New Zealand Country Amendment NSW RMS Guide to Slope Risk Analysis Version 4, April 2014

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Waka Kotahi 12 June 2023 Version 1

Slope Risk Analys Version 4, April 2014





Transport Roads & Maritime Services

New Zealand Country Amendment: NSW RMS Guide to Slope Risk Analysis Version 4, April 2014

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More information

Waka Kotahi NZ Transport Agency Published June 2023

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This document is available on Waka Kotahi NZ Transport Agency's website at www.nzta.govt.nz

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1. Introduction

Waka Kotahi, New Zealand Transport Agency, is adopting the New South Wales (NSW) Roads & Maritime Services (RMS) 'Guide to Slope Risk Analysis' Version 4 dated April 2014.

This country amendment identifies country specific changes and sections of the document that are not being used/adopted at the present time.

In essence these are:-

- Embankments and retaining walls sections are not being adopted;
- Modification related to speeds to be adopted in the analysis;
- Soil descriptions to be used; and,
- Slope risk assessment in relation to earthquake and rainfall.

This country amendment details changes using the section and paragraph numbering used in the NSW RMS Guide to Risk Analysis Version 4, for ease of comparison.

Only accredited persons who have completed the Waka Kotahi training course *Slope Risk Analysis* and are accredited by Waka Kotahi may undertake the assessment procedure for Waka Kotahi.

Wherever 'Roads and Maritime Services' or 'Roads and Maritime' are used, they shall be substituted by Waka Kotahi.

It should be noted that the copyright of the NSW RMS 'Guide to Slope Risk Analysis' Version 4 dated April 2014, remains with NSW RMS and its successors.

2. Terminology

'Roads and Maritime Project Manager' to be replaced Waka Kotahi Geotechnical SME (Subject Matter Expert).

5. Risk Analysis – Hazard Identification

Paragraph 2

Add to the end of the paragraph as follows. 'However,conduct the analysis and make recommendation to Waka Kotahi.

Paragraph 4

Add to the end of the paragraph as follows. 'Any such.....case basis and agreed with Waka Kotahi. Generally, lengths should not exceed 250m'.

5.3.2.2 Embankments

Not used.

5.3.2.3 Retaining Structures

Not used.

5.3.2.4 Retaining Structures and Live Loading Mechanisms

Not used.

6. Risk Analysis – Likelihood Analysis

6.2.1 Detachment Probability for Retaining Structures

Not used.

6.2.2 Detachment Probabilities for Failure of Retaining Structures and Embankment Under Live Loading

Not used.

7. Risk Analysis – Consequence Analysis

7.2.1.1 Allocation of Temporal Probability Rating for Road Users

The AADT (Average Annual Daily Traffic) can be obtained from the Waka Kotahi appointing person, the applicable network manager or through the Waka Kotahi Geotechnical SME.

Table 12 Design stopping sight distances is replaced with the following table for New Zealand highways.

Posted Speed (km/h)	Total stopping distance (m)
50	75
60	95
70	115
80	155
90	180
100	210

Table 12. Design stopping sight distances (Source: adapted from Austroads Guide to Road Design 4A for Waka Kotahi adopted reaction times)

7.2.2 Vulnerability (V)

NSW RMS uses the 'posted speed limit'. Generally, this will be significantly higher than that which can be achieved in many areas of New Zealand in our mountainous/semi-mountainous areas.

Consequently, in New Zealand the *lower of* the posted speed limit and the speed environment may be adopted. The speed environment is the 85th percentile speed through the area which can be obtained from Waka Kotahi. Clearly state which has been used.

7.2.2.3 Vulnerability for Failures Under Live Loading

Not used

10. Reporting

Insert the following after the first paragraph.

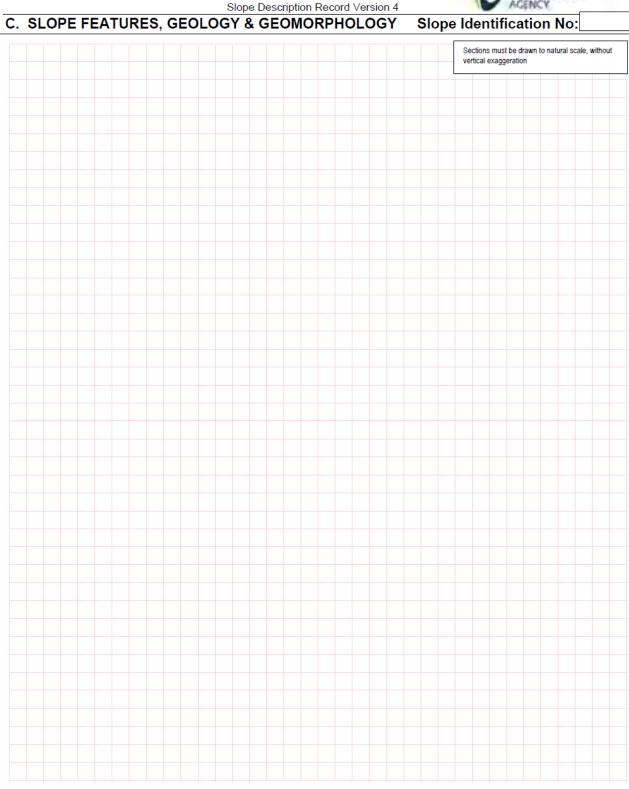
The completed report shall be provided to the Waka Kotahi appointing person and a copy sent to <u>WKARLReports@nzta.govt.nz</u>.Incorporation into the Waka Kotahi Geohazard Management System may also be required and will be specified in appointment award where and when required.

Appendix A

A1.1.1 Location

Slope locations shall be identified by SH/RS/RP and true left/right, together with associated GPS coordinates as identified on Waka Kotahi reporting sheets, examples of which are included in this document.



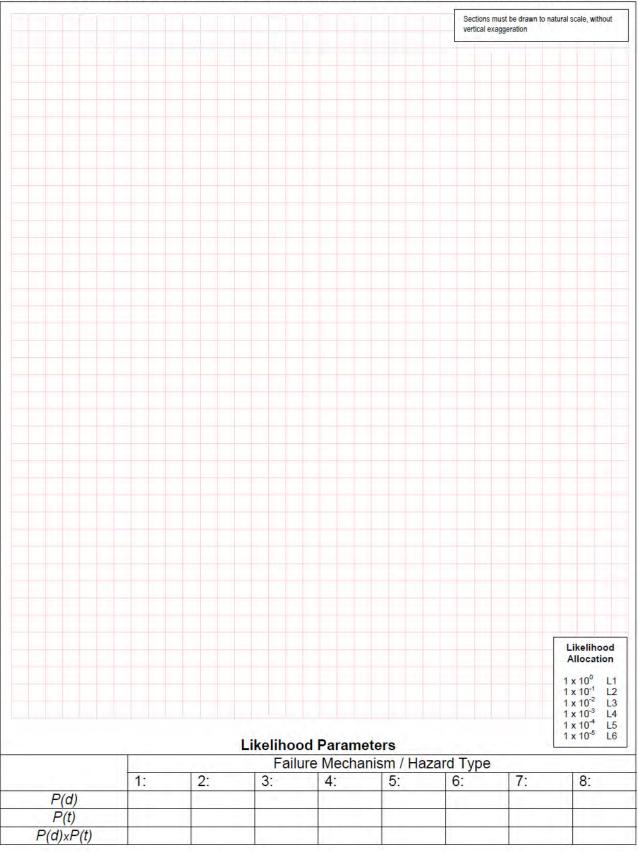


Notes:

Sketches, cross sections, photo references, describe distribution of materials, weathering profile, characteristics of materials, orientation of defects and their characteristics etc & relate to slope geometry. Describe failure type and scale, mechanism if possible, maximum block size if relevant, distance travelled by debris if known, any other relevant information. Include any evidence of secondary failure mechanisms. Include the location of any retaining structures and shotcrete, nails, etc relative to slope features.



C. SLOPE FEATURES, GEOLOGY & GEOMORPHOLOGY Slope Identification No:



Slope Risk Analysis Summary Report Version NZ 1.0



Report version NZ 1.0		V	AGENCY					
Slope Identification No.						Date		
Inspection Date			Completed By:			Checked By:		
Slope Data	Slope Class Desci	iption:	Max Slope Height (m)		Av. Slope Angle (°)		Material	
A Location		•						
Route position	State Highway No		Start Routes Station		End Routes Station		L or R?	
			Start Route Pos.		End Route Pos.		Length	
GPS Coordinates (NZGD2000) Decimal Degrees to 5 places	SI	art	Latitude		Longitude		Elevation	
	Fir	nish	Latitude		Longitude		Elevation	
UTM Coordinates		art	Zone		Easting		Northing	
Plan Reference No./Road Rank	Fir	nish	Zone		Easting Plan Start		Northing L or R?	
Locality Name					Chainage		E OFTA.	
Road Data	AADT			Year of Count		Speed Limit (km/hr)		
	No of Lanes	Prescribed Direction		Counter Direction			istance e? (Y/N)	
Risk Analysis								
Hazard/Failure Mechanism	1	2	3	4	5	6	7	8
Hazard Type								
Failure Dynamics Ratings								
Scale of Failure Rating - for Volume								
(S1 - S5) Scale of Failure Rating - for Block Size (S1 - S5)								
Velocity of Failure Rating (R1 - R5)								
Likelihood Rating (L1 - L6)								
Consequence Class Ratings								
Temporal Probability (T1 - T5)								
Vulnerability (V1 - V5)								
Consequence Class for Loss of Life (C1 - C5) Consequence Class for property								
damage etc (C1 - C5)								
Risk Analysis Ratings		1						
Slope Attribute Score								
Event Magnitude (M1 - M5)								
Hazard Classification (H1 - H5) Assessed Risk Level								
(ARL1 - ARL5)								

Slope Risk Analysis Sumn Report Version NZ 1.0	nary	ary WAKA KOTAHI			Page 2 Slope Identification			
Hazard/Failure Mechanism	1	2	3	4	5	6	7	8
Elements at Risk								
Buildings								
Infrastructure								
Services								
Other								
Support and Remediation								
Existing support, stabilisation, control or management measures (list)								
Need for further investigation? (Y/N)		Possible re measures (
Reports								
Author(s)	Orgar	isation		Ti	tle		File/Ref	erence No
Sketches and Photographs								
File Name				Cap	otion			

Slope Risk Analysis Summary Report Version NZ 1.0



Page 3 Slope Identification No.

Skotobos and Photographs											
Sketches and Photographs File Name	Caption										
		Caption									
Supporting Information											
For Each Hazard or Failure Mechanism	1	2	3	4	5	6	7	8			
Scale Dimensions for volume											
Length (m)											
Height (m)											
Width (m)											
Estimated volume (m ³)											
Scale dimensions for block size											
Length (m)											
Height (m)											
Width (m)											
Type of triggering mechanism											
Total Score: A	в	с	D	F	G	н	I	J			
Monitoring and Management Inspection Features: Specific: Provide details of features requiring inspection eg. Loose blocks, tension cracks, subsidence General: Progressive deterioration or development of any of the features described Instrumentation: Existing instrumentation - describe Proposed instrumentation - describe Inspection and Report Interval: Routine (casual/intermittent). Specify frequency: During/after significant rainfall events (eg 10yr/20yr ARI). Specify Frequency: Following significant earth tremors/quakes. Specify Magnitude: Defined Interval. Specify frequency: Responsibility: NOC SMC NZTA Management: Signs Temporary barriers Lane Closure Risk Management Plan											

SLOPE ID:											
A Slope Geomet	ry							Scoring	- total or	n page 3	3.
	Overal	I Slope	Batter	Slope	Ber	nches		A1	Slope A	ngle	
	Height (m)		Height (m)		Height (m)	1	Rock Slope	Score	Soil Slope		
CUT	neight (m)		rieigitt (iii)	/ (ligic ()	ricigin (iii)	/ (ingle ()	≥60	10	≥45	20	
EMBANKMENT							≥50	8	≥35	15	
STRUCTURE						1	≥40	5	≥25	10	
Shoulder/Verge w	idth:		Total Clear	Fall Zone V	/idth:		≥40 <40	0	<25	5	
Distance to Road		undon//lf					\4 0	-		-	
	Reserve Bo	bundary (If I			Weather		5.2		ter Slope	Height	
Slope above			Slope belov	w			>3		20 15		
Angle			Angle				20-3		-		
Distance								20m	10 8		
	Interial Material B Evidence of Past Failures Score: YES 5 points						5-1		-		
				5 points		NO (0)	-	im	0		_
Material	Soil	Rock	Composite		Engin			A3 Tota	I Clear F	all Widt	h
	Fall	Topple 🗌	Wedge 🗌	Slide 📃	Rota	ational 🗌	>5	im	0		
Mechanism	Slide 🗌	Spread	Avalanche		Translatio	nal 🗌	2-	ōm	5		
	Debris Flov	N	Other:				<5	im	10		
C Potentially Adv	verse Featu	ires (typica	al score)				A4 A	ngle of I	Nat. Slope	Above/I	below
Rock Features							Rock Slope	Score	Soil Slope	Score	
Loose Blocks/Bou	lders (10)		Erodible Se	ams (5)			≥70	5	≥45	5	
Tension Cracks (*	10)		Vegetation	in defects (5) 🗌 🛛 Ma	ax. for	≥60	4	≥35	4	
Overhangs /Voids	s (10)		Number			ck slope	≥50	2	≥25	2	
Shear/Fracture zo	nes (10)		Many (10)				<50	0	<25	0	
Spalling (5)	. ,		Some (5)			55.					
Newly Constructe	d		No adverse	features (0)				ally Adve		
Soil/Embankmer				V -	, —		Fe	atures	Total Sco	ore	
Tension Cracks (2			Toe heave	(20)							
Bulging (20)	/		Hummocky			lax. for			ally Adve		
Surface Deformat	ion (10)	П	Damage to			oil slope	Disco	ntinuiti	es Total	Score	
Erosion at toe (10	• •		New Constr		is	80.					
Number	, Many (10)		Some (5)	dottorr			E Ins	talled [Drainage	Total	
		ontinuities	()	re)				Sc	core		
D Potentially Adverse Discontinuities (typical score)											
Rock Defects								r Carrvi	ina Sorvi	202	
Rock Defects		Condition	a (0)		Max. Sco	ore is 45			ing Servi	ces	
Planes (10)		Tight/Clear		H (5)	Max. Sco	ore is 45	Water N	<i>l</i> ains	ing Servi	ces	
Planes (10) Wedges (10)		Tight/Clear	n (0) hered/infilled	□ d (5) □	Max. Sco	ore is 45	Water N Sewer I	/lains ^D ipes	ing Servi	ces	
Planes (10) Wedges (10) Potential toppling		Tight/Clear	hered/infilled	□ d (5) □		ore is 45	Water N Sewer I Irrigatio	/lains Pipes n	-	ces	
Planes (10) Wedges (10) Potential toppling Number	Many (10)	Tight/Clear Open/weat		d (5)	Max. Sco None (0)	ore is 45	Water N Sewer I Irrigatio Domest	<i>l</i> lains Pipes n ic wate	r Supply	ces	
Planes (10) Wedges (10) Potential toppling Number E Installed Drain	Many (10)	Tight/Clear Open/weat	Some (5)	⊔ 1 (5) □		ore is 45	Water N Sewer I Irrigatio Domest Stormw	<i>A</i> ains Pipes n ic water ater Dra	r Supply	ces	
Planes (10) Wedges (10) Potential toppling Number E Installed Drain <i>Surface Drains</i>	Many (10) age (typica	Tight/Clean Open/weat	bered/infilled Some (5)				Water N Sewer I Irrigatio Domest Stormw Farm D	Aains Pipes n ic wate ater Dra am	r Supply	ces	
Planes (10) Wedges (10) Potential toppling Number E Installed Drain <i>Surface Drains</i> Above batter slop	Many (10) age (typica	Tight/Clean Open/weat I scores) Good conco Unlined	hered/infilled Some (5) litions (0) None (5) [None (0)		Water N Sewer I Irrigatio Domest Stormw Farm D Reservi	Aains Pipes n ic wate ater Dra am	r Supply	ces	
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SLOPE ID:

I Installed measures and their Condition (typical scoring) Describe the extent of damage/distress to installed measures on the sketches. Also any access restrictions or other features.								
Describe the extent of damage/distress to installed measures	on the sketch	es. Also any	access restrictions or other features.					
NONE INSTALLED (0)								
Retaining Structures								
Type *				Length (m)	Height (m)			
Type				Longin (III)	neight (m)			
				┥───┤				
*Massann / Deinferend Constate / Ophian / DSW/ Other				<u> </u>				
*Masonry/Reinforced Concrete/Gabion/RSW/Other			Book Foll Mash: Dranad					
Shotcrete 🗌 Rock Bolts 🗌 👘 Fences/Barrie		Soils Nails		_ixed _				
Anchors	Monitoring		Access Restrictions					
Other (Describe):	(0							
Estimate area Shotcrete: Est. qty: Anch	hor/Soil Nails	s:	Est. area Mesh: Est. qty Rock bolt	ts/Dowels:				
Information from:	_							
Observation Anecdotal Search Inferred								
Condition								
All in generally Good Condition (0)								
Retaining Structures								
Cracking (10) Bulging (10) Tilting (10)	Sliding (10)	Settlen	nent (10) 🗌 Corrosion (5) 🦳 Seepage	e through face	e (5) 🗌			
Seepage at or below toe (5)				-				
Shotcrete								
Cracking (10) Seepage through cracks (5)	Seepage at	t or below to	be (5) Corrosion/acid attack (5)	Displacemer	nt (10) 🔲			
Anchors/rock bolts/dowels/soil nails	1 5			•	() _			
Corrosion (5) Loss of Bond (10) Loss of Tensi	on (10)	Loose P	late (10) 🗌					
Mesh/fence/barriers		200001						
Anchorage failure (10) Corrosion (5-10)	Damage fro	om impact (5-10) Accumulation of debris (5)	Э				
	Damage in	on inpact (
	av. 70							
Scoring I Installed measures and their Condition M	ax. 70							
		<u>, </u>		<u> </u>				
J Potentially Affected Development or Features (typ	oical scores	5)						
General Nature of Adjacent Development	_							
Residential Industrial/Commercial		Open Space	ce Nat. Park/Reserve/Water sto	orage Catchm	ent			
Spedific Development Features								
Development Type	Distance from	m Road	Development Type	Distance from	Road			
	Above (m)	Below (m)		Above (m)	Below (m)			
Regularly Occupied Buildings (10)			Water Supply (5)					
-Domestic/Residential			-Mains					
-Commercial/Residential			-Local					
-Educational			Gas Supply (5)					
-Offices			-Mains					
-Industrial			-Local					
-Other:			Telecommunications (5)					
Normally unoccupied buildings (5)	-		-Telephone					
,			•					
-Storage			-Coaxial/fibre optic cable/NBN					
-Automatic infrastructure			-Mobile Phone/microwave					
Facilities			Carparks (5)					
-Abandoned			Footpaths/cycleways (5)					
-Other (describe):			Water Storage (5)					
Other Roads (10)			Water storage structures (5)					
Railways (10)			Other specify:					
Power Distribution (5)			Public open space in regular use (5)					
-Mains			Rural/Agriculture (2)					
-Local			Forest (2)					
-Above ground (poles/towers)			Other Open Space (2)					
-Underground			Waterways/National Parks					
Scoring J Potentially Affected Development or Feat	tures Max. 1	10						
Possible Remedial Measures								
Cutting								
Removal/Reconstructions options:			Soolo Down					
		Dealian	Scale Down		estation			
Remove selected blocks	be 🗌	Realign	Local Extensive	Remove veg	getation			
Mesh		Shotcrete						
Draped Fixed Mixed Attenuation		Structu	ral Surface Protection	Soil Nails				
Rock face Support	Fences/Bai			— <u>-</u> .				
Rock Bolts Dowels Rock Anchors	Concret	e Barrier	Other Rigid Barrier Elastic Barrier	Bund				
Drainage								
Surface Shoulder Batter Toe	Crest		Subsoil Drains Trench Drains	, 🗌 Wells				
Blanket Drains Clean/Clear/Repair Ex	isting draina	age	Horizontal Drains					
Embankment								
Reconstruction options:								
Flatten Batter Toe Berm	🗌 Widen	🗌 Toe Wa	all Remove/reconstruct	Other				
Drainage Controls								
	r 🗌 Extend/i	improve cul	vert or pipe outlets on batter	kerbing				
Improve surface drainage at toe		Trench		0				
Verify capacity of culvert(s) - hydraulic analysis				55-				
Measures are considered:								
Definable from a more detailed inspection			e geotechnical investigation and design					

Appendix C

A modified version of Appendix C is provided on the Waka Kotahi ARL Course and shall be used for New Zealand sites. The changes relate to removal of tables related to retaining walls and embankments: there are no changes to any of the remaining tables.

Appendix D

The descriptive terms for soils and rocks in Appendix D is substituted with NZ Geotechnical Society Field Description of Soil and Rock, December 2005.

Appendix E

Not used