



Department of
Infrastructure, Planning and Natural Resources

Geotechnical Policy Kosciuszko Alpine Resorts



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TABLE OF CONTENTS

1.0	Objectives	2
2.0	Definitions	2
3.0	When is a geotechnical report required to be lodged with a development application	5
4.0	Preparing a geotechnical report	5
5.0	Circumstances in which the Department would not support a development application	7
6.0	Preparation of a site classification report	7
7.0	Copies required	8
8.0	Standard conditions	9
9.0	Consultants and peer review	9
10.0	About the forms	9
11.0	Maps and accompany notes	13
	Appendix A - Qualitative terminology and risk matrix	14

GEOTECHNICAL POLICY

KOSCIUSZKO ALPINE RESORTS

1.0 Objectives

1.1 The objectives of this policy are to ensure that:

- (a) geotechnical and related structural matters are adequately investigated and documented by applicants prior to the lodgment of any development application to carry out any development subject to this policy,
- (b) to establish whether or not the proposed development is appropriate to be carried out, either conditionally or unconditionally, having regard to the results of those geotechnical and related structural investigations,
- (b) in the event that a proposed development, is only appropriate, if carried out subject to geotechnical and related structural engineering conditions, those conditions are able to be met and are identified by applicants prior to lodgment of the development application including all appropriate constraints and remedial actions required prior to, during and after the carrying out of the development,
- (c) to ensure effective controls exist to guarantee that a development is carried out in accordance with the requirements of this policy,
- (d) to ensure that the preparation of geotechnical and related structural engineering information and certificates required to be lodged by this policy are carried out by suitably qualified professionals with appropriate expertise in geotechnical engineering, and
- (e) that developments are only carried out if geotechnical and related structural engineering risks are identified and can be effectively addressed.

1.2 Application of this policy

- (a) This policy addresses both structural and geotechnical requirements relating to geotechnical issues only. Separate structural requirements will also apply for the erection of any structure in accordance with the Building Code of Australia (BCA) and best engineering practice.
- (b) This policy applies to the land to which State Environmental Planning Policy No. 73 - Kosciuszko Ski Resorts (SEPP No. 73) applies.
- (c) The Department will act on behalf of the Minister for Infrastructure and Planning, as the consent authority, for development control within Kosciuszko Alpine Resorts and shall administer the requirements of this policy.

2.0 Definitions

Any terms which are defined in the Environmental Planning & Assessment Act 1979 (E.P & A Act) or the Environmental Planning & Assessment Regulations 2000 (E.P & A Regs) here under have the same meaning when used in this policy.

In this policy, the following terms have the meanings set out below:

Acceptable risk – the guidance for the establishment of acceptable risk criteria, in this policy, has been based on the contents of Section 4.2.1-Property and Section 4.2.2-Loss of Life in Australian Geomechanics Society 2000 (AGS 2000). Acceptable risk for loss of life is taken as, one order of magnitude, lower than the “tolerable risk” for the person most at risk, as given in table 4.2.2 of AGS 2000. The risk level for the loss of life can be determined by the quantitative methods outline in AGS 2000 or the semi-quantitative methods outlined in Appendix A of this policy. The risk level for loss of property can be determined by qualitative example given in AGS 2000 or by the semi-quantitative method outlined in Appendix A of this policy. Acceptable risk for loss of property is taken as low or very low in the risk matrix in Appendix A.

AGS 2000 – Australian Geomechanics Society, “Landslide Risk Management Concepts and Guidelines”, Australian Geomechanics Society sub committee on Landslide Risk Management, Australian Geomechanics Journal Vol. 35 No.1, March 2000 also reprinted in Australian Geomechanics Journal Vol. 37 No.2, May 2002.

Application means any development application which relates to land to which SEPP No. 73 applies.

CPeng – Chartered Professional Engineer

CPgeo – Chartered Professional Geologist

RPgeo – Registered Professional Geologist

Civil engineer or structural engineer means a civil or structural engineer who is a member of a professional engineering institute, is degree qualified and either has or is employed by a corporation which has professional indemnity insurance of not less than \$2 million, such insurance being demonstrated to the Department to be in force, for the year in which any information is submitted to the Department in accordance with this policy.

DIPNR means the Department of Infrastructure, Planning and Natural Resources

Final geotechnical certificate means a certificate prepared by a geotechnical engineer or engineering geologist in accordance with form 3.

Geotechnical engineer or engineering geologist means a specialist geotechnical engineer or engineering geologist who is degree qualified, is a member of a professional institute and who has achieved chartered professional status being either CPEng or CPGeo or RPGeo with “Landslide Risk Management” as a core competence”, and either has or is employed by a corporation which has professional indemnity insurance of not less than \$2 million, such insurance being demonstrated to be in force for the year in which any information is submitted to the Department in accordance with this policy.

Geotechnical hazard means a condition with the potential for causing the movement of rock, debris or earth, which may cause injury or death to persons or damage to, or destruction of property.

Geotechnical maps means the maps marked “Geotechnical Policy A4 Map” for each of Perisher Valley (G.1, G1.1-G1.8), Smiggin Holes (G2), Guthega Village (G3), Charlotte Pass (G4), Thredbo (G5), Bullock’s Flat (G6), Kosciusko Mountain Retreat (G7), Ski Rider Motel (G8) and Sponars Chalet (G9).

Geotechnical report means a report prepared by and/or technically verified by a geotechnical engineer or engineering geologist as defined by this policy, which incorporates each of the elements, where applicable to the type of development, described in item “4.0 – Preparation of the geotechnical report” of this policy.

Minister means Minister for Infrastructure and Planning.

Policy means Geotechnical Policy – Kosciuszko Alpine Resorts

PCA means principal certifying authority

Related land means land including roads and thoroughfares that could affect or could be affected by any development proposed on a site.

Requirements include all acts, statutes, regulations, by-laws, ordinances, codes, delegated legislation, all approvals granted under any such instrument, the BCA and any applicable Australian Standard

Risk means a measure of the probability and severity of an adverse effect to health, property or the environment.

Site means the whole of any allotment (lease or sub-lease) of land to which the carrying out of any development relates.

Site classification means a classification of the site in accordance with AS 2870.1 Australian Standard Residential Slabs and Footings, 1996 amendments 1 to 4.

Structural design means the selection and proportioning of load carrying elements incorporated in a structure, which require certification by a structural or civil engineer.

Structural document means a document (which may be in the form of drawings) from a structural engineer or civil engineer that makes recommendations in respect of the structural design and structural works required for any structure to be erected on the site which, under this policy, requires certification in accordance with form 2.

Structural works means the elements of any structure designed by a structural or civil engineer.

The Department means the Department of Infrastructure, Planning and Natural Resources

Verifier means a geotechnical engineer or engineering geologist, as defined by this policy, who verifies a geotechnical report.

3.0 When is a geotechnical report required to be lodged with a development application

3.1 All development applications, which include but are not limited to, the erection of any buildings or the carrying out of any works, or the demolition of any buildings on sites identified to be located within the areas designated “G” on the accompanying geotechnical maps for the Kosciuszko Alpine Resort areas, are to be accompanied by a geotechnical report, other than a development application for a development as specified below:

- (a) building alterations (including the making of, or an alteration to the size of, any opening in a wall or roof of a building, such as a doorway, window or skylight) comprising:
 - (i) non-structural alterations to the exterior of a building, such as painting, plastering, cement rendering, cladding, attaching fillings and decorative work; or
 - (ii) non-structural alterations to the interior of a building that do not result in the current load-bearing capacity of the building being exceeded;
- (b) demolition (carried out in accordance with AS 2601-1991: The Demolition of Structures) of any structure that covers an area of not more than twenty five square metres;
- (c) the erection of any building within an existing allotment comprising:

- (i) an advertising structure or structures; or
- (ii) a verandah or porch fully supported by an existing building; or
- (iii) non-structural repairs to or maintenance of an existing building,

provided that no work to an existing building results in the current load bearing capacity of the building being exceeded; or

- (d) minor earthworks, including landscaping, not involving excavations or fill in excess of one metre in vertical height; or
- (e) minor construction works which present minimal or no geotechnical impact on the site or related land as determined and certified (form 4) by a geotechnical engineer or engineering geologist as defined by this policy.

3.2 Any development application not accompanied by a geotechnical report, which is required to be lodged under clause 4.1 of this policy, may not be accepted by the department until such time as it is accompanied by a satisfactory geotechnical report.

4.0 Preparation of a geotechnical report

4.1 The geotechnical report to be submitted with a development application required under this policy is to include the following elements:

- (a) An assessment of the risk posed by all reasonably identifiable geotechnical hazards which have the potential to either individually or cumulatively impact upon people or property upon the site or related land to the proposed development in accordance with the guidelines set out in 'Landslide Risk Management Concepts and Guidelines' first published in the Australian Geomechanics Journal, Vol. 35 No.1, March 2000 (guidelines). Note: Appendix A provides an example of qualitative terminology for use in assessing risk to life and property.
- (b) Plans and sections of the site and related land from survey and field measurements with contours and key features identified, including the locations of the proposed development, buildings/structures on both the subject site and adjoining site, stormwater drainage, sub-surface drainage, water supply and sewerage pipelines, trees and other identifiable geotechnical hazards.
- (c) Details of all site inspections and site investigations and any other information used in preparation of the geotechnical report. A site inspection is required in all cases. Site investigation may require sub-surface investigation; appropriate investigation may involve boreholes and/or test pit excavations or other methods necessary to adequately assess the geotechnical/geological model for the site. At Thredbo, reference may be made to the suite of existing geotechnical data and regional studies held by Kosciuszko Thredbo Pty Ltd, as part of the information to be used in assessing the site. Where similar information data exists for the other Kosciuszko Ski Resorts then this information may be similarly used in assessing the site.
- (d) Photographs and/or drawings of the site and related land adequately illustrating all geotechnical features referred to in the geotechnical report, as well as the locations of the proposed development.
- (e) Presentation of a geological model of the site and related land showing the proposed development, including an analysis of sub-surface conditions, taking into account thickness of the topsoil, colluvium and residual soil layers, depth to underlying bedrock, and the location and depth of ground-water.

- (f) A conclusion as to whether the site is suitable for the development proposed to be carried out either conditionally or unconditionally. This must be in the form of a specific statement that the site is suitable for the development proposed to be carried out, subject to the following conditions:
- (i) Conditions to be provided to establish the design parameters, including but not limited to;
 - footing levels and supporting rock quality,
 - degree of earth and rock cut and fill,
 - recommendations for excavation batters,
 - parameters, bearing capacities, and recommendations for use in the design of all structural works including all footings, retaining walls, surface and sub-surface drainage,
 - recommendations for the selection of building structure systems consistent with the geotechnical assessment of risk, and
 - signing of form 2 as the mechanism to check that these parameters have been interpreted correctly and incorporated into the structural design

 - (ii) Conditions applying to the detailed design to be undertaken for the construction certificate, including but not limited to;
 - any structural design relating to geotechnical aspects of the proposal is to be checked and certified by a suitably qualified and experienced geotechnical engineer,
 - any other design conditions the geotechnical engineer preparing the geotechnical report believes are required in the design phase in order to ensure the design will achieve the “acceptable risk management” level as defined in this policy for potential loss of both property and life, and
 - signing of form 2 as the mechanism to check that these design conditions have been interpreted correctly and incorporated into the structural design.

 - (iii) Conditions applying to the construction phase, including but not limited to;
 - constructed works which require inspection and/or signoff by a suitably qualified and experienced geotechnical engineer. The report must highlight and detail the inspection regime to provide the builder with adequate notification for all necessary inspections,
 - any other construction conditions including works methodology and temporary works that the geotechnical engineer preparing the geotechnical report believes are required in the construction phase to ensure the design will achieve the “acceptable risk management” level as defined in this policy for potential loss of both property and life, and

- signing form 3 as the mechanism to verify that the above methodology and inspections have been completed in accordance with the report.
- (iv) Conditions regarding ongoing management of the site/structure, including but not limited to;
- any conditions that may be required for the ongoing mitigation and maintenance of the site and the proposal, from a geotechnical viewpoint.
- (g) A copy of form 1 bearing the original signature of the engineering geologist or geotechnical engineer as defined by this policy, who has either prepared or technically verified the geotechnical report.

5.0 Circumstances in which the Department would not support a development application

- 5.1 Where, under clause 4.1, a development application is required to be accompanied by a geotechnical report, then this report must be prepared and/or verified by a geotechnical engineer or engineering geologist as defined by this policy, through the submission of form 1. Where a geotechnical report accompanying a development application, has been prepared by a geotechnical engineer or engineering geologist with qualifications which do not meet the requirements of this policy then the Department shall refuse to support the development application, until the geotechnical report has been verified by a geotechnical engineer or engineering geologist as defined by this policy.
- 5.2 The Department will not support a development application, on geotechnical grounds, if a geotechnical report or independent review of a geotechnical report accompanying an application, identifies the risk to property and/or life posed by the geotechnical hazard as greater than the level of “acceptable risk” (as defined by this policy and AGS 2000) after all feasible measures to reduce the risk have been considered and/or where the geotechnical report does not follow the methodology of AGS 2000.

6.0 Preparation of a site classification report

All development applications which involve the erection of any structure (other than a structure identified in clause 3.1 (a)-(e) of this policy) on sites identified to be outside the area designated “G” on the accompanying geotechnical maps *do not* require an accompanying geotechnical report. However, instead they must be accompanied by a site classification report prepared in accordance with AS 2870-1996 - Residential Slabs and Footings. This report must be prepared by a geotechnical engineer or engineering geologist as defined by this policy and must contain a site classification report and the following;

- (a) A conclusion as to whether the site is suitable for the development proposed to be carried out either conditionally or unconditionally. This must be in the form of a specific statement that the site is suitable for the development proposed to be carried out, subject to the following conditions if required:
- (h) Conditions to be provided to establish the design parameters, including but not limited to:
- footing levels and supporting rock quality,
 - degree of earth and rock cut and fill,
 - recommendations for excavation batters,
 - parameters, bearing capacities, and recommendations for use in the design of all

structural works including all footings, retaining walls, surface and sub-surface drainage, and

- signing of form 2A as the mechanism to check that these design conditions have been interpreted correctly and incorporated into the structural design.

(ii) Conditions applying to the detailed design to be undertaken for the construction certificate, including but not limited to:

- any structural design relating to geotechnical aspects of the proposal is to be checked and certified by a suitably qualified and experienced geotechnical engineer,
- any other design conditions the geotechnical engineer preparing the site classification report believes are required in the design phase, and
- signing of form 2A as the mechanism to check that these design conditions have been interpreted correctly and incorporated into the structural design.

(iii) Conditions applying to the construction phase, including but not limited to:

- constructed works which require inspection and/or signoff by a suitably qualified and experienced geotechnical engineer. The report must highlight and detail the inspection regime to provide the builder with adequate notification for all necessary inspections,
- any other construction conditions including works methodology and temporary works that the geotechnical engineer preparing the geotechnical report believes are required in the construction phase, and
- signing of form 3A as the mechanism to verify that the above methodology and inspections have been completed in accordance with the report.

(iv) Conditions regarding ongoing management of the site/structure, including but not limited to:

- any conditions that may be required for the ongoing mitigation and maintenance of the site and the proposal, from a geotechnical viewpoint.

(b) A copy of form 1A bearing the original signature of the engineering geologist or geotechnical engineer as defined by this policy, who has prepared or technically verified the site classification report.

Note: Where the site classification report contains no design recommendations, parameters or requirement for geotechnical site inspection, then neither form 2A or form 3A are required.

7.0 Copies required

7.1 If, by operation of clause 3.1 or 6.0, a geotechnical report or site classification report is required to be lodged with a development application, then at least three signed complete copies of the geotechnical report must

be lodged.

8.0 Standard conditions

- 8.1 Prior to the occupation of any structure or the commencement of any use authorised by a development consent, the applicant must submit to the PCA, a copy of the final geotechnical certificate (form 3), bearing the original signature of the author or verifier of the geotechnical report. The PCA is to refuse to issue an occupation certificate, regardless of whether the occupancy certificate application is of interim or final status, until it receives the final geotechnical certificate (form 3). Where the original author or verifier of the geotechnical report is unavailable to sign form 3, the Department will accept another suitably qualified geotechnical engineer as the authority to sign off.
- 8.2 The Department may, if appropriate, impose conditions on a development consent requiring the lodgement of interim geotechnical certificates related to the stages of the construction of any development the subject of the consent. The form of any such interim certificate must be consistent with forms 3, amended as required, to reflect its status as an interim certificate only.
- 8.3 Any development consent for a development subject to this policy may incorporate condition of consent requiring the applicant to:
- (a) maintain any ongoing maintenance procedures and/or carry out any monitoring identified in the final geotechnical certificate,
 - (b) provide an annual certificate to the Department from a geotechnical engineer or engineering geologist confirming compliance with requirement (a) above, and
 - (c) comply with the design requirements of the site classification.

9.0 Consultants and peer review

- 9.1 Where a geotechnical report contains a recommendation for a separate analysis of the site to be carried out by another consultant, for example a flood study to be compiled by a hydrological consultant, this recommendation is to be highlighted to the applicant in the submission of the geotechnical report. This would enable the applicant to engage the required consultant and obtain the necessary report prior to the lodgement of the development application.
- 9.2 This policy requires that the structural or civil engineer, who prepares the structural documentation, is a civil or structural engineer as defined by this policy. This policy also requires that the engineer in preparing the structural documentation, has viewed and where necessary used the recommendations given in the geotechnical report for the same development. These requirements need to be verified by accompanying the submission of the structural documentation with a completed copy of form 2
- 9.3 The Department retains the right to have a geotechnical report submitted with a development application, peer reviewed by an independent geotechnical engineer or engineering geologist.

10.0 About the forms

Copies of the forms are available from the Department's office in Jindabyne. The forms are available in hard copy or digital form.

10.1 Form 1 - Declaration and certification made by geotechnical engineer or engineering geologist in a geotechnical report.

When is Form 1 to be submitted?

Form 1 is to be submitted with a geotechnical report. Attach form 1 to the inside cover of the geotechnical report.

Why is form 1 necessary?

This form is essential to verify that the author of a geotechnical report is a geotechnical engineer or engineering geologist as defined by this policy. Alternatively, where a geotechnical report has been prepared by a professional person not recognised by this geotechnical policy, then form 1 may be used as technical verification of the geotechnical report if signed by a geotechnical engineer or engineering geologist as defined by this policy.

What if form 1 is not attached?

Where a geotechnical report is submitted without an appropriately signed copy of form 1, the certifying authority may refuse to accept the report unless accompanied by a completed form 1.

10.2 Form 2 – Declarations and certification made by structural engineer or civil engineer and geotechnical engineer or engineering geologist in relation to a geotechnical report

When is form 2 submitted?

This form must be attached with the submission of the structural documentation required for the determination of a construction certificate or combined development application and construction certificate submission. The applicant must issue a copy of the structural documents and form 2 to the geotechnical engineer who prepared or technically verified the geotechnical report for the development application now requiring a construction certificate.

Why is form 2 necessary?

Form 2 is essential, as it provides evidence to the certifying authority determining the construction certificate, that structural documents have been prepared or verified by a structural or civil engineer as defined by this policy, and that the structural documents have been prepared in accordance with the recommendations given in the geotechnical report for the same development.

Form 2 is also essential to establish that the recommendations given in the geotechnical report have been interpreted and incorporated into the structural design as originally intended by the geotechnical engineer in preparing the geotechnical report.

What if form 2 is not submitted?

If a completed form 2 is not attached to the structural documents submitted to the certifying authority with the application for a construction certificate, then the certifying authority must refuse to issue a construction certificate until a completed form 2 is submitted.

10.3 Form 3 – Final geotechnical certificate

When is form 3 submitted?

This form must be submitted at the completion of a project, with an application for occupation certificate from the PCA.

Why is form 3 necessary?

Form 3 is essential, as it provides verification that the development works have been carried out in accordance with the requirements of the geotechnical report, and any subsequent geotechnical requirements introduced during the construction process.

When do you need a geotechnical engineer to inspect the site?

The purpose of this form is to ensure that the recommendations made in geotechnical report have been complied with during construction. Where required the geotechnical engineer or engineering geologist who prepared and/or verified the report will carry out site inspections as determined by the report prior to signing form 3. It is advised that the geotechnical report contains a highlighted reference to this requirement to enable the builder to give adequate notification for such inspections.

What if form 3 is not submitted?

If a completed form 3 is not submitted with an application for occupation certificate then the PCA must refuse to issue an occupation certificate until a completed form 3 is submitted.

10.4 Form 4 – Minimal impact certification

When is form 4 required to be submitted?

This form may be used where minor construction works which present minimal or no geotechnical impact on the site or related land are proposed to be erected within the “G” line area of the geotechnical maps. A geotechnical engineer or engineering geologist must inspect the site and/or review the proposed development documentation to determine if the proposed development requires a geotechnical report to be prepared to accompany the development application. Where the geotechnical engineer determines that such a report is not required then they must complete form 4 and attach design recommendations where required. A copy of form 4 with design recommendation, if required, must be submitted with the development application.

Why is form 4 necessary?

Form 4 was developed as a way of allowing a relatively small inconsequential development, proposed within the “G” line, to proceed without the need for a geotechnical report to be produced, in accordance with the policy. The consent authority is willing to accept an application for this type of development, if form 4A is completed by an appropriately qualified geotechnical engineer certifying that the impact from the development is so minimal that a report is not required. *However in all situations, a site classification report, prepared in accordance with AS 2870.1, will be required.*

10.5 Form 1A – Declaration and certification made by geotechnical engineer or engineering geologist in a site classification report

When is form 1A required to be submitted?

Where a structure is proposed to be erected outside the “G” line area of the geotechnical maps, then a geotechnical report is not required to be submitted with the development application. However, in this circumstance a site classification report is required to be prepared and submitted with the development application.

Why is form 1A necessary?

Form 1A is to be signed and submitted with this report to certify the credentials of the geotechnical engineer who either prepared or verified the report and that the report was prepared in accordance with AS 2870-1996. Attach form 1A to the inside cover of the site classification report.

What if form 1A is not attached?

Where a geotechnical report is submitted without an appropriately signed copy of form 1A attached, the Department will refuse to accept the report unless accompanied by a completed form 1A.

10.6 Form 2A - Declarations and certification made by structural engineer or civil engineer and geotechnical engineer or engineering geologist in relation to a site classification report

When is form 2A required to be submitted?

This form must be attached to the structural documentation accompany any submission of a construction certificate to the certifying authority for determination, for a development proposed outside the "G" line. The applicant must issue a copy of the structural documents and signed form 2A to the geotechnical engineer who prepared or technically verified the site classification report for the development application now requiring a construction certificate.

Why is form 2A necessary?

Form 2A is essential, as it provides evidence to the certifying authority determining the construction certificate, that structural documents have been prepared or verified by a structural or civil engineer as defined by this policy and that the structural documents have been prepared in accordance with the recommendations given in the site classification report for the same development.

Form 2A is also essential to establish that the recommendations given in the site classification report have been interpreted and incorporated in to the structural design as originally intended by the geotechnical engineer who prepared and/or technically verified the site classification report.

What if form 2A is not submitted?

If a completed form 2A is not attached to the structural documents submitted to the certifying authority with the application for a construction certificate then the certifying authority must refuse to issue a construction certificate until a completed form 2A is submitted.

10.7 Form 3A - Final geotechnical certificate for a site classification report

When is form 3A submitted?

This form must be submitted at the completion of a project, prior to occupation of the premises and prior to the issue of an occupancy certificate from the Department , where the development was constructed outside the "G" line.

Why is form 3A necessary?

Form 3A is necessary, as it provides certification that the building works have been carried out in accordance with the requirements of the site classification report, and any subsequent geotechnical requirements introduced during the construction process.

When do you need a geotechnical engineer to inspect the site?

The purpose of this form is to ensure that the recommendations made in site classification report have been complied with during construction. In most cases the geotechnical engineer or engineering geologist who prepared and/or verified the report will need to observe the foundation materials, excavation cut and fill retention systems, subsoil drainage, etc prior to signing form 3A. It is advised that the site classification report contains a highlighted reference to this requirement to enable the builder to give adequate notification for such inspections, where required.

What if form 3A is not submitted?

If a completed form 3A is not submitted with an application for an occupation certificate then the PCA must refuse to issue an occupation certificate until a completed form 3A is submitted.

11.0 Maps and accompany notes

Copies of the geotechnical maps are available from the Department's office in Jindabyne. The maps are available in hard copy or digital form. The geotechnical maps may also be downloaded from the Department's website (www.dipnr.nsw.gov.au). The geotechnical maps numbered G1 to G6 inclusive were prepared by GHD-Longmac Pty Ltd for the National Parks and Wildlife Service as part of NPWS - A4 Geotechnical Policy. The Department has incorporated these same maps into this policy with the permission of National Parks and Wildlife Service. The Department commissioned GHD-Longmac Pty Ltd to prepared additional maps of the areas around Sponars Chalet at Diggers Creek, Ski Rider Motel at Wilsons Valley and Kosciusko Mountain Retreat at Sawpit Creek.

Accompany notes to the geotechnical maps are available from the Jindabyne office of the Department.

The Jindabyne office of the Department is located at Snowy River Avenue in Jindabyne. The contact phone number is (02) 6456 1733.

APPENDIX A QUALITATIVE TERMINOLOGY AND RISK MATRIX

Landslide risk assessment – Example of qualitative terminology for use in assessing risk to property

Qualitative measures of likelihood

Level	Descriptor	Description	Indicative Annual Probability
A	ALMOST CERTAIN	The event is expected to occur	$> . 10^{-1}$
B	LIKELY	The event will probably occur under adverse conditions	$. 10^{-2}$
C	POSSIBLE	The event could occur under adverse conditions	$. 10^{-3}$
D	UNLIKELY	The event might occur under very adverse circumstances	$. 10^{-4}$
E	RARE	The event is conceivable but only under exceptional circumstances.	$. 10^{-5}$
F	NOT CREDIBLE	The event is inconceivable or fanciful	$<10^{-6}$

Note: “. “ means that the indicative value may vary by say \pm • order of magnitude, or more.

Qualitative measures of consequences to property

Level	Descriptor	Description
1	CATASTROPHIC	Structure completely destroyed or large scale damage requiring major engineering works for stabilisation.
2	MAJOR	Extensive damage to most of structure, or extending beyond site boundaries requiring significant stabilisation works.
3	MEDIUM	Moderate damage to some of structure, or significant part of site requiring large stabilisation works.
4	MINOR	Limited damage to part of structure, or part of site requiring some reinstatement/stabilisation works.
5	INSIGNIFICANT	Little damage.

Note: The “Description” may be edited to suit a particular case.

Qualitative risk analysis matrix – Level of risk to property

LIKEIHOOD	CONSEQUENCES TO PROPERTY				
	1:CATASTROPHIC	2: MAJOR	3: MEDIUM	4: MINOR	5: INSIGNIFICANT
A – ALMOST CERTAIN	VH	VH	H	H	M
B – LIKELY	VH	H	H	M	L-M
C – POSSIBLE	H	H	M	L-M	VL-L
D – UNLIKELY	M-H	M	L-M	VL-L	VL
E – RARE	M-L	L-M	VL-L	VL	VL
F – NOT CREDIBLE	VL	VL	VL	VL	VL

Risk level implications

RISK LEVEL		EXAMPLE IMPLICATIONS (1)
VH	VERY HIGH RISK	Extensive detailed investigation and research, planning and implementation of treatment options essential to reduce risk to acceptable levels; may be too expensive and not practical
H	HIGH RISK	Detailed investigation, planning and implementation of treatment options required to reduce risk to acceptable levels
M	MODERATE RISK	Tolerable provided treatment plan is implemented to maintain or reduce risks. May be accepted. May require investigation and planning of treatment options.
L	LOW RISK	Usually accepted. Treatment requirements and responsibility to be defined to maintain or reduce risk.
VL	VERY LOW RISK	Acceptable. Manage by normal slope maintenance procedures.

Note: (1) The implications for a particular situation are to be determined by all parties to the risk assessment; these are only given as a general guide.

(2) Judicious use of dual descriptors for Likelihood, Consequence and Risk to reflect the uncertainty of the estimate may be appropriate in some cases.

Extracted from: “Landslide Risk Management Concept & Guidelines” originally published in Australian Geomechanics Journal Vol. 35 No. 1 March 2000”