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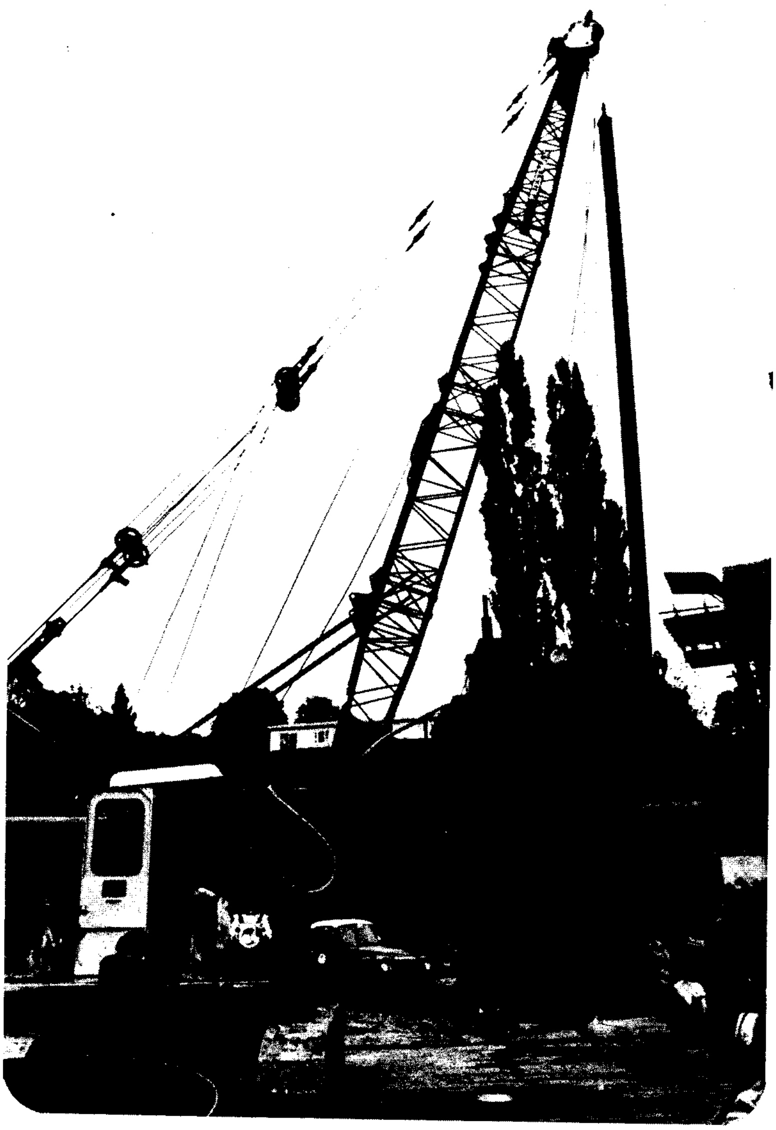
N.Z. GEOMECHANICS NEWS

No. 27

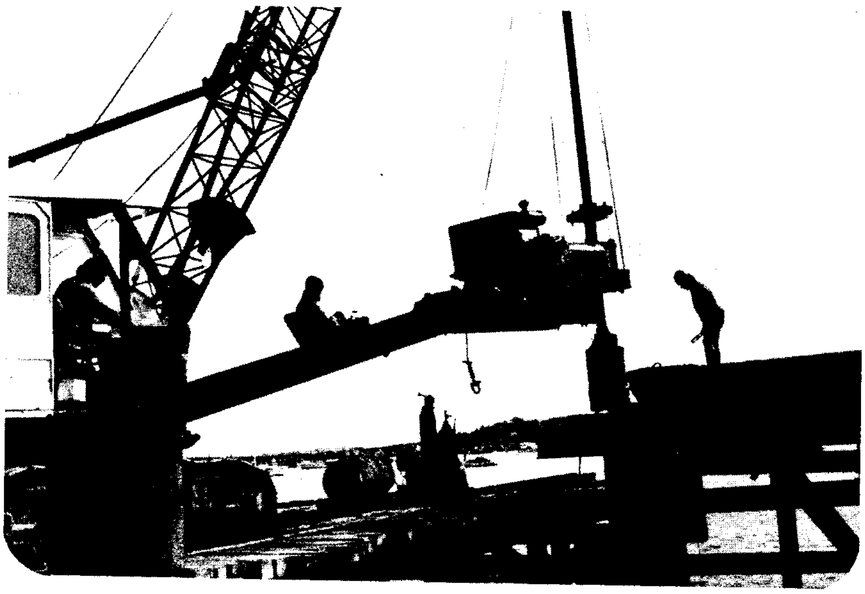
DECEMBER 1983

A NEWSLETTER OF THE N.Z. GEOMECHANICS SOCIETY

Hamilton Boundary Rd Bridge
2000 mm diam. bored piles 40 metres deep, raked 1 in 10 belled to 4000 mm diam.



PILES:
BIG OR SMALL



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GILBERD HADFIELD PILE CO. LTD.

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N.Z. GEOMECHANICS NEWS

NO. 27, NOVEMBER 1983

A NEWSLETTER OF THE N.Z. GEOMECHANICS SOCIETY

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THIS IS A RESTRICTED PUBLICATION

"N.Z. Geomechanics News" is a newsletter issued to members of the N.Z. Geomechanics Society. It is designed to keep members in touch with recent developments. Authors must be consulted before papers are cited in other publications.

Persons interested in apply for membership of the Society are invited to complete the application form at the back of this newsletter. The basic annual subscription rate is $17.00 and is supplemented according to which of the International Societies, namely Soil Mechanics ($7.00), Rock Mechanics ($9.50), or Engineering Geology ($4.50) the member wishes to be affiliated. Members of the Society are required to affiliate to at least one International Society.

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EDITOR'S NOTES

The Symposium on "Geomechanics in Urban Planning" organised jointly by the New Zealand Geomechanics Society and the New Zealand Planning Institute was held in Palmerston North in 1981. The nature and distribution of nine physical hazards to urban development including volcanic eruption, earth deformation and shaking (earthquakes), mining, settlement, landslides, soil dispersion, volumetric change of soil, and flooding and coastal erosion were detailed in a series of technical papers and discussion sessions. Methods of investigating the degree of risk associated with each of these hazards and the way they are incorporated into the planning process were described. The Symposium examined questions of responsibility and liability of Local Bodies and their professional advisers. Copies of the Symposium Proceedings are now available from the Secretary, IPENZ, P.O. BOX 12-241, Wellington North at a cost of $20 to Society members and $25 to non members.

The 15th Congress of the Pacific Science Association was held in Duneding in February of this year. Section B9a "Geological and Geophysical Hazards' included three papers on local slope stability problems. This issue includes one of the slope stability papers, an account of the recent history of landslide activity in the Wairarapa hill country, by Dr M.J. Crozier of Victoria University. The remaining two papers are to be reproduced in subsequent editions of Geomechanics News.

An account of the Seventh South East Asian Geotechnical Conference held in Hong Kong in November, 1982 is given by Guy Evans, formerly of Christchurch and now with the Hong Kong Housing Authority. Guest lecturers and session moderators who attended the conference included many prominent workers in the broad field of geotechnical engineering and the topics covered were wide ranging.

This issue also contains the Submission of the Geological Society of New Zealand to the M.W.D. Committee to inquire into the Wheao Canal Failure.

Contributions to N.Z. Geomechanics News would be welcome. They may be in the form of technical articles, notes of general interest, letters to the Editor, or book reviews, and may cover any subject within the fields of Soil Mechanics, Rock Mechanics and Engineering Geology. Articles on site investigations, construction techniques, or design methods which have been successfully used in New Zealand, and would be of help to other members, would be particularly welcome. All contributions should be sent to the Editor.

G.G. Grocott,
Editor.

PUBLICATIONS OF THE SOCIETY

The following publications of the Society are available:

(a) From the Secretary, IPENZ, P.O. Box 12-241, Wellington North:

- Proceedings of the Palmerston North Symposium "Geomechanics in Urban Planning", April 1981. Price $20.00.
- "Stability of House Sites and Foundations - Advice to Prospective House and Section Owners". (Published for the Earthquake and War Damage Commission). Price $0.50.
- Proceedings of the Third Australia-New Zealand Conference on Geomechanics, Wellington, May 1980. Price $90.00 for the three volume set.
- Proceedings of the Hamilton Symposium "Tunnelling in New Zealand", November 1977. Price $18.00 to members, $20.00 to non-members.
- Proceedings of the Second Australia-New Zealand Conference on Geomechanics, Brisbane, July 1975. Price $25.00.
- Proceedings of the Wanganui Symposium "Using Geomechanics in Foundation Engineering", September 1972. Price $8.00 to members, $10.00 to non-members.
- Proceedings of the Christchurch Symposium "New Zealand Practices in Site Investigations for Building Foundations", August 1969. The last copies of a limited reprinting are available at $8.00 to members, $10.00 to non-members.
- Copies of all back-issues of "New Zealand Geomechanics News" are available to members at a nominal price of $2.00 per copy.
- The following back issues of the IAEG Bulletin are available. Price $3.00 to members.

Issue	No. available
14	1
15	10
21	1

(b) From Government Bookshops:

- "Slope Stability in Urban Development (DSIR Information Series No. 122). Price $2.00.

The following publications of the Society have been sold out:

- Proceedings of the Nelson Symposium "Stability of Slopes in Natural Ground", 1974.
- Proceedings of the Wellington Workshop "Lateral Earth Pressures and Retaining Wall Design", 1974.

P.C. McGregor,
Publications Officer.

THE MASS MOVEMENT REGIME: RECENT HISTORY OF LANDSLIDE ACTIVITY IN THE WAIRARAPA HILL COUNTRY, NEW ZEALAND

M.J. Crozier

The geomorphic characteristics of New Zealand hill country are developed largely through the interplay of tectonic, fluvial and mass movement processes. While tectonic uplift and the consequent downcutting response of streams continually creates the necessary relief for mass movement, mass movement itself tends to destroy that relief and remove the conditions necessary for its operation. This is acheived by reducing slope height, lowering slope angle or by building up basal slopes and valley floors with depositional material.

Given sufficient stability within the geomorphic system, some degree of equilibrium will be achieved between the supply of slope material to the stream and its removal by the drainage system (Strahler, 1950; Ahnert, 1967). However, for large tracts of New Zealand hill country it is evident that the supply of mass movement debris currently exceeds the transportational capacity of the drainage system, leading to a net aggradation of valley floors and colluvial slopes. The evidence for this is particularly notable in headwater valleys where relatively gentle sloping colluvial landforms are superimposed on forms of fluvial degradation. Whereas valley patterns make up characteristic stream networks, cross-sectional valley profiles have changed from 'V' shaped to flat bottom forms. This apparent ascendancy of mass movement over fluvial activity suggests that not only is the geomorphic system unstable but that a recent environmental change in favour of mass movement has taken place.

The extensive conversion of indigenous forest to pasture land in the space of a few decades is generally held sufficient to constitute such a change and is attributed to inducing or accelerating much of the mass movement activity currently observed. This, however, is a view which is difficult to substantiate, partly because of the multitude of factors which determines the balance of slope resistance and stress and partly because of the lack of sound historical data on the rates and causes of mass movement. Some indirect support for the assertion has been provided by the comparison of shear strength of forest and deforested soils (O'Loughlin, 1974; Ziemer, 1981), and some from the different response of forest and pasture covered slopes to a given amount of triggering rainfall (Selby, 1976).

RECORD OF LANDSLIDE ACTIVITY

An alternative and more direct method for establishing changes in the mass movement regime involves the construction and interpretation of the landslide record. For a large part of the Wairarapa Hill country a chronology of landslide activity has been established from documentary sources, photographic interpretation as well as erosional and stratigraphic evidence determined in the field (Crozier et al, 1982).

Frequency and Magnitude of Recent Episodes

In the 102 year period dating from 1880, the Wairarapa hill country has probably experienced 18 major landslide* episodes. The quality of record (which improves dramatically in 1920) allows only 12 of these to be regarded with any certainty as having produced widespread slope movement. Whether probable occurrences (since 1880) or recorded occurences (since 1920) are considered, there would appear to be an approximate probability of a landslide episode affecting some part of the study region on average in one out of every five or six years, although there was a concentration of landslide activity in the late 1930's and early 1940's.

Without knowing the full areal extent of the erosion episodes, it is difficult to generalize on their relative magnitudes. However, from a study of 21 slopes within the region Trustrum (1981) found that 21% of the land surface had been eroded by 1932 and from 1932 to 1979 a further 18% was eroded, giving a cumulative eroded area of 39%. Trustrum's calculation of area eroded corresponds closely with a figure of 40.6% determined earlier from a sample of 123 slopes selected randomly from throughout the region (Crozier et al, 1980). These data indicate that the average rate at which undisturbed ground has been eroded over this forty-seven year period is 0.4% per year. Trustrum's diagramatic representation of the increase in the areal extent of erosion suggests a more or less constant rate of increase since 1932. Assuming that the hill country at one time supported a complete regolith cover and that this rate remained constant, the current phase of erosion could have commenced around 1880 - approximately the date for forest clearance in this region.

Measurements from the Pakaraka experimental catchment established within the Wairarapa hill country indicate that on average one percent of eroded land surface represents the displacement of $71m^3$/ha of regolith and soil (Crozier et al, 1982). Extrapolation of this data to the rest of the region suggests a redistribution and loss of material at a rate of aproximately $28.5m^3$/ha/year over the recent 47 year period.

---

*

The landslides consist largely of debris slides, debris avalanches and debris flows, using the nomenclature of Varnes (1978) or earth slips and soil slips, using the nomenclature of Campbell (1951). Movement takes place on the regolith/bedrock contact at depths varying from 0.5 to 2 metres.

Stratigraphic Evidence

Air photo analysis of the study region (Crozier et al, 1980) showed that the sediment delivery ratio during the 1977 episode was very low with most landslide material being deposited in second and third order headwater valleys without entering the largest drainage systems. The depositional surface for the 1977 material in many cases was a relatively flat floor of an otherwise fluvially formed valley. The form and texture of these valley floors suggests that infilling may have occurred on previous occasions in a manner similar to the 1977 episode. In addition erosion rates calculated from the dating of landslip scars and the generally accepted view on the importance of the original forest cover in providing stability supported the expectation that the valley-fill would consist of mass movement deposits emplaced in the period since 1880.

To test this hypothesis a drilling programme was set up in the Pakaraka experimental catchment in February 1980. Four 35mm diameter cores were taken from the axis of a third order valley floor at approximately 200m up-valley of the weir. The core furthest up-valley (number 4) was discarded owing to local interference from a nearby slip.

Care must be taken in generalizing from so few samples. The results, however, indicate the presence of five separate mass movement deposits. The uneven, ill sorted distribution of organic material within all the strata is similar to that of the 1977 material, although earlier deposits have more woody remains. The depositional surfaces of the 1977 episode and what is assumed to be the 1961 episode were easily identified by the presence of recognizable grass, reed and sedge remains. However, the three earlier deposits, which were originally assumed to be younger than 100 to 130 years, yielded the unexpected radiometric dates shown in Table 1.

TABLE 1

AGE OF VALLEY FLOOR MASS MOVEMENT DEPOSITS
PAKARAKA EXPERIMENTAL CATCHMENT

Deposit	Age Years before present (1980)	Interval Years	NZ14C No
A	3 (1977)	16	
B	19 (1961)	514	
C	533 ± 59	1047	5157
D	1590 ± 90	1710	5155
E	3290 ± 190		5156

Apart from the two most recent episodes no material was found representing the other mass movement episodes which have been recorded as having affected the region. There are three possible explanations for this:

a) the catchment under study was not affected

b) the material displaced in these episodes was deposited on lower slopes or up-valley of the drilling sites, or

c) fluvial erosion has subsequently removed the evidence of the missing episodes.

Explanation b) appears to be the most appropriate, as some pre-1961 erosional scars are evident and no evidence of fluvial activity was recognized in the valley floor deposits.

Assuming that the ratio of depth of valley floor sediment to slope mass movement which applied in 1977 is constant at each site for all episodes, then approximate erosion rates can be determined from the dated sediment cores (Table 2). These results, although limited by the above assumption, suggest that mass movement activity by landslide erosion has increased with time - recent rates being several times greater than those occurring prior to European deforestation.

TABLE 2

LANDSLIDE EROSION RATES (m^3/ha/year)

Period	Site 1	Site 2	Site 3	Mean
AD 1961-AD 1977	119	101	26.3	82.1
	AD 1932-AD 1979	Regional Rate		28.5
533 BP-AD 1961	2.4	1.7	0.3	1.5
1580 BP-533 BP	2.3	1.3	0.4	1.3
3290 BP-1580 BP	0.3			0.3

CONCLUSIONS

There are few areas in which the history of landslide activity is as well documented as the Wairarapa hill country. Nevertheless care must be exercised extrapolating results beyond the region and in applying the conclusions without full regard to the assumptions employed in the analysis. In particular, the relationship of depositional record to erosional activity makes assumptions which might not be tenable if more data were available. On the basis of existing evidence a number of conclusions can be made.

1) In the upper catchments landform development in the region has changed from a dominantly fluvial regime to a dominantly mass movement regime. In one catchment this appears to have occurred on or before 3290 years BP and can be referred to as the initiation of a mass movement cycle.

2) Since its initiation the mass movement cycle has been characterised by numerous mass movement episodes. Some of these, such as the 1977 episode have been shown to consist of a number of separate closely spaced events (Crozier et al, 1980).

3) The interval between episodes appears to be decreasing with time. A similar trend was shown by Grant (1981) for North Island erosion 'periods'. This conclusion, however, is particularly tenuous as sedimentary records tend to deteriorate with time.

4) The rate of mass movement erosion has increased over the last 3000 years.

5) The available evidence indicates a marked increase in the level of mass movement activity since the onset of European landuse practices. This may mark the onset of new mass movement 'phase'.

6) Taking into account the current rate of regolith removal and the remaining area of undisturbed regolith, the current phase of erosion could be expected to continue for about 150 years. However, as the remaining regolith has persisted in the most stable sites, erosion rates might be expected to slow down.

7) The concentration of mass movement activity in the late 1930s/early 1940s is coincident with Grant's Waipawa 'period'. His Waihirere period approximately corresponds in time with Pakaraka valley floor deposit 'C' (533 years BP). Grant has observed material relating to his erosion periods as far south as Castlepoint.

8) This century landslide episodes have occurred on average about one on every five or six years in some part of the study region. In the last half century regolith and soil have been displaced at a rate of approximately $28.5m^3$/ha/year.

9) Assuming that the hill country at one time supported a complete regolith cover, then measured erosion rates suggest that the current phase of erosion commenced at about the time of forest clearance.

10) Mass movement episodes similar to those taking place this century have occurred in earlier times. If these earlier events occurred on forested slopes (which appears likely) reafforestation cannot be considered a 'guarantee' against landslide activity.

11) European landuse practices cannot be considered a causative factor in all soil and regolith landslide episodes.

12) The mass movement regime can be viewed as a hierarchy of activity. (Table 3).

TABLE 3

MASS MOVEMENT REGIME: HIERARCHY OF ACTIVITY

Category	Intervening Period (approx)	Causes (examples)
Cycle	centuries - millennia	tectonic uplift climatic change deforestation
Phase (periods)	decades - centuries	variation in intensity of above
Episode	years - decades	variation in climatic pattern
Event	weeks - days	fluctuation in climatic parameter
Occurrence	minutes - hours	fluctuation in slope hydrology

The beginning of a cycle is defined by a change in the mode of landform development. It represents a level of disturbance in the equilibrium established among geomorphic processes which results in a recognizable landform response. The duration of the cycle equals the length of time during which the initiated trend in landform development continues to be manifest. Any period of sustained change in rate of this trend is referred to as a phase.

Mass movement activity is discontinuous and manifest in the form of discrete episodes which themselves may consist of a number of isolated events. Mass movement activity is also discontinuous in space and each localized unit is referred to as an occurrence. Chronologically, occurrences may be almost simultaneous or spaced sufficiently closely to constitute an event.

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DISCUSSION

Speaker; Crozier, M J

Q. D H Bell - Were pollen samples taken from valley floor debris deposits?

A. No. The area was aforested and so wood tissue samples were used for dating purposes and identification.

Q. D H Bell - Was a decrease in pasture productivity recorded in landslide areas?

A. Research carried out by others suggests that slip eroded surfaces exposed for 50 years had recovered to 80% of normal productivity. Areas disturbed in 1977 still had low productivity. One reason for the loss in productivity in disturbed areas was the relatively low soil moisture storage capacity.

Q. V E Neall - What was the nature of erosion on these slopes 3000 years ago? Were deposits of landslide debris removed from the valley floors by fluvial action?

A. As the stream flow under the forests was different to the present circumstance it would be reasonable to assume that they were removed. There was no evidence of debris sorting by fluvial action in the inspection pits.

Q. D Walcott - What was the dominant factor governing the regolith depth?

A. We had initially assumed that the site was a loess basin. However investigation revealed both aeolian deposition and weathering of the lithology contributed to regolith formation. Landslides generally occurred in previously undisturbed regolith.

Q. W N Jenks - What was the viscosity of the landslides?

A. Very low. A turf mat covered a silty regolith of 1 metre average depth. With heavy rain the regolith became saturated, with associated rise in pore water pressure and reduction in cohesion. Water content exceeded the liquid limit. A very fluid mass resulted into which one could readily push a fist.

NEWS FROM THE MANAGEMENT SECRETARY

1. 1984 IPENZ CONFERENCE

The conference is to be held in Hastings from 13-17 February 1984. The Geomechanics Society will be sponsoring one session which will take place on Tuesday 14 February between 10.45 and 12.00 noon.

Two papers will be presented and their titles with brief summaries are given below:

a) "Hawkes Bay Landslides and Their Influence on Primary Production".

J.R. Pettinga and D.H. Bell.

Extensive (1-100+ ha), deep-seated and shallow-seated landslides are widespread in occurrence. The spectrum of failure types and their controlling parameters are outlined. An engineering geologist is able to make a significant contribution, in co-ordination with normal Catchment Board activities. Techniques and input criteria are summarised.

b) "Some Civil Engineering Concepts Relevant to Soil Erosion Processes."

J.G. Hawley.

Erosion is here considered to include not only surface attrition but mass movement (landslides) and loss of soil components to percolating groundwater. The processes leading to failure are considered, and the view is expressed that recognition of the dominant process(es) leading to development of failure conditions is the important challenge to be faced in each situation.

2. ANNUAL GENERAL MEETING

The Annual General Meeting of the Society will be held during the 1984 IPENZ Conference at 12.00 noon on Tuesday 14 February, following the conclusion of the presentation of Society papers.

3. NOMINATIONS FOR 1984 MANAGEMENT COMMITTEE

Nominations for election to the Management Committee for 1984 were received on behalf of:

G.G. Grocott
D.N. Jennings
T.J. Kayes
N.S. Luxford
P.C. McGregor
P.J. Millar
B.R. Paterson
S.A.L. Read

Since the number nominated represents the requisite number of positions to be elected by the society members, no ballot is necessary. The nominations will be put to the Annual General Meeting of the Society on 14 February 1984 for confirmation of election.

4. **SOCIETY NAME**

In the last issue a letter was published from Dr B.W. Riddolls and Mr A.J. Olsen suggesting a postal ballot concerning the name of the Society. The matter was raised at the last management committee meeting resulting in the decision that the most appropriate forum to continue to discuss the Society's name is in Geomechanics News by way of letters to the Editor. Society members who wish to give their personal opinion are therefore encouraged to write to the Editor.

5. **4TH AUSTRALIA-NEW ZEALAND CONFERENCE ON GEOMECHANICS**

The Conference which is being organised by the Australian Geomechanics Society will be held in Perth from 11-14 May 1984. The second circular with details of the conference and the call for registrations is due for release in the immediate future. The last Australasian conference, held in Wellington in May 1980, was attended by a large number of Australians, and we should try and return the compliment by attending this conference in Perth. If there is sufficient interest, block travel bookings would be appropriate and anybody interested in such arrangements should contact the Management Secretary for further information.

6. **DRAFT METHOD OF SOIL DESCRIPTION FOR ENGINEERING SOILS**

The method of soil description was issued to members in 1980 in draft form so that suggested modificastions could be incorporated. Few comments were received, the majority supporting the method as circulated.

The sub-committee formed to review the draft method of soil description has been asked to recirculate the draft together with the comments which have been received. The sub-committee has also been asked to extend the method to include the description of rock.

The sub-committee proposes to issue the modified draft method for soil description together with a draft for rock description with the June 1984 issue of Geomechanics News. Society members who would like to make contributions for the above document are invited to submit written comments before 28 February, 1984. All contributions should be sent to:

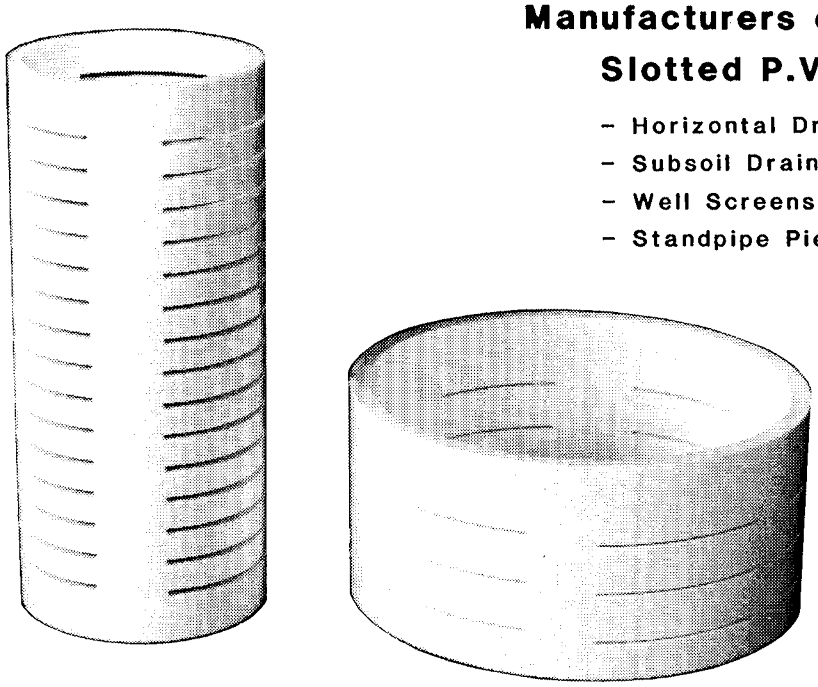
S.A.L. Read,
Geomechanics Society Draft Method,
c/- N.Z. Geological Survey,
P.O. Box 30-368,
Lower Hutt.

7. NEW MEMBERS

The following new members are welcomed to the Society:

Crampton	N.A.	Hall	R.J.	Heer	B.P.
Howarth	R	Kelsey	P.I.	Leadbeater	D.B.
Litherland	J.W.	McKay	D.R.	Moody	K.E.
van Barneveld	J.H.	Yetton	M.D.		

S.A.L. Read
Management Secretary



FORTHCOMING CONFERENCES

14 - 18 February, 1984	IPENZ Annual Conference. Hastings, New Zealand.
19 - 24 March, 1984	Third International Symposium on Land Subsidence. Venice, Italy.
09 - 13 April, 1984	International Conference on the Planning and Operation of Open Pit and Strip Mines, Pretoria, South Africa.
06 - 11 May, 1984	International Conference on case histories in Geotechnical Engineering. St Louis, Missouri, U.S.A.
14 - 18 May, 1984	4th Australian and New Zealand Geomechanics Conference. Perth, Australia.
21 - 23 May, 1984	5th International Conference on Expansive Soils. Adelaide, Australia.
27 - 30 May, 1984	Second International Conference on the Application of Stress-Wave Theory on Piles. Stockholm, Sweden.
20 - 24 June, 1984	25th U.S. Symposium on Rock Mechanics. Evanston. Illinois, U.S.A.
04 - 14 August, 1984	27th International Geological Congress. Moscow, U.S.S.R.
03 - 06 September, 1984	Design and Performance of Underground Excavations. Cambridge, U.K.
16 - 22 September, 1984	IVth International Symposium on Landslides. Toronto, Canada.
22 - 24 October, 1984	Fifth Australian Tunnelling Conference. Sydney, Australia.
February, 1985	Geomechanics in Tropical Lateratic and Saprolitic Soils. Brasilia, Brazil.
11 - 15 August, 1985	XI ISSMFE. ISSMFE Jubilee International Conference. San Francisco, U.S.A.
15 - 21 September, 1985	First International Conference on Geomorphology. Manchester, England.

Further information on these conferences may be obtained by writing to the Management Secretary or the Vice Chairman of the appropriate discipline.

S.A.L. Read
Management Secretary

ISSMFE TECHNICAL COMMITTEE ON PENETRATION TESTING SPT WORKING PARTY

DOCUMENT NO. 3

INTERNATIONAL REFERENCE TEST PROCEDURES

EDITOR'S NOTE:

This draft specification describing test procedures for the Standard Penetration Test has been prepared by the SPT Working Party of the ISSMFE Technical Committee on Penetration Testing. Members of the N.Z. Geomechanics Society are invited to contribute any comments on the draft specification, and these should be forwarded to the Management Secretary.

TEST PROCEDURE

1. **Preparing The Borehole**

1.1 The borehole shall be carefully cleaned out to the test elevation using equipment that will ensure the soil to be tested is not disturbed.

1.2 The water or mud level in the borehole shall at all times be maintained at a sufficient distance above the groundwater level to minimise disturbance. When artesian or sub-artesian conditions are present the water or mud level in the borehole shall be maintained to produce hydraulic balance at the test elevation.

1.3 The drilling tools shall be withdrawn slowly to prevent loosening of the soil to be tested.

1.4 When casing is used, it shall not be driven below the level at which the test is to commence.

2. **Executing The Test**

2.1 The sampler assembly shall be lowered to the bottom of the bore hole on the drive rods with the drive weight assembly on top. The "initial penetration" under this total deadweight shall be recorded. Where this penetration exceeds 150 mm the seating drive will be omitted, and if it exceeds 450 mm the test drive will be omitted and the 'N' value taken as zero.

After the initial penetration, the test will be executed in two stages:

Seating Drive: A penetration of 150 mm. If the 150 mm penetration cannot be achieved in 50 blows, the latter shall be taken as the seating drive.

Test Drive: A further penetration of 300 mm. The number of blows required for this 300 mm penetration is termed the penetration resistance (N). If the 300 mm penetration cannot be achieved in 100 blows the test drive shall be terminated.

The rate of application of hammer blows should not be excessive such that there is the possibility of not achieving the standard drop or preventing equilibrium conditions prevailing between successive blows. Typically, the maximum rate of application of blows is 30. The number of blows required to effect each 150 mm of penetration shall be recorded. If the seating or test drive is terminated before the full penetration, the record should state the depth of penetration for the corresponding 50 blows.

3 Recovery Of Soil Sample And Labelling

3.1 The sampler shall be raised to the surface and opened. The representative sample or samples of the soil in the sampler shall be placed in an air-tight container.

3.2 Labels shall be fixed to the containers with the following information:

a. Site

b. Borehole number

c. Sample number

d. Depth of penetration

e. Length of recovery

f. Date of sampling

g. Standard penetration resistance (N)

SEVENTH SOUTH EAST ASIAN GEOTECHNICAL CONFERENCE, HONG KONG

22-26 NOVEMBER 1982

G.L. Evans

Papers were not presented by their authors but were commented on by moderators. In addition, there were guest lecturers, talking on specialised topics.

GUEST LECTURE

"Slope Stability Evaluations"
Prof. Nilmar Janbu, Norwegian Institute of Technology, Trondheim

Prof. Janbu's presentation was a theoretical treatment of the factors relating to soil particle attraction. Athough not adequately understood, effective stress analysis is the basic approach which should be adopted for analysis. Based on his experience in Norway, Prof. Janbu showed that for many long standing slopes a total stress analysis gave low factors of safety between 0.4 and 0.7.

SESSION: SLOPE STABILITY

Moderator: Dr E.W. Brand, Geotechnical Control Office, Hong Kong.

The state of the art of slope analysis in Hong Kong was presented. The theme was one of problems associated with residual soils, and in particular, the difficulty in quantification of the varying properties of Hong Kong soils. Any investigation should have a knowledge of the complete soil profile of a site, as the ground conditions may include the six weathering grades from rock to soil, and the presence of joints and relict joints is a complicating factor. The importance of water was stressed as in many parts of Hong Kong the decomposed granite material is very permeable and susceptible to changes in pore water pressure.

With regard to soil shear strength and slope stability studies, the need for laboratory triaxial tests at the correct confining pressures was stressed. Many Hong Kong slides are shallow and stresses obviously low, but laboratory tests often used confining stresses that were too high and did not represent reality.

SESSION: FIELD INSTRUMENTATION

Moderator: Mr R.C. Weeks, Geotechnical Instruments Ltd U.K.

In his talk Mr Weeks pointed out the danger of instrumenting a site without proper knowledge of the relevant factors to be measured and the capabilities of the instruments. The development of very specialised instruments had now reached a stage where a great range was available and it was important to make the right choices. In assessing any problem the designer must be aware of aspects including:

the choice of instruments
the need and limits of accuracy and reliability
installation by competent people
after care and maintenance requirements

GUEST LECTURE

"Time-deformation Relations in Creep to Failure"
Mr D.J. Varnes, U.S. Geological Survey, Denver.

The mechanism of creep to failure of a wide variety of materials, including rocks, soils and metals was discussed. It was shown that the time deformation rate curve could be analysed mathematically in a similar way for completely different ground materials. His talk brought together the work of a number of researchers who had developed mathematical solutions to analyse time-strain relationships.

SESSION: AIR PHOTO INTERPRETATION

Presented by: Dr A. Burnett, Mr K.A. Styles of Geotechnical Control Office, Hong Kong, and Mr A.J. Brimicombe of Binnie and Partners, Hong Kong.

Dr Burnett outlined the elementary principles of photogrametry and described the equipment used at the Geotechnical Control Office in Hong Kong. The relatively low cost of this method of obtaining considerable information about the geology, hydrology and stability of any area was stressed. Mr Brimicombe gave a typical example of terrain evaluation of a site and details of how each type of map, including slope gradient map, drainage and hydrology map showing types of streams and a map showing changes in surface material and site geomorphology was drawn.

Mr Styles talked on terrain classification maps, and their use in identifying specific geological, hydrological or physical constraints on the ground.

SESSION: ENGINEERING GEOLOGY AND ROCK MECHANICS

Moderator: Prof. J.L. Knill, Imperial College of Science and Technology, London.

The theme of Prof. Knill's talk was principally concerned with the properties and behaviour of rocks, and included only brief mention on overburden problems.

He highlighted the necessity of distinguishing between the rock mass and the rock material as allowance must always be made for defects in material behaviour. Mention was made of the frequent difficulty in determining a rock head level because of the variations in weathering of the overburden material. Several specific geological processes were described as being significant in the context of engineering geology, including the effect of water and in particular permeability and erosion of limestone; changes in rock masses with time; and the effects of stress relief creating natural movements in rock masses and rock joints.

SESSION: RECLAMATION AND WATERFRONT STRUCTURES

Moderator: Prof. S. Hansbo, Sweden.

Prof. Hansbo talked about three methods of reclamation; hydraulic fill, bottom dumping and end dumping. The advantages and disadvantages of each technique was discussed, for example with end dumping it is important to contain the filled area inside bunds or dykes so that if soft seabed mud is displaced into waves these can be confined and removed, but the bottom interface of the filling becomes very irregular. With bottom dumping, the selection of the correct materials to be placed on the seabed is important, so that sometimes sand filters are needed. Various methods of consolidation of soft reclaimed areas were discussed and illustrated. These include consolidation by dynamic impact by dropping a large weight (20 to 40 tonne from heights of 20 to 40 metres), immersed vibration using a vibro-wing, vibrating rollers, and vertical sand drains.

In discussion Prof. Hansbo described some of the difficulties experienced with cutter suction dredges where a very small stone content in the material being dredged had resulted in an enormous increase in cost because of what was an apparent cutting difficulty.

GUEST LECTURE

"Application of Stress Wave Theory on Pile Driving"

Prof. B.B. Broms, Swedish Royal Institute of Technology.

Prof. Broms spoke about the basic equations that governed the propogation of stress waves in piles; the effect of the size and weight of the driving hammer; the effect of cracks and joints in piles; the response of the soil under transient forces during driving; the methods of predicting pile capacity during driving and the control of stress limits in the pile during driving operations and the use of the stress measurement to investigate the performance of the pile driving hammer.

The stress wave method depends on the use of a strain gauge and an accelerometer attached to the top of the pile. These accelerometers are capable of recording accelerations of 100g and the output from them is electrically integrated to give the velocity of the stress waves in the pile. From the outputs of the strain gauge and the accelerometer, various properties of the pile can be readily determined, faults such as cracks or failures revealed, and length of the pile driven and the bearing capacity of the pile.

SESSION: PILES AND PIERS

Moderator: Dr D.J. Henkel, Ove Arup and Partners, London.

Dr Henkel chose to review the essential problems in the design and construction of piles and piers. With the advent of off-shore activities in the 1970's longer and longer piles became prevalent and a lot of research was initiated and many papers written.

He reviewed briefly the papers which have been published and discussed the combined load carrying by skin friction and end bearing and the horizontal load capacity of piles.

SESSION: RETAINING WALLS AND BASEMENTS

Moderator: Dr A.W. Malone, Geotechnical Control Office, Hong Kong.

Dr Malone spoke about the use of walls in Hong Kong and commenced by describing gabion walls, which although easy to design and construct seem to have fallen out of favour.

A wall type probably peculiar to Hong Kong is the hand dug caisson wall with either contiguous caissons or short gaps in between which are in-filled with panels of concrete. In both types the wall is a cantilever with the bottom of the caisson sufficiently deep below the lower ground level to provide adequate anchorage against overturning.

Aspects of sheet pile wall design relating to failures of some sheet piled basements were discussed. Typically there was inadequate toe support due to insufficient pile penetration, and buckling from inadequate stiffening of props occurred.

Dr Malone discussed the use of diaphram walls which have been quite extensively used in Hong Kong. It is important with this type of wall to ensure that the bentonite mud filling of the excavated trench exceeds the static groundwater, to reduce the risk of side wall collapse during construction. Anchored walls were also discussed. These have been used extensively in Hong Kong in the early 1980's, but since that period serious corrosion problems have occurred. As a result, designers in Hong Kong have been subjecting anchored walls to much more rigorous examination.

FORUM: DEEP FOUNDATIONS AND EXCAVATIONS

Chairman: Tan Sri Prof. F.K. Chin
Panellists: Prof. B.B. Broms, Dr L.J. Endicott, Dr D.J. Henkel, Dr S.L. Lee, Dr A.W. Malone and Dr H. Mori.

Under British Law, if you remove water by dewatering and cause damage to adjacent property you are not liable for the damage. The panel were asked how they would distinguish between damage caused by the removal of water and that caused by removal of support by lateral movement of retaining walls or other soil movement. The panel was divided in views on this question. Dewatering is undoubtedly likely to cause damage, but greater damage could result from lateral soil movements. If dewatering is done before any other activity any movement from this cause could be identified.

SESSION: SOIL IMPROVEMENT

Moderator: Dr Z.C. Moh, MAA Engineering Consultants (HK) Ltd. Hong Kong.

In his remarks the moderator described a number of examples of soft ground engineering problems including the use of vertical drainage, surcharge loading and compaction techniques.

SESSION: SETTLEMENT

Moderator: Dr R. Foott, Dames and Moore, Hong Kong.

Dr Foott briefly reviewed the set papers bringing out particular points raised in them and then posed a number of questions as to how one investigates the settlement models used and whether they represent actual soils. Finally he described work undertaken with trial marine fills and embankments and the instrumentation used at the site of the proposed new airport on Lantau Island, which would involve the reclamation of 600 hectares of land.

FORUM: SLOPE STABILITY

Chairman: Prof. P. Lumb.
Panellist: Mr H. Beatie; Dr E.W. Brand; Prof. N. Janbu; Prof. J.L. Knill; Mr D.J. Varnes.

Prof. Lumb opened the discussion with the question - what real progress has there been in the last 10 years on the understanding of Slope Stability problems.

Mr Varnes commented that over the last 15 years there had been an increase in the understanding and application of engineering geology and also the way in which geological data is processed. Prof. Knill said there was a greatly improved ability to observe characteristics in rock masses such as defects and the data obtained from joint surveys can be used to help analyse the safety of a rock slope.

Prof. Janbu expressed the view that slope stability was just a special case of soil stability. If one had a filled platform on soft ground, or a slope, the problem is esentially one of soil stability.

Dr Brand thought that 10 years was a very short time and a much longer time scale is needed to make progress in some areas. He cited the case of London clay studies extending over many years before its long term behaviour was understood. He considered that terrain evaluation maps were a major step in the right direction, and in Hong Kong in particular, site investigation methods had improved enormously in the last 10 years. Mr Beatie said he thought the greatest advance in the last 8 years was the growth in the science of geotechnology giving a much more integrated view of soil mechanics and rock mechanics.

There was a lengthy discussion on the real meaning of the "factor of safety" as applied to slopes. It was generally agreed this was mainly to cover up areas of ignorance. Where there was accurate knowledge of a material and its behaviour "factor of safety" can be substantially smaller than otherwise. However with slope analyses there are unknown factors because it is difficult to explain why some slopes remain standing when theoretical analysis shows they are unsafe. The Geotechnical Control Office CHASE investigation was an attempt to find some answers to this on an empirical basis by observing and collecting data from a large number of slopes.

GEOLOGICAL SOCIETY OF NEW ZEALAND

SUBMISSION TO THE M.W.D. COMMITTEE TO INQUIRE INTO THE WHEAO CANAL FAILURE

1. INTRODUCTION

The Geological Society of New Zealand Incorporated is an organisation representing the interests of the wider geological community in New Zealand. Professional and amature geologists from both public and private organisations make up the Society.

The Geological Society of New Zealand, through a specialist subcommittee drawn from its own members, wishes to present the following submission to the committee to inquire into the Wheao Canal failure.

In particular, with respect to the "terms of reference" provided for the inquiry, the Society commented on two aspects:

i) Geological factors which may have contributed to the failure of the canal and;
ii) The role of engineering geology in investigations, design and construction.

The Society understands that geological investigations into the Wheao Power Scheme were carried out and presented in a number of reports, which it did not see and does not refer to. Therefore our submission in this regard is confined to principles and general practice, applicable to the Wheao and other Projects.

Our comments on the role of engineering geology are made in a helpful, positive, and constructive spirit with the objective of contributing towards the safety and integrity of such projects.

We do not intend any criticism of the Wheao investigations. The points we raised in Section 3 are intended to indicate the level of engineering geological involvement that we consider necessary.

2. GEOLOGICAL FACTORS WHICH MAY HAVE CONTRIBUTED TO THE FAILURE OF THE CANAL

Because we have been able to conduct only one very brief site inspection of the failure area, we cannot provide a thorough engineering geological assessment or put forward failure models. Of necessity, our comments were confined to some general and preliminary observations, which may be relevant.

2.1 The Volcanic Plateau is characterised by a complex history of voluminous eruptions and of weathering and erosion over the last few million years. The high degree of volcanic activity continues. The result is a wide range of natural materials presenting a full rock to soil spectrum, including a widespread and complex sequence of tephras and ignimbrite deposits, modified by weathering and erosion to varying extents.

These features of the region combine to provide:

i) Unpredictable subsurface geometry, especially at a scale significant to ground engineering.

ii) Widely variable geotechnical properties - both of the intact materials and of the formations they make up.

iii) Highly porous and permeable deposits with a potential for collapse and for piping and tunnel erosion.

iv) Clayey deposits with a high degree of sensitivity.

v) Complex groundwater conditions with a potential for promoting instability of slopes.

vi) Difficulty of observation and recognition of the above features, as a result of the restricted exposures and a mantle of tephra and colluvium.

2.2 A brief, preliminary inspection of the failure area adjacent to the penstocks intake structure at the end of the Wheao Canal revealed geologic features which fit into some of the categories listed above. Specifically the following features were observed.

2.2.1 Ignimbrite Rockmass

(i) An ignimbrite rockmass forms the floor of the failure channel and contains an open, near-vertical, persistent and intersecting fracture system (Figures 1 and 2).

(ii) Grooving, parallel to the failure channel sides, occurs on top of the fractured ignimbrite rockmass. These grooves are a few millimetres deep and wide and several centimetres long. (Figure 1)

2.2.2 Soils overlying the rockmass

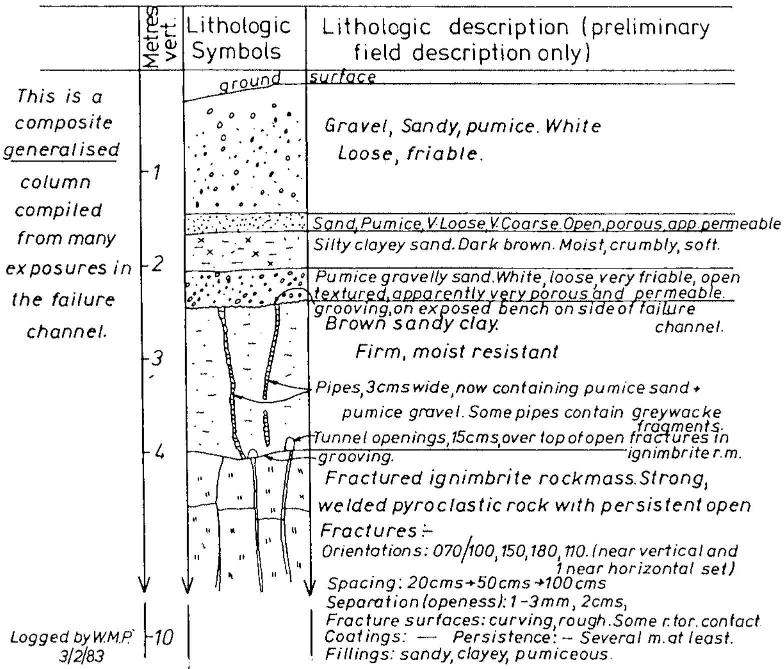
(i) An overlying sequence of soils consists of sandy clay and loose, permeable sands and gravels of low density rhyolitic pumice (Figures 1 and 2).

(NOTE: The following terms have been used according to these definitions:
tephra:- A general term for all clastic (fragmental, particulate) material derived by volcanic explosion or aerial expulsion from a volcanic vent.
ignimbrite:- Rock and soil deposits formed by widespread deposition of material from ash-flows and incandescent glowing-cloud eruptions.
colluvium:- Any mass of soil material (including large fragments and blocks of rock) detached from a higher part of a slope and deposited by wash or mass movement lower down the slope.)

FIGURE 1

WHEAO; Canal Failure Channel.

Preliminary lithologic Column compiled from the exposure created by the failure channel.



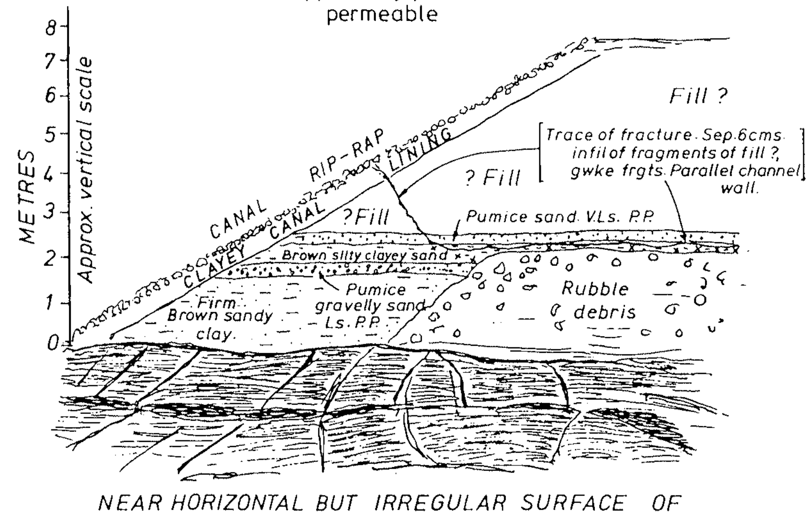
Note: Dimensions are in the vertical axis are an approximate average only.

FIGURE 2

WHEAO: Canal Failure Channel

Preliminary Sketch log, of the western side of the head of the failure channel, adjacent to the canal. Elevation view. Generalised log. (Refer to lithologic column also)

Ls = loose
PP = apparently porous & permeable



NEAR HORIZONTAL BUT IRREGULAR SURFACE OF FRACTURED IGNIMBRITE ROCK MASS, EXPOSED IN FLOOR OF FAILURE CHANNEL.

Logged by W.M.P. 3/2/83

(ii) Immediately on top of the fractured ignimbrite rock mass is a 1 to 2 metre thick, brown sandy clay which is firm, resistant, and moist. The sandy clay is traversed by a number of vertical pipes, each a few centimetres wide, and now containing pumice sand and gravel and in some cases small greywacke fragments. There are also some large pipe openings and tunnels, each several centimetres wide, at the base of the sandy clay (Figure 1). These openings are located immediately over some of the more open fractures in the ignimbrite rock mass. Small grooves, a few millimetres deep and wide and tens of centimetres long, occur on the top of brown sandy clay which is exposed as a bench on either side of the failure channel (Figure 1).

(iii) Overlying the brown sandy clay is a sequence of white pumice gravelly sand, dark brown clayey sand, white pumice sand, and pumice sandy gravel, the aggregate thickness of which averages 2 metres or more. The dark brown clayey sand is firm and moist. The pumice sands and gravels are very loose or loose (respectively), porous, of low density and apparently highly permeable. The sands appear to be poorly graded (Figures 1 and 2).

These soil layers and the underlying ignimbrite rock mass extend gently back up the length of the failure channel from its intersection with the wall of a steep narrow natural gully (leading down to the Wheao River) to the canal where they can be seen to abut directly against the underside of the canal lining (Figure 2).

2.3 The features described could have played a part in the failure of the canal and are seen as being significantly and potentially hazardous to integrity of the canal but we were unable to conclude in this regard and could not do so without much more data and analysis.

To provide a more precise and conclusive assessment would require a review of all the geological information on which the decisions of location, design, and construction methods are based. We would also need to review the construction/excavation engineering geological records and make a detailed assessment of the failure itself, including field investigations and laboratory testing.

The natural formations exposed in the failure channel are exposed elsewhere in road cuts above the canal. Presumably, they were also exposed in the canal excavation.

We would point out that:

a) Some failures could be attributed to apparently minor geological features whose significance was not appreciated at the time of observation in some exposure or excavation.

b) Deduction of how failure occurs is easier after the event than is prediction and avoidance of it beforehand. Even a considerable amount of investigation may not lead to successful prediction and avoidance.

3. THE ROLE OF ENGINEERING GEOLOGY IN THE INVESTIGATIONS, DESIGN, AND CONSTRUCTION OF PROJECTS SUCH AS THE WHEAO POWER SCHEME.

3.1 Introductory Comment

This section, the main point of the submission, has wide implications. The Geological Society of NZ is concerned at the number of major ground failures and narrowly averted failures in recent years involving geological factors, (e.g. Abbotsford, Omokoroa, Ruahihi and Wheao). We consider that the geological profession is able to advise the planners, designers and owners of engineering works with a view to minimising the incidence of failures of this kind.

The Society believes that planners and developers are not yet generally aware of the high potential for difficulties with ground engineering works, which can be directly related to the scale and range of the geological complexity of New Zealand when compared with most other developed countries. In this regard, we perceive that there is a pressing need for education within the profession of the necessity for adequate engineering geological and geotechnical input in projects involving ground engineering.

The Society views with concern the present situation whereby major capital works may be undertaken involving consideration of ground conditions without having to seek geological advice. Normally such advice is sought for major works, an area where it has achieved considerable success, but the need for it is not determined by geologists themselves, nor is it prescribed in any statute, so far as we are aware.

Appraisal of geological conditions for engineering works should be undertaken by engineering geologists, that is professionally qualified geologists who are trained or directly experienced in the application and communication of geological techniques and principles in engineering. The obligatory and continuous involvement of engineering geologists from inception through to operational monitoring and surveillance in ground engineering works is, we believe, a necessary measure if the incidence of failures due to geological causes is to be reduced. This would substantially increase their involvement in such works.

To bring this about, we submit the following points, which we see as positive steps to help ensure the safety and integrity of current and future projects. We have five points to make and strongly recommend that these should be acted upon:

3.2 Recommendations

(i) Planning teams should include an engineering geologist, from the very outset of the project. To do otherwise is to beg the geological questions. A less rigorous approach, with the best intent, may not recognise critical geologic features.

(ii) Engineering geologists should be actively and fully involved from the inception of projects through the feasibility, design, investigation, construction, and monitoring phases. Time and money must be allocated for this in determining the budget and the viability of the project and the allocation should be arrived at in collaboration with the engineering geologist.

(iii) A project engineering geologist should take a leading role in helping to direct investigation programmes of natural ground and maintain logging and recording of all available engineering geological data throughput investigation and construction. This includes full and detailed construction excavation logging and recording, the value of which may only become apparent when a potentially dangerous ground condition is detected and recognised fully for the first time in some construction excavation. Only in this way can the fullest possible picture of engineering geological conditions be arrived at and the greatest opportunity be created for recognising potentially dangerous ground conditions which may at least require treatment or design modification, and at worst could lead to disastrous failure.

The size of any scheme does not lessen the need for engineering geology and a similar component of geologic work may be required for both small and large projects, depending on the nature and variability of ground conditions.

It cannot be over-emphasised that the role of engineering geology within the geotechnical team is to help determine that sufficient investigations have been carried out to ensure that as far as possible all potentially adverse ground conditions have been either identified, avoided or eliminated. The nature and extent of investigations required to achieve this will vary from place to place according to the particular geological environment. The volcanic plateau, for example, warrants a very different approach than, say the Tertiary sedimentary deposits elsewhere in the North Island or the greywackes of Wellington and the South Island.

In particular, in the terrain of the volcanic plateau, the problem demands that every available piece of information created during investigation and construction is recorded and interpreted by an engineering geologist, preferably based on site, to optimise such opportunities. This monitoring is most effective when combined with the standard practice of detailed engineering geologic mapping and research of the locality in and around the project.

There is a potential for misidentification and miscorrelation of the volcanic lithologic units and this can readily lead to:

- Over-simplification or misunderstanding of the geologic history and, consequently, the non-recognition of potential failure horizons, weak zones, weak layers and groundwater regimes.
- Misunderstanding of the basic properties of the materials for geotechnical purposes.

The basic and fundamental properties of the volcanic materials involved, and their complex geometry and variation as deposits, are the subject of research for which there is, so far, little published material that is widely available. These features require expert advice and sophisticated analytical facilities in addition to the engineering geologist's work. This should be an obligatory accompaniment to the project engineering geologist's responsibilities. Provision must be made to use these services under his co-ordination. In view of these features, location and recognition of dangerous geologic situations is a difficult problem, (at times perhaps impossible) the solution of which is not adequately met by limited investigation resources and may frequently require extensive exploratory excavation by trenching, deep pits, shafts and drives. Current opinion is that a major contribution of research in volcanic terrain is required. We wholeheartedly support this idea and see it as an area of urgent need, requiring a wide spectrum of Earth Science and geotechnical engineering expertise.

(iv) The decision-making committees involved with hydro-electric schemes, dams and other ground engineering works, should include an engineering geologist. Provisions of this kind are seen as a necessary catalyst for the proper and full use of engineering geological expertise in New Zealand. It is not sufficient to obtain merely preliminary engineering geological reports. A continuing involvement is required throughout a project. It is highly desirable also that engineering geologists be involved in design decisions, as well as providing the geological information on which they are based.

(v) Ways need to be found that engineering geological expertise is used: One view is that legislation involving engineering geologists should be formulated to expedite and ensure that full and proper use of engineering geological expertise and geological specialist knowledge in New Zealand occurs.

Another view, which is preferable and more positive, is to educate the profession(s) involved so that there will be a widespread, moral obligation to seek and use engineering geological expertise along the lines we have recommended.

Professional education of this kind is likely to be a much more successful vehicle for ensuring the full and proper use of engineering geological expertise than is legislation. A wide range of institutions have a part to play in the education process, including those responsible for Tertiary education, and also those which make up the learned and professional societies and their technical groups.

Submission prepared by W M Prebble (Convenor), with B W Riddolls, G D Mansergh and M J Isaac for Geological Hazards Subcommittee.

LETTERS TO THE EDITOR

The following items of correspondence have been received by the Editor:

Sir,

I would like to add my comments on the name of our Society to those of Riddolls and Olsen, which appeared in the last issue of Geomechanics News. I was a member of a small subcommittee that was involved with the setting up of the N.Z. Geomechanics Society. With regard to the choice of name it seemed quite important to follow the name of the then recently established Australian Geomechanics Society. The concept followed in both Australia and New Zealand of gathering the local representation of the three International Societies into one group had not been followed elsewhere. Given that Australia and New Zealand comprise the Australasian region for all three International Societies there seemed to be much in favour of keeping the names of the two societies similar. Thus in 1972 the name: New Zealand Geomechanics Society, seemed eminently suitable.

Since then there has been ample time to reflect, and I have come to a view similar to that of Riddolls and Olsen; namely, that the 'mechanics' part of the name does not reflect adequately the wider engineering perspective of our Society, and certainly does not convey the equal status engineering geology enjoys with soil mechanics and rock mechanics. Our Society is devoted to fostering knowledge of those things 'geo' (other than the hydrology of surface runoff) that relate to engineering. (In fact one could go much further than soil mechanics, rock mechanics and engineering geology - what about soil science, geomorphology and geophysics?).

Since 1972 the name "Geotechnical" has come into more frequent usage. We hear of the British Geotechnical Society. The American Society of Civil Engineers changed the name of the soil mechanics and foundation engineering journal to the Journal of the Geotechnical Engineering Division of the ASCE in 1974. Other possible names would be Geoengineering, Ground Engineering or Geotechnics. No doubt there are several other contenders that would convey the scope of our soceity better than Geomechanics.

Thus I support Riddolls and Olsen that it is appropriate to consider again the name of our Society.

M.J. PENDER
Senior Lecturer in Civil Engineering

Dear Sir,

In your June 1983 issue (No. 26) Messrs Riddolls and Olsen suggested changing the name of the Society from "Geomechanics" to "Geotechnical". In a letter to you published in issue No. 10 (May 1975) I discussed the meaning of the concept "geomechanics" and suggested that there were etymological reasons for the use of the term "geomechanics" to describe it. The concept of geomechanics was also dicussed by Dr Pender in issue No. 9.

Personally I am not greatly concerned what name the Society goes by (even "The Black and White Minstrel Show" would do !) but I would point out that change will give rise to some tricky decisions. For example, will future Australasian Geomechanics Conferences held in New Zealand be called "Australasian Geotechnical Conferences"? Will we change the name of Geomechanics News? Can we persuade the Australians to follow our lead?

But I am disturbed by the reason for change advanced by Messrs Riddolls and Olsen. They say "all members of the Society practice in the field of geotechnical engineering". This seems to clash with our rules which state (part rule 3.2):

> "... membership is in no way restricted to those eligible for membership of the Institution...."

They may not mean to be elitist in talking of "geotechnical engineering" but their claim could well be taken by soil scientists, well drillers, soil mechanics technicians and other non engineers who practice geomechanics to imply that the Society no longer wants them as members. That wold be a complete reversal of the policy that I have seen develop in the Society over the years. It is one of the merits of the name "Geomechanics Society" that it does not give undue prominence to "geotechnical engineers" or any other sub group. The Society was set up as a meeting place for all who practice geomechanics irrespective of the qualification they hold or the skills they posses. As a Technical Group of IPENZ it cannot help but be biased towards engineering. We who are engineers should therefore do everything we can to damp down that bias in our participation in the Society.

Change the name if you have good reason. But not at the expense of those, such as technicians in a "geomechanics laboratory", who are not engineers.

J.H.H. Galloway.

FROM THE INTERNATIONAL VICE CHAIRMEN

1. ROCK MECHANICS

1.1 ISRM Working Groups

A call for contributors to working groups of the Commission of Testing Methods is being made. Details of the terms of reference and method of appointment are available from the Vice-Chairman.

The proposed working groups, 1983-87 are:

1. Surface Seismic Method.
2. Deformability using Borehole Dilatometers.
3. Deformability using Flatjacks.
4. Deformability by Insitu Testing of Blocks in Uniaxial Compression.
5. Convergence Monitoring.
6. Conventional Surveying.
7. Crack and Fault Movement Monitoring.
8. Ground Vibration Monitoring.
9. Rock Anchor Testing.
10. Shotcrete Testing.
11. Hydrogeologic Testing.
12. Stress Determination.
13. Drilling and Boring Tests.
14. Fracture Toughness Tests.
15. Book Format Publication.
16. Thermal Characteristics.
17. Aggregate Tests.
18. Dynamic Elastic Properties.
19. Monitoring (Additions).
20. Uniaxial Tests (Revision).
21. Point Load Test (Revision).
22. Triaxial Test (Revision).

1.2 The 6th Congress of the ISRM will be held in Montreal in 1986.

1.3 The regional Vice President for Australasia for the 1983-87 term will again be Mr W. (Bill) E. Bamford, Monash University.

2. SOIL MECHANICS

2.1 Abstracts for papers for presentation at the 1985 XI ICSMFE San Fransico Conference should be in the hands of the Secretary, NZGS no later than 20 December 1983.

2.2 Published in this issue is a draft test procedure for the SPT being prepared by the International Society. Any comments you may wish to make on the draft should be sent to the Secretary, NZGS.

2.3 The NZGS is continuing with its plans to prepare a commemorative volume of NZ papers for the 1985 San Fransico Conference. If you have published a paper in the last 10 years which you would like to submit for presentation in such a volume please notify the Secretary. NZ engineering firms will be approached in the near future for funding assistance for such a volume.

LOCAL GROUP ACTIVITIES

AUCKLAND GROUP

Three meetings were held during the latter half of the year, the first on 5 July 1983 covering the stability of land for housing development and entitled "Everything You Ever Wanted to Know about Sectin 641A, But Were Too Afraid to Ask". A panel of three speakers, comprising Mr P. Kovasovich, the Mt Roskill Borough Engineer; Mr N. Rogers, Tonkin and Tayor Ltd and Mr B. Gallagher, Barrister and Solicitor covered this topic from three angles and stimulated a lively discussion from the attendance of about 50 members.

On 4 October, Mr Jim Schofield of the Geological Survey, Otara, presented an explanation of the new geological maps which he has prepared covering the Auckland area from near Warkworth to the mouth of the Waikato River. Mr Schofield will shortly be retiring and this was the last opportunity to disseminate information on this region of vital interest to those in the Auckland area. The maps themselves are not likely to be published until near the end of 1984. The meeting was unfortunately rather poorly attended for such an important topic particularly as such a good presentation was made which resulted in the audience obtaining a much better understanding of this geologically complex area. In particular, Mr Schofield dealt with the origins and properties of the Onerahi Chaos Breccia north of Auckland. The maps which will eventually be published were excellent showing the 'form lines' and enabling a much better understanding of the geological structure than can be obtained from the present maps. We await their publication with great interest.

Professor David Stapledon rounded off the year on 1 December with an excellent talk on "The Geotechnical Specialist and Contractural Disputes" which stimulated a lively discussion. This meeting was a joint meeting with the Auckland Branch of I.P.E.N.Z. and the New Zealand Society on Large Dams. The topic generated a lively discussion among the 40 people attending. After Professor Stapledon's meeting, an end of year dinner was arranged in the University Club and in this relaxed atmosphere a very pleasant meal was enjoyed by the 23 members attending.

The Auckland Committee wishes to thank the speakers and the members of the Society for their support at meetings. We would like to also thank the University of Auckland, where all these meetings were held, for their great support and assistance. Finally I would like to thank the Auckland Committee for the work they have put in during the year.

P.B. Riley.

WELLINGTON GROUP

On Thursday 21st July Ian Brown and Bernard Hegan from the N.Z. Geological Survey reported on the 5th International Society of Rock Mechanics Congress held in Melbourne in April 1983. Ian Brown discussed some aspects of the Congress and reported on a field trip to the coal mines of the Latrobe Valley. (For those interested Ian presented a written report on the congress which was published in the June 1983 Geomechanics News). Bernard Hegan gave an interesting report on a post conference tour to the Thompson and Bluerock Dams in Victoria. He gave the audience an insight into the seepage and stability problems being experienced.

On Thursday 27 October a combined meeting was held with NZSOLD and the Wellington Branch of IPENZ. Trevor Jones, Chairman of the MWD Wheao Inquiry, presented a very interesting report on the Inquiry into the Wheao Canal Failure. This stimulated a lively technical discussin in which Trevor was capably assisted by his three committee members John Galloway, Alan Howarth and Graham Ramsay. Society members interested in the findings of the inquiry are referred to the report which the Committee prepared, available from the Government Printer.

D.N. Jennings.

INTERNATIONAL TUNNELLING ASSOCIATION

NINTH ANNUAL MEETING - WARSAW 1983

PRESS RELEASE

The International Tunnelling Association held its ninth annual meeting in Warsaw from the 15th to the 19th May 1983 in conjunction with the International Symposium "Underground Works - Man - Environment". The meeting was attended by representatives, delegates, observers and working group members of 22 of the 33 member nations of the association and 2 representatives of the International Association.

1. MEMBER NATIONS REPRESENTED

South Africa, Federal Republic of Germany, Austria, Belgium, Canada, People's Republic of China, Hungary, Spain, United States of America, Finland, France, Iceland, Italy, Japan, Netherlands, Norway, Poland, United Kingdom, Sweden, Switzerland, Czechoslovakia, Venezuela.

2. MEMBER NATIONS NOT REPRESENTED

Algeria, Australia, Brazil, Columbia, Republic of Korea, Greece, India, Irak, Mexico, New Zealand, Turkey.

3. ORGANISATION

The Association has registered two new member nations: Columbia and Hungary and one resignation: Denmark. The new category of members "affiliates" permitted the adhesion of 14 corporate members and 5 individuals.

The new Executive Council is the following:

J K Lemley	USA	President	until 1986
G Girnau	FRG	Past President	until 1989
H C Fisher	Sweden	Past President	until 1986
A M Muir Wood	United Kingdom	Honorary President	
E Broch	Norway	Vice President	until 1986
HPS Van Lohuizen	Netherlands	Vice President	until 1986
E Tegido Nogues	Spain		until 1987
Y Onouchi	Japan		until 1987
GAO Ouoing	PR China		until 1985
Z Gergowicz	Poland		until 1985
V Roisin	Belgium	Secretary General	

4. WORKING GROUPS

Each of the ten working groups previously created held working sessions during this conference.

4.1 Working Group STANDARDISATION (A. Hurpin - France)

The group met twice with four nations represented. The group undertook the study for standardization of circular tunnel profiles. A draft has been prepared and will be sent for comment to ITA Member Nations.

The group examined the state of preparation of the technical glossary. The glossary of terms for conventional excavation will be published before the next meeting in English, French, German and Japanese.

4.2 Working Group RESEARCH (J.F. Bougard - France)

The group gathered 13 people representing 10 countries. The present activities of the group are related to:
- The use of tunnel boring machines in hard rock: after completion of the first part of the chapter "needs of research" remains to be developed.
- Problems associated with water.

The Working Group has commenced a number of studies about extruded linings and settlements in urban sites and to up-date the list of research studies led by member nations.

4.3 Working Group CONTRACTUAL SHARING OF RISKS (J. Leeney - UK)

Nine nations were represented at the working group sessions:
Belgium, China, France, Germany, Iceland, Japan, Sweden and the United Kingdom.

Recommendations on the provision of insurance and on the operation of performance bonds for underground construction contracts were approved by the group for adoption as policy by the International Tunnelling Association and work on the "Role of the Engineer" and "Measurement Problems" progressed.

A dialogue with the Federation Internationale des Ingenieurs Conseils, F.I.D.I.C., to modify the international conditions of contract to incorporate the recommendations of the I.T.A. has commenced and a working sub-group was formed to draft the necessary amendments to the F.I.D.I.C. form.

4.4 Working Group SUBSURFACE PLANNING (K. Pronk - Netherlands on behalf M. Barker - USA)

The working group on Subsurface Planning had two meetings. Seventeen participants representing twelve countries took part in the discussions.

Eight presentations were made, five of which treated aspects of the energy related use of the subsurface, the subject on which the group was concentrating this year. Five papers were received and four more are expected to be received in the near future. The group decided to continue focussing on the energy aspect, without excluding other contributions within the wider field of interest of the group. The Working Group will try to provide recommendations to the Executive Council on the energy related use of the subsurface during the meeting in Caracas next year.

4.5 Working Group CATALOG OF TUNNELS (G. Fokuchi - Japan)

The meeting of the Working Group Catalog of Tunnels was held with eight participants from six countries: People's Republic of China, France, Germany, Italy, Japan and United Kingdom. The working group has suggested that the preparation of the catalogues should be revised for future projects every year, for those under construction every two years, and for those completed - every three years. Further methods to promote the low cost distribution of this information to member countries have been discussed.

4.6 Working Group MAINTENANCE AND REPAIR OF UNDERGROUND STRUCTURES (A.M. Muir Wood - UK on behalf of M. O'Reilly - UK)

The Working Group on Maintenance and Repair of Underground Structures has reviewed a programme for more effective work during the next two years, recognizing the increasing importance, on economic and social terms of this aspect of ITA's interests.

4.7 Working Group GENERAL APPROACHES TO THE DESIGN OF TUNNELS (P. Ges - France on behalf of H. Duddeck -FRG)

The Working Group General Approaches to the Design of Tunnels gathered the representatives of 5 nations. Following the set of recommendations which had been decided in Brighton in 1982, the work of the group will concentrate on the following four items, which constitute the basic steps of every design procedure:
- choice of geological, hydrogeological, geotechnical, geometrical and environmental parameters;
- in situ monitoring, to check the behaviour of the structure;
- practical rules, derived by the conditions of construction, durability and/or operation of the completed work.

Tentative recommendations are to be prepared on the basis of existing documents in some member nations, namely in Japan, Switzerland and France.

4.8 Working Group SEISMIC EFFECTS ON UNDERGROUND STRUCTURES (H.C. Fisher - Sweden on behalf of W. Hakala - U.S.A)

It is likely that the main objective of the working group, namely the production of a monograph on Aseismic Design of Underground Structures, will be completed in 1984.

4.9 Working Group HEALTH AND SAFETY IN WORK (N. Krige - RSA)

The Working Group met on two occasions. Nine delegates representing Japan, France, Germany, People's Republic of China and South Africa attended the meetings.

The Working Group approved the design proposals for 6 new safety signs. The designs will now be finalized and then presented for approval.
The working group discussed the document "Guidelines for Good Tunnelling Practice" and accepted the amendments proposed by the tutor of the working group. The amended document will be distributed as soon as possible.

The working group also discussed the use of compressed air in tunnels and decided that the same guidelines on the proper use of compressed air could be developed. With regard to electrical installations it was decided to develop guidelines using existing regulations of various countries as the basis.

4.10 Working Group COST/BENEFITS OF UNDERGROUND URBAN PUBLIC TRANSPORTATION (M. Blenneman - FRG)

The Working Group was established one year ago with members of 11 nations. The tasks of the group are twofold:
- The first is to collect data on the effects and benefits of underground urban public transportation systems and to publish them in a worldwide survey.
- The second task is to study methods of cost-benefit estimations as a tool for showing the positive effects of underground urban railway systems.

The activities of the first year focused on the collection of data. The Warsaw meeting of the group was attended by delegates from 7 countries. Several papers were presented regarding national activities within the stated tasks of the group. This will lead to a draft report which will fulfill the first aim of the group's work.

5. OPEN SESSION - "URBAN CONTRACTING AND THE ENVIRONMENT"

This session, which took place on Wednesday 18th May 1983, was jointly chaired by Mr G Girnau (ITA) and Mr Stamatello (NOT). After a general lecture given by Mr V Roisin evocating the various constraining factors affecting tunnelling operations in cities, six speakers presented reports on some personal experiences in their respective countries. Mr Tore Braten (N),W Quietz (FRG), M Legeais (Fr), J Lemley (USA), T Romanowski (PL), J Vanderlinden (B) gave information about delicate underground contracting operations dominated by the necessity of saving the environment, of respecting the foreseen completion schedule and of respecting all conditions of the contract. A fruitful discussion followed in conclusion of the session.

The main results of the activity of the Working Groups, the report of the open session, the main decisions of the General Assembly, will be published in the ITA Journal "Advances in Tunnelling Technology and Subsurface Use" published by PERGAMON PRESS.

The next annual meeting will be held in Caracas, Venezuela in June 1984 in conjunction with the 1st Latin American Congress of Underground Works of which the main theme is "Underground Constructions in Heterogeneous Soils". ITA member nations are requested to encourage their members to submit papers to be presented during the Congress.

A SYSTEM FOR IMPROVED DESCRIPTION OF ENGINEERING PROPERTIES OF GEOLOGICAL MATERIALS

B.W. Riddolls, G.G. Grocott.

One of the roles of geologists involved in geotechnical engineering has been as translators of geological terminology and concepts. This might not be so necessary if traditional descriptive geological terminology provided an indication of the physical properties of geological materials.

The geotechnical fraternity has made many attempts at devising systems for describing and classifying geological materials for engineering purposes. The best known of these is the 2-fold distinction between "rock" and "soil". The terms beg definition, but in general, "rock" is difficult to disaggregate whereas "soil" is not. Engineering geologists have tended to follow the "soil/rock" system, to try to ensure effective communication with engineers.

The "soil/rock" system has been adequate in most instances, but there are many materials which are intermediate. They include Tertiary sediments (often called "soft rocks") products of weathering, and volcanic deposits of various kinds.

It is therefore contended that a more flexible descriptive system is required. The basis for such a system is normal geological terminology, but qualified in terms of a simple scale of "relative strength", as follows:

RELATIVE STRENGTH TERM	**DEFINITION**
Very weak	Crushed, disaggregated or remoulded by hand.
Weak	Broken by hand only with difficulty; small thin pieces broken by finger pressure
Moderately Weak	One blow of hammer breaks sample.
Moderately Strong	Few firm blows of hammer required to break sample
Strong	Several blows of hammer required to break sample
Very Strong	Can only be chipped by hammer

Using these terms, it is possible, for example, to describe both "very weak" IGNIMBRITE and "very strong" IGNIMBRITE. Their geological origins are similar, but engineering properties very different. It will be evident that the "very weak" class corresponds with soil-like material, and that conventional classification procedures may be still followed as required, e.g:

"Very weak" grey IGNIMBRITE = soft silty SAND

It is believed that the "relative strength" concept has considerable potential for improving communication amongst geotechnical workers, and with their civil engineering colleagues and clients. Continued reliance on the "soil/rock" system in geotechnical description can too easily lead to oversimplification, increase the chances of misinterpretation, and so lead to failure.

GEOMECHANICS ACTIVITIES AT THE DEPARTMENT OF MINERAL TECHNOLOGY, OTAGO UNIVERSITY

J.D. St George and K. Rogan.

A number of projects in the geomechanical area are being undertaken by the Department of Mineral Technology.

SHEAR TESTING OF ROCKS

A shear cell for rock discontinuity testing has recently been built in the Department capable of applying a 10 tonne normal load on speciments with an area up to 100 cm^2. Tests to date have been limited to frictional properties on natural joints in Dunedin Phonolite and Hokonui sandstone. It is hoped to fully instrument the cell for normal and shear loads and displacements. The data by A/D conversion will be processed by a micro computer and stored on disk for further analysis.

PROBABILISTIC APPROACH TO SLOPE STABILITY

In open pit operations the stability of slopes is integrated into the mine planning by selection of bench heights, slope angles and direction of working. Theoretical work has begun on relating the acceptable risk involved in the overall mine plan to the probability of slope failure which is dependant on a number of uncertainties, predominantly shear strength properties of the geological units present and appropriate groundwater conditions.

GROUNDWATER EVALUATION

Aquifer transmissivity is, like many geological parameters, a correlated radom spatial variable. Most classical statistical methods would treat each value of transmissivity as an independent random variable and so the correlated nature of the data is lost. By applying geostatistical estimation techniques, which are well proven in mining applications, it is hoped that expensive drilling programmes may be optimised and the maximum amount of useful data recovered.

APPLICATION FOR MEMBERSHIP

OF

New Zealand Geomechanics Society
A TECHNICAL GROUP OF THE NEW ZEALAND INSTITUTION OF PROFESSIONAL ENGINEERS NEW ZEALAND

The Secretary,
Instituion of Professional Engineers N.Z.,
P.O. Box 12-241,
WELLINGTON.

I believe myself to be a proper person to be a member of the N.Z. Geomechanics Society and do hereby promise that, in the event of my admission, I will be governed by the Rules of the Society for the time being in force or as they may hereafter e amended and that I will promote the objects of the Society as far as may be in my power.

I hereby apply for membership of the New Zealand Geomechanics Society and supply the following details:

NAME ______________________________
(To be set out in full in block letters, surname last).

PERMANENT ADDRESS ______________________________

____

QUALIFICATIONS AND EXPERIENCE ______________________________

____

NAME OF PRESENT EMPLOYER ______________________________

NATURE OF DUTIES ______________________________

Affiliation to International Societies: (All members are required to be affiliated to at least one Society, and applicants are to indicate below the Society(ies) to which they wish to affiliate).
I wish to affiliate to:

International Society for Soil Mechanics and Foundation Engineering	(ISSMFE)	Yes/No	($7.00)
International Society for Rock Mechanics	(ISRM	Yes/No	($9.50)
International Association of Engineering Geology	(IAGE)	Yes/No	($4.50 $11.50 with Bulletin)

Signature of Applicant ______________________________

Date ____________________ 19 ______

N.B. Affiliation fees are in addition to the basic Geomechanics Society membership fee of $17.00

Nomination:

I ______________________________ being a financial member of the N.Z. Geomechanics Society hereby nominate ______________________________ for membership of the above Society.

Signed ______________________________ Date ____________________ 19 ______

NEW ZEALAND GEOMECHANICS SOCIETY

NOTIFICATION OF CHANGE OF ADDRESS

The Secretary,
The Institution of Professional Engineers New Zealand,
P.O. Box 12241,
WELLINGTON.

Dear Sir,

CHANGE OF ADDRESS

Could you please record my address for all New Zealand Geomechanics Society correspondence as follows:

____

____

____

Name: ______________________________

Address to which present correspondence is being sent:

____

____

____

Signature ____________________

Date ____________________