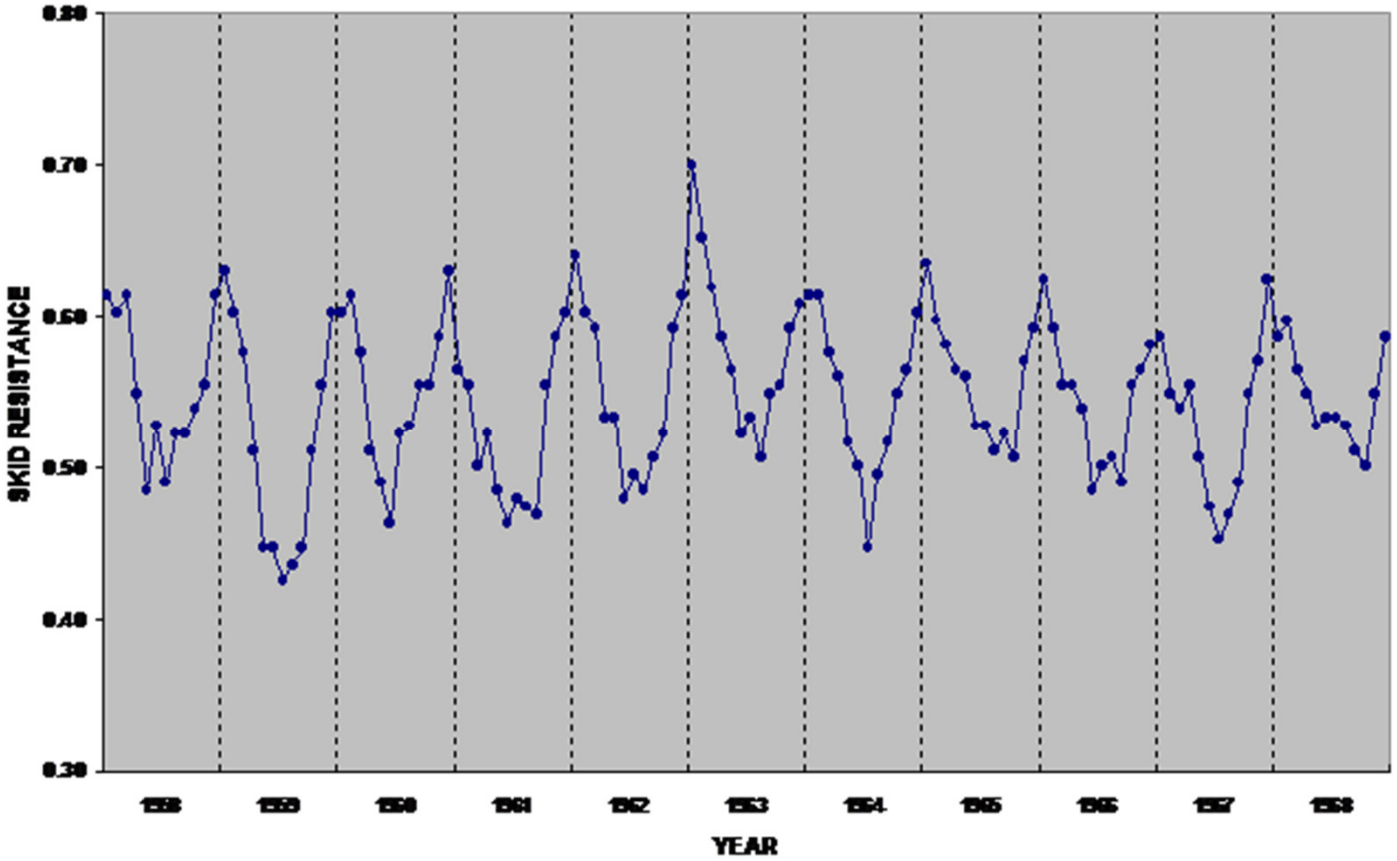
Seasonal Variation

- Wet road skid resistance varies throughout the year.
- In the UK and NZ, generally coincide with seasonal change, lowest values in summer and highest in winter.

Seasonal Variation



Seasonal Variation

- Seasonal variation. Variation in skid resistance due to seasonal effect (summer / winter) within a year.

Seasonal Variation

- Seasonal variation.
- In-year variation. Variation in skid resistance measurement within a year, due to seasonal effect, short-term variations and repeatability of measurement.

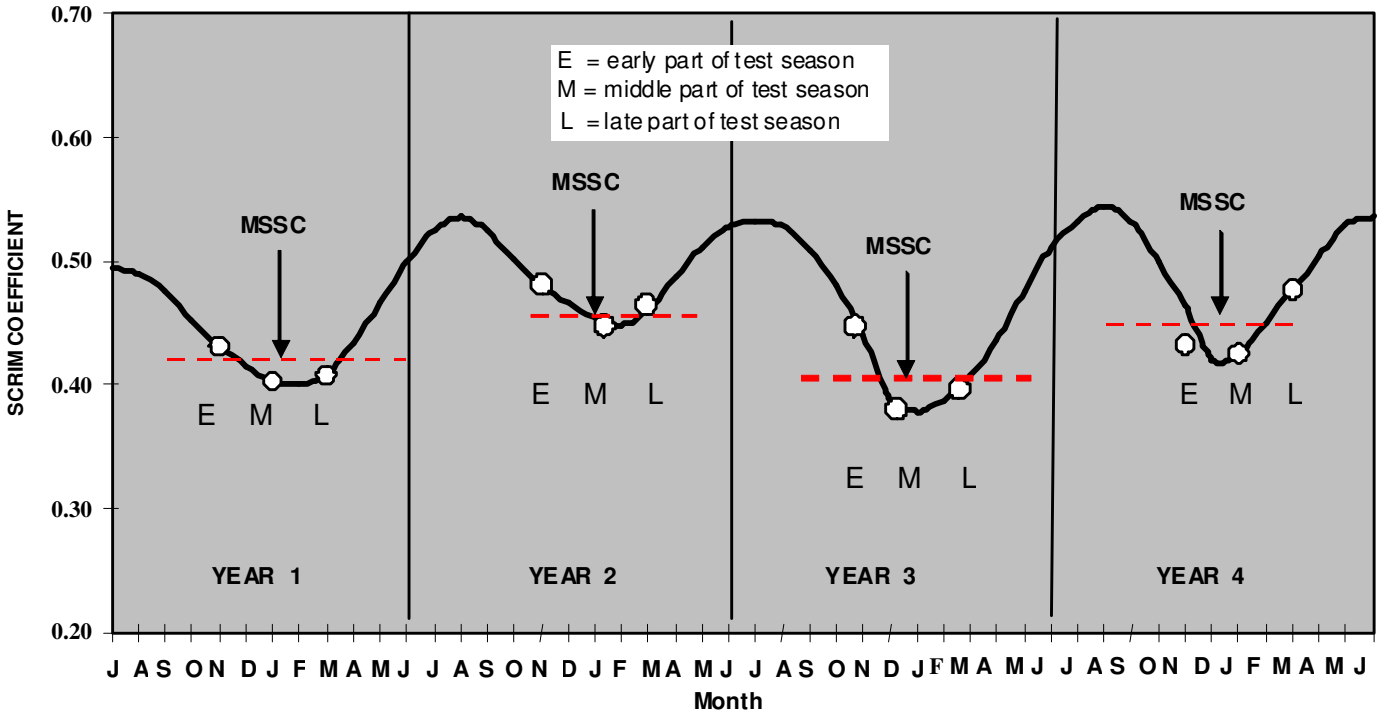
Seasonal Variation

- Seasonal variation.
- In-year variation.
- Year-on-year variation. Changes in seasonal/in-year variations over the years, due to impact of unusual climatic conditions.

MSSC

- Network surveyed 3 times in the same year, in early, mid and late parts of testing season.
- MSSC is the average of the 3 consecutive measurements during the testing season.

MSSC

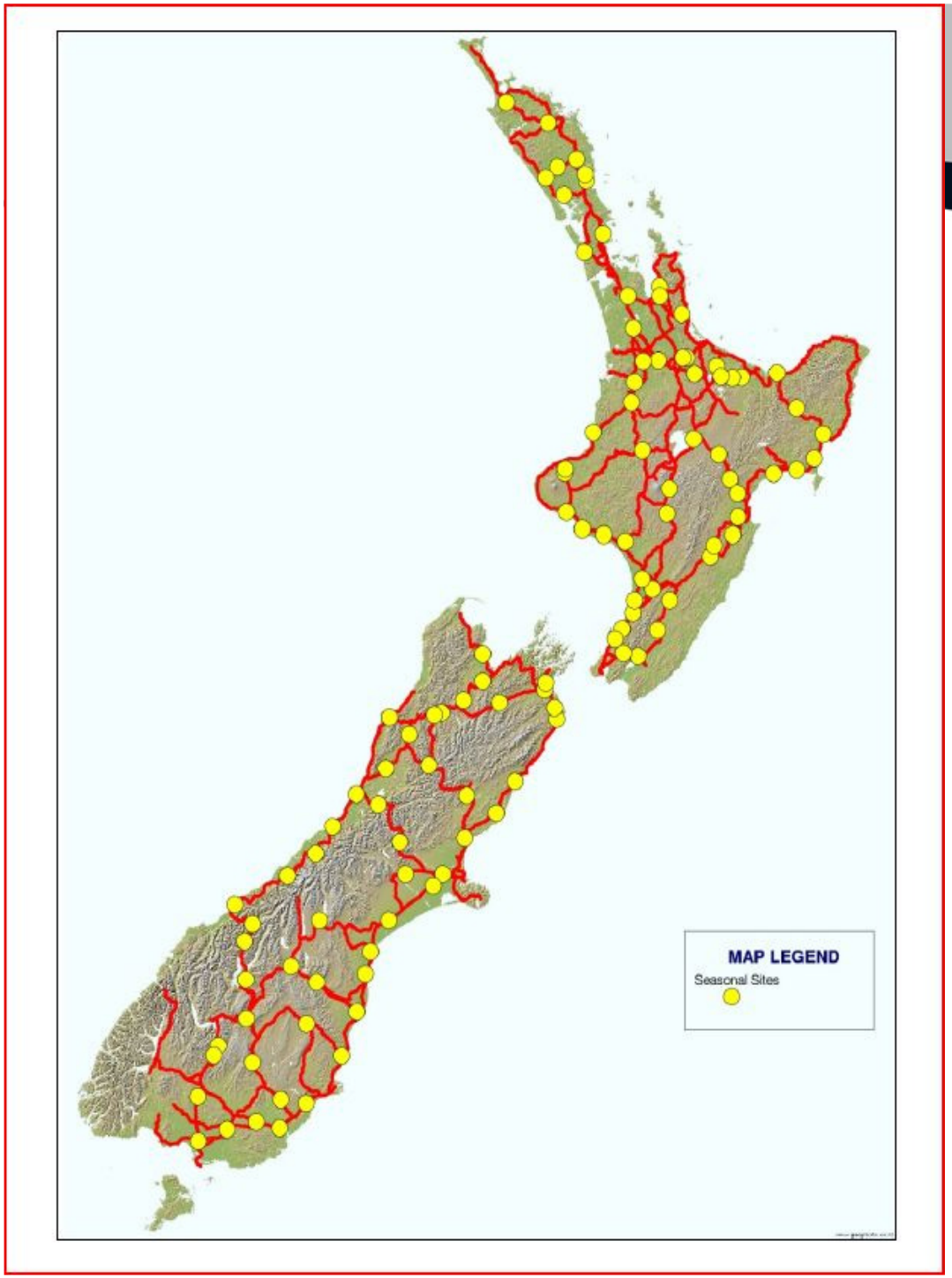

E = early part of test season
M = middle part of test season
L = late part of test season
MSSC
MSSC
MSSC
MSSC
E M L
E M L
E M L
E M L
YEAR 1
YEAR 2
YEAR 3
YEAR 4
SCRIM COEFFICIENT
0.70
0.60
0.50
0.40
0.30
0.20
J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J
Month

CSC

- Based on single annual survey of the network.
- Uses measurements from preceding 3 years to characterise long-term skid resistance of the network.
- Used with mean network skid resistance in current year to calculate a correction factor.

ESC

- Based on single annual survey of the network with benchmark sites.
- Benchmark sites tested 3 times in same year.
- MSSC factor determined.
- Average MSSC of all benchmarks sites in an area, compared to average MSSC for preceding 3 years.



NZTA ESC

Country split into 14 climatologically similar zones, with 114 seasonal sites.

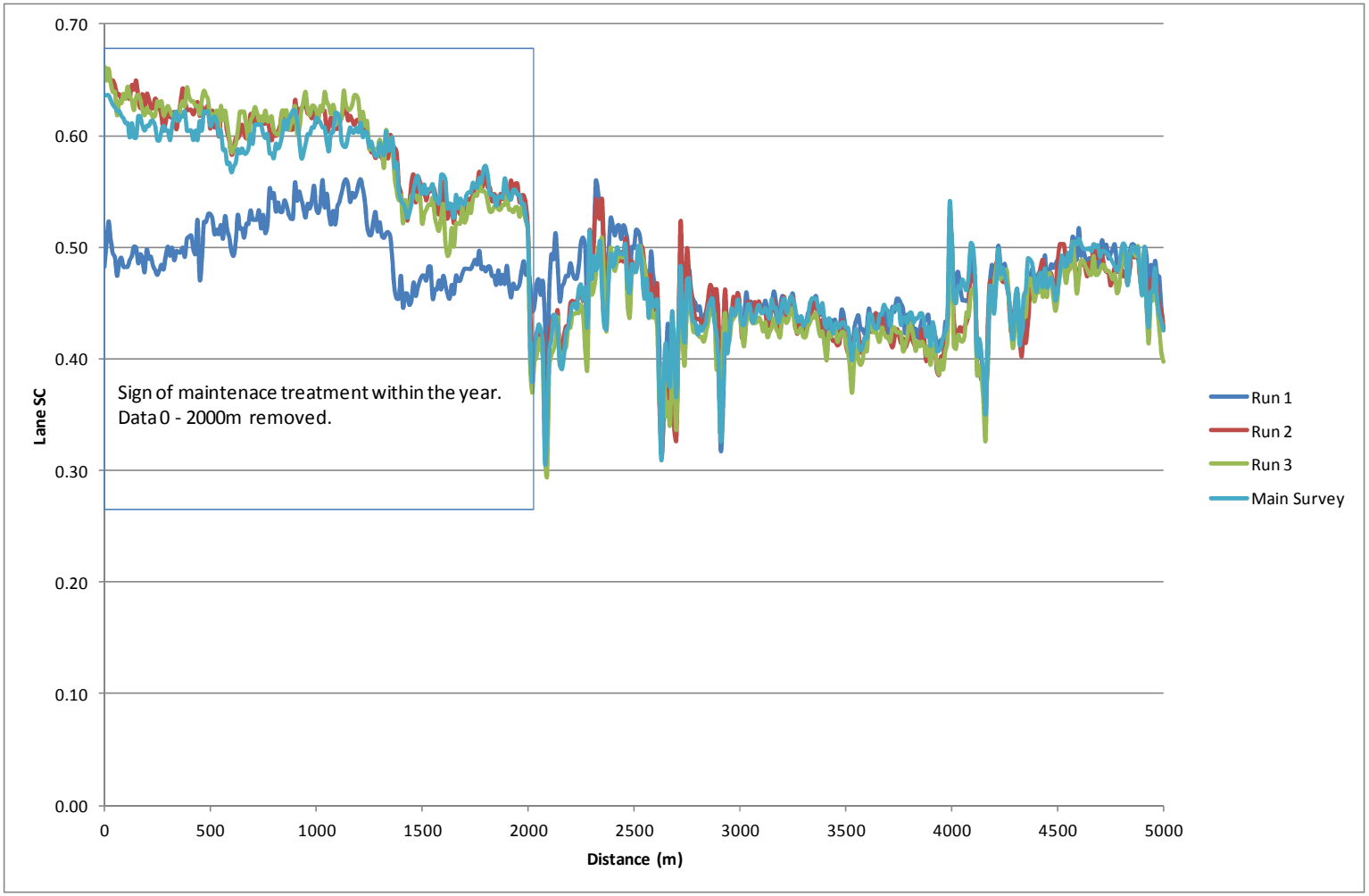
NZTA ESC

- Seasonal sites tested 3 times each year, start, middle and end of testing season.
- Additionally each site tested as part of the routine survey in each zone.
- Reading obtained during the survey is compared to the mean MSSC value to obtain an MSSC correction factor.

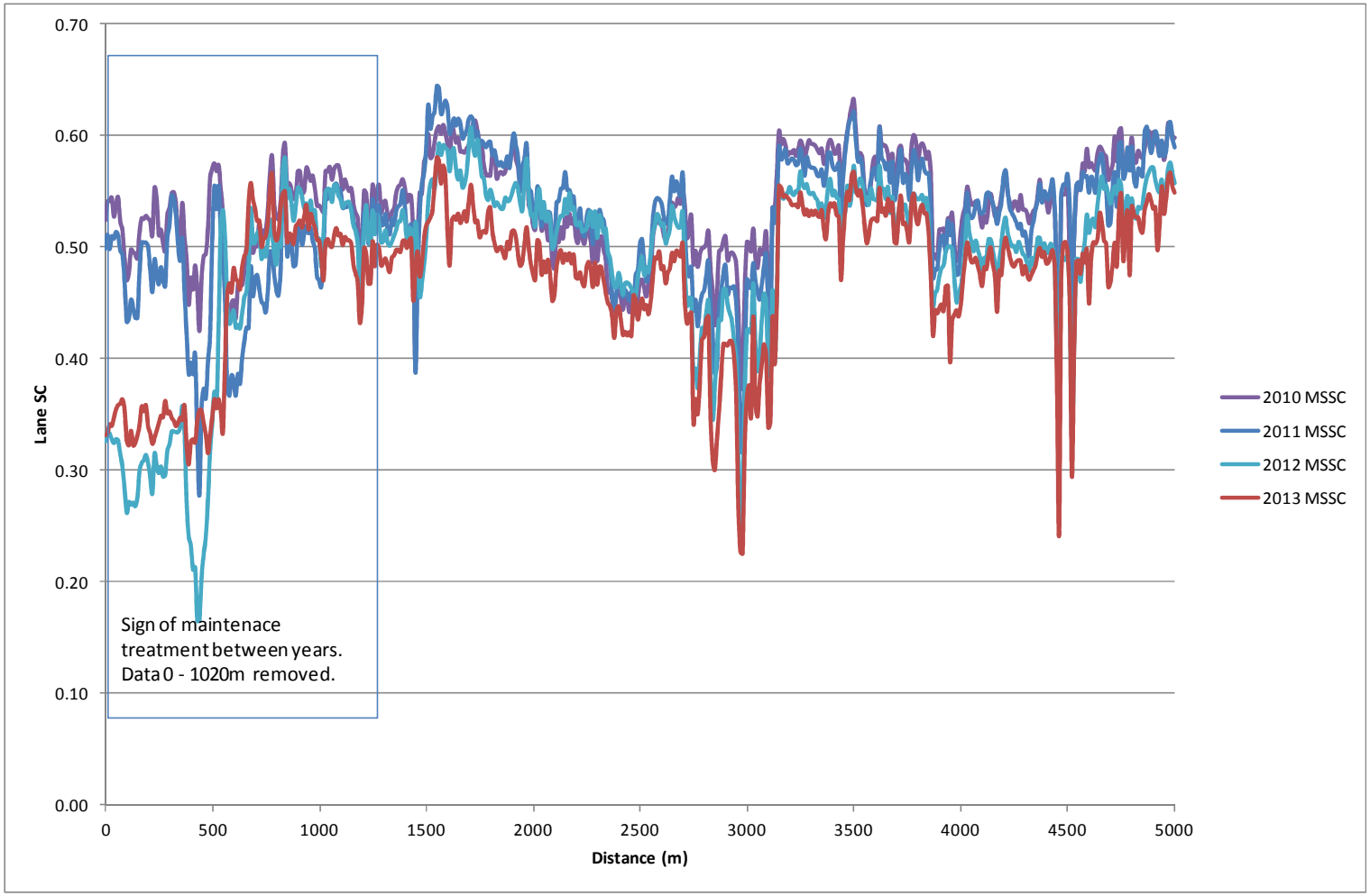
NZTA ESC

- Average MSSC for each seasonal zone compared with previous 3 years average MSSC, to obtain ESC correction factor for each zone.
- Reported ESC is calculated by applying the zone MSSC factor and the zone ESC factor to each 10m of machine measured SC data.

NZTA ESC


0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
Lane SC
Sign of maintenace treatment within the year.
Data 0 - 2000m removed.
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
Distance (m)
Run 1
Run 2
Run 3
Main Survey

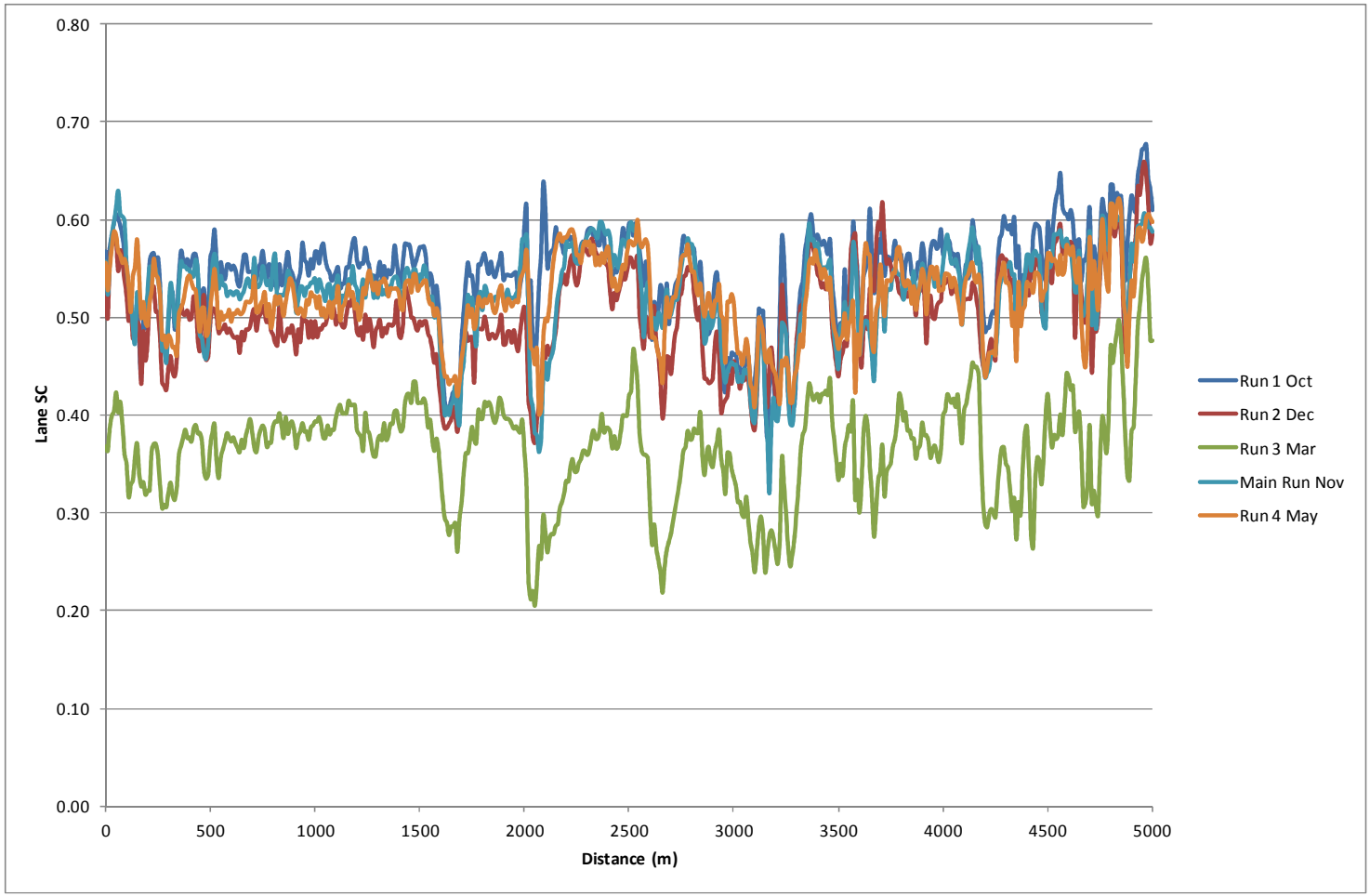
NZTA ESC


0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
Lane SC
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
Distance (m)
Sign of maintenace treatment between years. Data 0 - 1020m removed.
2010 MSSC
2011 MSSC
2012 MSSC
2013 MSSC

2012/2013 NZTA ESC

Seasonal Zone	MSSC Correction Factor				ESC Correction Factor	Combined MSSC and ESC Correction Factor			
	Nov	Dec	Jan	Feb		Nov	Dec	Jan	Feb
A			0.993		1.019			**1.011**	
B1	0.967				1.035	**1.001**			
B2		0.986			1.046		**1.031**		
B3	0.907				1.067	**0.968**			
C	0.924				1.070	**0.989**			
D		0.945	1.005		1.062		**1.004**	**1.068**	
E			0.986		1.039			**1.025**	
F		0.927	0.967		1.045		**0.969**	**1.011**	
G		0.974			1.027		**1.000**		
H			0.953		1.034			**0.986**	
J			0.983		1.042			**1.024**	
K1				1.038	1.051				**1.091**
K2				1.007	1.040				**1.047**
L				1.046	1.041				**1.089**

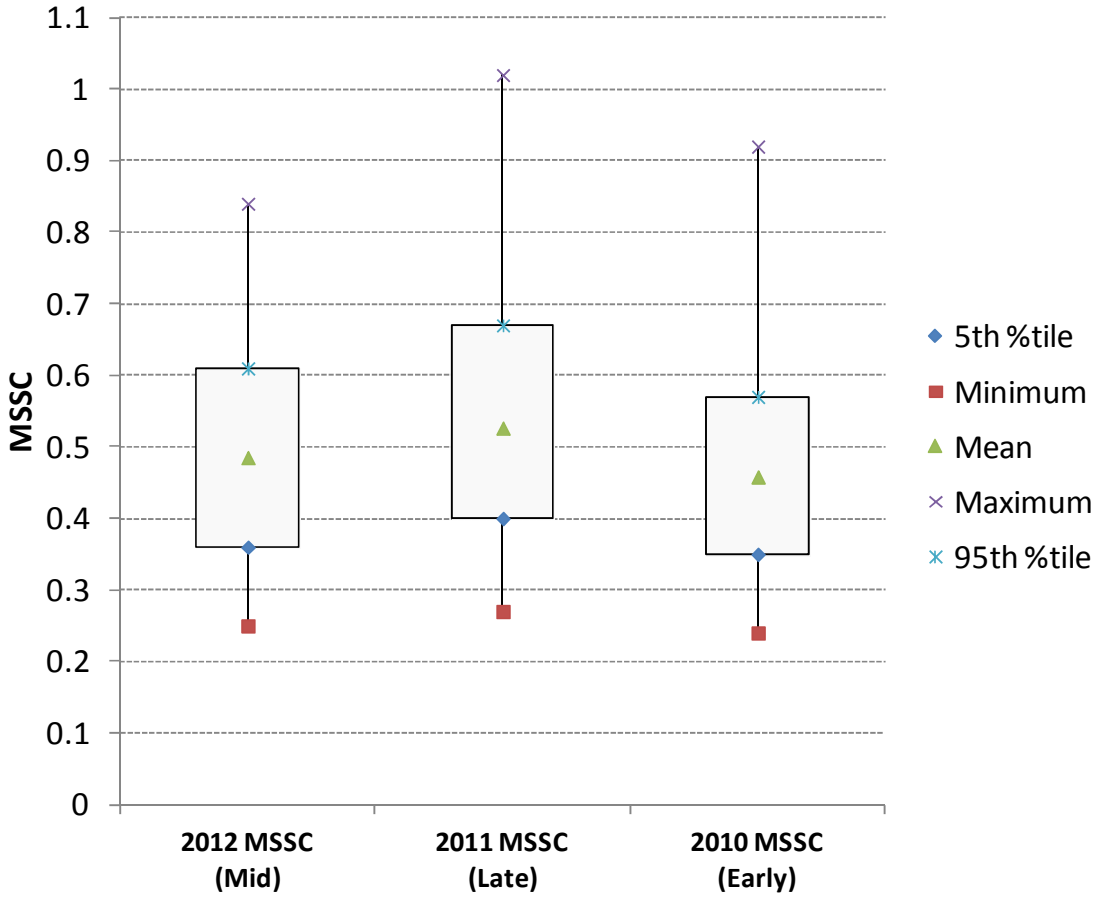
2012/2013 NZTA ESC



2013/2014 NZTA ESC

Seasonal Zone	MSSC Correction Factor				ESC Correction Factor	Combined MSSC and ESC Correction Factor			
	Nov	Dec	Jan	Feb		Nov	Dec	Jan	Feb
A		1.041			1.012		**1.054**		
B1	1.021				1.042	**1.064**			
B2		1.013			1.041		**1.055**		
B3	0.946				1.071	**1.013**			
C	0.990				1.024	**1.014**			
D		1.009			1.052		**1.062**		
E		0.991			1.067		**1.057**		
F	0.990				1.014	**1.004**			
G		0.995			1.037		**1.032**		
H			1.028		1.022			**1.051**	
J			1.017		1.031			**1.048**	
K1			1.023		1.035			**1.058**	
K2			1.013		1.022			**1.035**	
L		1.027	0.993		1.029		**1.057**	**1.021**	

Seasonal Variation in UK

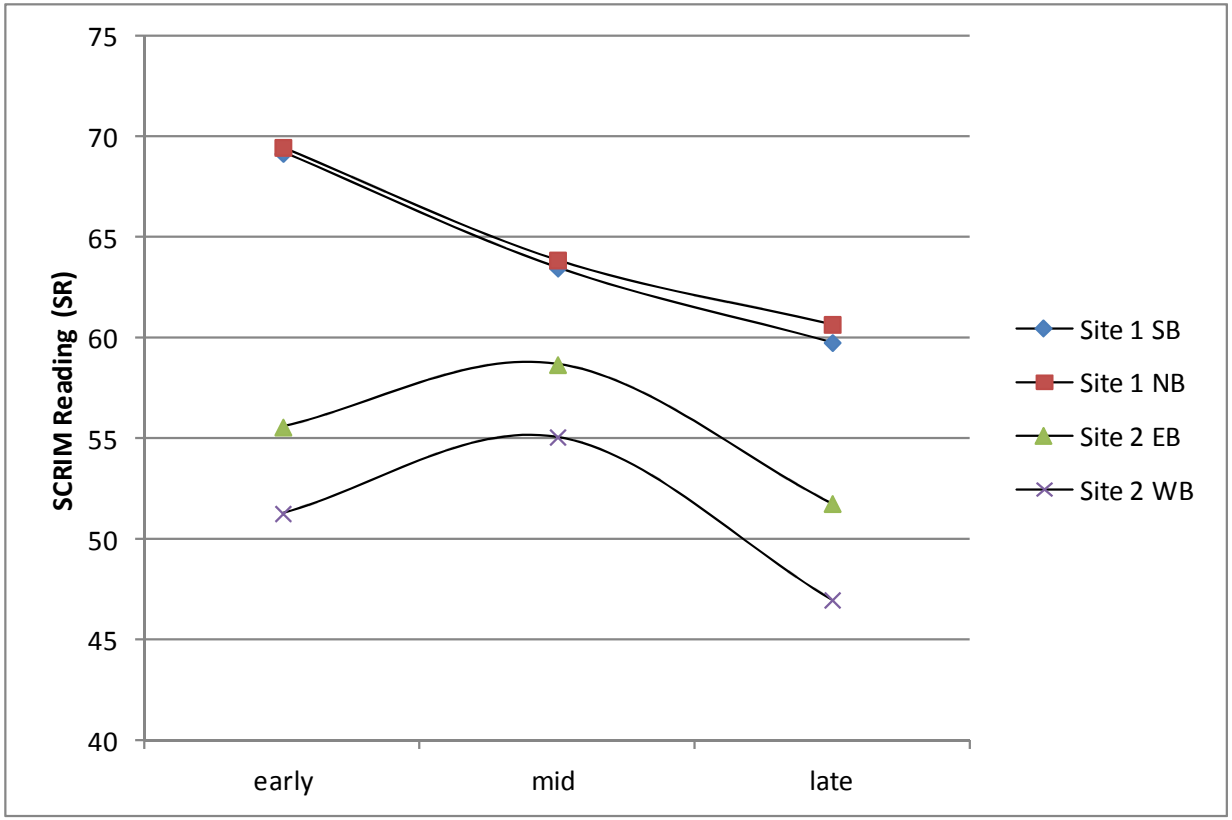


Seasonal Variation in UK

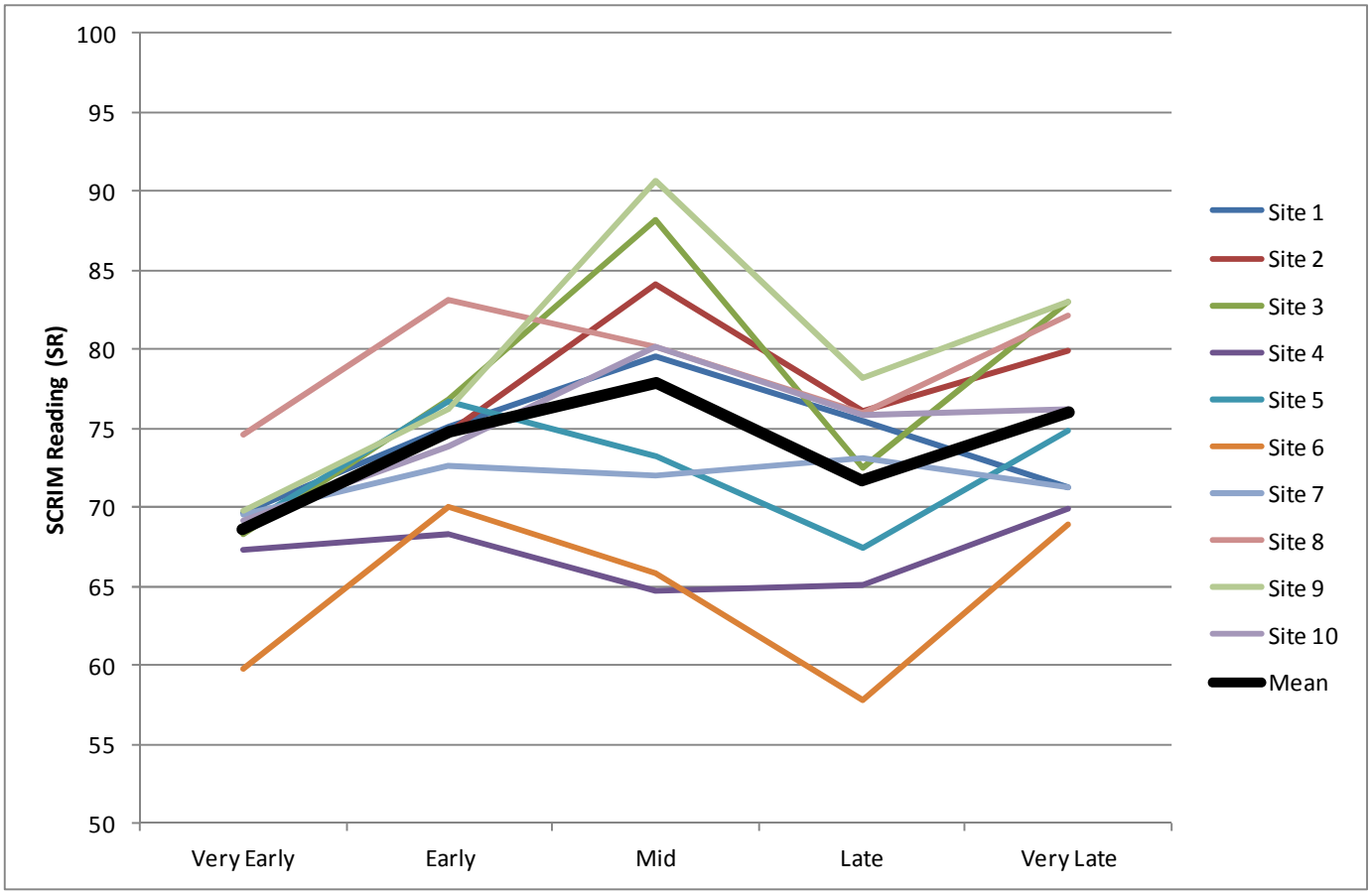
- 2010 mean network MSSC 0.46, 41% 1550 km SCRIM deficient.
- 2011 mean network MSSC 0.53, 18% 740 km SCRIM deficient.
- 2012 mean network MSSC 0.49, 29% 1210 km SCRIM deficient.

Seasonal Variation in UK

Year	MSSC Correction Factor
2009	1.073
2010	1.080
2011	1.085
2012	0.966



Changing Weather Patterns



Summary

- Seasonal variations can be significant, with year-on-year variations of 10%.
- Not using year-on-year correction can result in large variations in amount of skid deficiency.
- Careful consideration to number and location of benchmark sites.