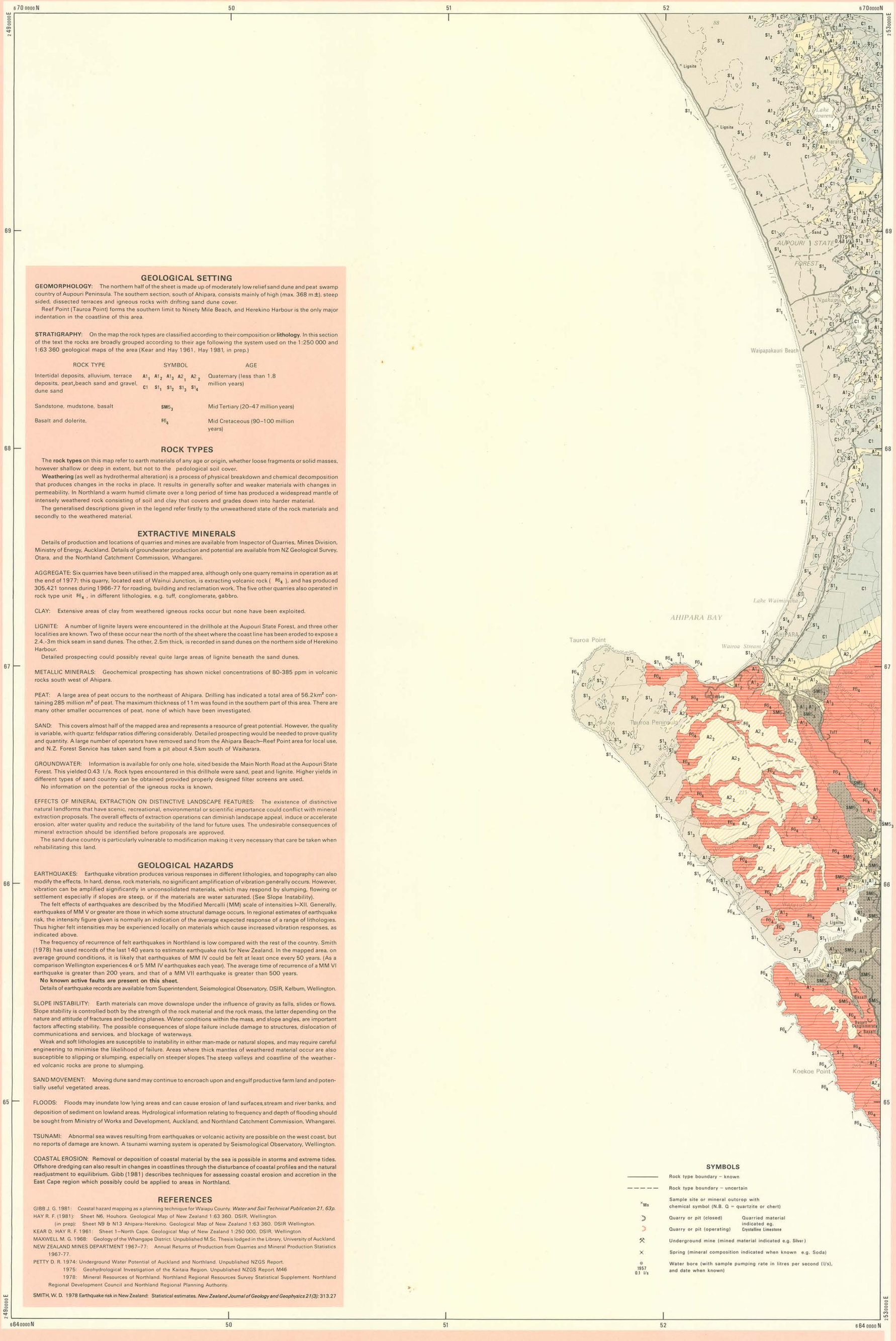
AHIPARA–HEREKINO



GEOLOGICAL SETTING

GEOMORPHOLOGY: The northern half of the sheet is made up of moderately low relief sand dune and peat swamp country of Aupouri Peninsula. The southern section, south of Ahipara, consists mainly of high (max. 368 m ±), steep sided, dissected terraces and igneous rocks with drifting sand dune cover.

Reef Point (Tauroa Point) forms the southern limit to Ninety Mile Beach, and Herekino Harbour is the only major indentation in the coastline of this area.

STRATIGRAPHY: On the map the rock types are classified according to their composition or **lithology**. In this section of the text the rocks are broadly grouped according to their age following the system used on the 1:250 000 and 1:63 360 geological maps of the area (Kear and Hay 1961, Hay 1981, in prep.)

ROCK TYPE	SYMBOL	AGE
Intertidal deposits, alluvium, terrace deposits, peat, beach sand and gravel, dune sand	$A1_1$ $A1_2$ $A1_3$ $A2_1$ $A2_2$ $C1$ $S1_1$ $S1_2$ $S1_3$ $S1_4$	Quaternary (less than 1.8 million years)
Sandstone, mudstone, basalt	$SM5_3$	Mid Tertiary (20–47 million years)
Basalt and dolerite,	$F6_4$	Mid Cretaceous (90–100 million years)

ROCK TYPES

The **rock types** on this map refer to earth materials of any age or origin, whether loose fragments or solid masses, however shallow or deep in extent, but not to the pedological soil cover.

Weathering (as well as hydrothermal alteration) is a process of physical breakdown and chemical decomposition that produces changes in the rocks in place. It results in generally softer and weaker materials with changes in permeability. In Northland a warm humid climate over a long period of time has produced a widespread mantle of intensely weathered rock consisting of soil and clay that covers and grades down into harder material.

The generalised descriptions given in the legend refer firstly to the unweathered state of the rock materials and secondly to the weathered material.

EXTRACTIVE MINERALS

Details of production and locations of quarries and mines are available from Inspector of Quarries, Mines Division, Ministry of Energy, Auckland. Details of groundwater production and potential are available from NZ Geological Survey, Otara, and the Northland Catchment Commission, Whangarei.

AGGREGATE: Six quarries have been utilised in the mapped area, although only one quarry remains in operation as at the end of 1977; this quarry, located east of Wainui Junction, is extracting volcanic rock ($F6_4$), and has produced 305,421 tonnes during 1966-77 for roading, building and reclamation work. The five other quarries also operated in rock type unit $F6_4$, in different lithologies, e.g. tuff, conglomerate, gabbro.

CLAY: Extensive areas of clay from weathered igneous rocks occur but none have been exploited.

LIGNITE: A number of lignite layers were encountered in the drillhole at the Aupouri State Forest, and three other localities are known. Two of these occur near the north of the sheet where the coast line has been eroded to expose a 2.4.-3m thick seam in sand dunes. The other, 2.5m thick, is recorded in sand dunes on the northern side of Herekino Harbour.

Detailed prospecting could possibly reveal quite large areas of lignite beneath the sand dunes.

METALLIC MINERALS: Geochemical prospecting has shown nickel concentrations of 80-385 ppm in volcanic rocks south west of Ahipara.

PEAT: A large area of peat occurs to the northeast of Ahipara. Drilling has indicated a total area of 56.2 km^2 containing 285 million m^3 of peat. The maximum thickness of 11 m was found in the southern part of this area. There are many other smaller occurrences of peat, none of which have been investigated.

SAND: This covers almost half of the mapped area and represents a resource of great potential. However, the quality is variable, with quartz: feldspar ratios differing considerably. Detailed prospecting would be needed to prove quality and quantity. A large number of operators have removed sand from the Ahipara Beach–Reef Point area for local use, and N.Z. Forest Service has taken sand from a pit about 4.5km south of Waiharara.

GROUNDWATER: Information is available for only one hole, sited beside the Main North Road at the Aupouri State Forest. This yielded 0.43 l/s. Rock types encountered in this drillhole were sand, peat and lignite. Higher yields in different types of sand country can be obtained provided properly designed filter screens are used.

No information on the potential of the igneous rocks is known.

EFFECTS OF MINERAL EXTRACTION ON DISTINCTIVE LANDSCAPE FEATURES: The existence of distinctive natural landforms that have scenic, recreational, environmental or scientific importance could conflict with mineral extraction proposals. The overall effects of extraction operations can diminish landscape appeal, induce or accelerate erosion, alter water quality and reduce the suitability of the land for future uses. The undesirable consequences of mineral extraction should be identified before proposals are approved.

The sand dune country is particularly vulnerable to modification making it very necessary that care be taken when rehabilitating this land.

GEOLOGICAL HAZARDS

EARTHQUAKES: Earthquake vibration produces various responses in different lithologies, and topography can also modify the effects. In hard, dense, rock materials, no significant amplification of vibration generally occurs. However, vibration can be amplified significantly in unconsolidated materials, which may respond by slumping, flowing or settlement especially if slopes are steep, or if the materials are water saturated. (See Slope Instability).

The felt effects of earthquakes are described by the Modified Mercalli (MM) scale of intensities I–XII. Generally, earthquakes of MM V or greater are those in which some structural damage occurs. In regional estimates of earthquake risk, the intensity figure given is normally an indication of the average expected response of a range of lithologies. Thus higher felt intensities may be experienced locally on materials which cause increased vibration responses, as indicated above.

The frequency of recurrence of felt earthquakes in Northland is low compared with the rest of the country. Smith (1978) has used records of the last 140 years to estimate earthquake risk for New Zealand. In the mapped area, on average ground conditions, it is likely that earthquakes of MM IV could be felt at least once every 50 years. (As a comparison Wellington experiences 4 or 5 MM IV earthquakes each year). The average time of recurrence of a MM VI earthquake is greater than 200 years, and that of a MM VII earthquake is greater than 500 years.

No known active faults are present on this sheet.

Details of earthquake records are available from Superintendent, Seismological Observatory, DSIR, Kelburn, Wellington.

SLOPE INSTABILITY: Earth materials can move downslope under the influence of gravity as falls, slides or flows. Slope stability is controlled both by the strength of the rock material and the rock mass, the latter depending on the nature and attitude of fractures and bedding planes. Water conditions within the mass, and slope angles, are important factors affecting stability. The possible consequences of slope failure include damage to structures, dislocation of communications and services, and blockage of waterways.

Weak and soft lithologies are susceptible to instability in either man-made or natural slopes, and may require careful engineering to minimise the likelihood of failure. Areas where thick mantles of weathered material occur are also susceptible to slipping or slumping, especially on steeper slopes. The steep valleys and coastline of the weathered volcanic rocks are prone to slumping.

SAND MOVEMENT: Moving dune sand may continue to encroach upon and engulf productive farm land and potentially useful vegetated areas.

FLOODS: Floods may inundate low lying areas and can cause erosion of land surfaces, stream and river banks, and deposition of sediment on lowland areas. Hydrological information relating to frequency and depth of flooding should be sought from Ministry of Works and Development, Auckland, and Northland Catchment Commission, Whangarei.

TSUNAMI: Abnormal sea waves resulting from earthquakes or volcanic activity are possible on the west coast, but no reports of damage are known. A tsunami warning system is operated by Seismological Observatory, Wellington.

COASTAL EROSION: Removal or deposition of coastal material by the sea is possible in storms and extreme tides. Offshore dredging can also result in changes in coastlines through the disturbance of coastal profiles and the natural readjustment to equilibrium. Gibb (1981) describes techniques for assessing coastal erosion and accretion in the East Cape region which possibly could be applied to areas in Northland.

REFERENCES

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INTRODUCTION

Rock types maps are intended to help planners and land users to:

i) identify the characteristics of near surface rock types;
ii) recognise areas of existing and potential mineral resources;
iii) become aware of geological hazards.

ROCK TYPE DESCRIPTIONS (LITHOLOGIES)

The map unit symbols are listed alphabetically within the two major rock type categories/ sedimentary and igneous. The first letter of each symbol indicates the major lithology, and the second letter (where present) a significant interbedded lithology. The numeral indicates the typical hardness (see PhysicalCharacteristics table)of the unweathered rock material, and the subscript numeral indicates a variation.

The description for each map unit may include common name, distinctive landform, colour, hardness, grain size, bedding, fracturing and chemical composition. Major and minor lithologies are described and also the weathered material in terms of changes in colour, hardness and grain size. The range of depth of the weathered mantle is also given. (See Definition of Descriptive Terms').

SEDIMENTARY ROCK TYPES

ALLUVIUM

$A1_1$ Undifferentiated intertidal deposits: mainly mud and sand, some shell and gravel; unconsolidated.

$A1_2$ Alluvium: mainly mud and sand, some gravel and peat, forming river bed and flood plain deposits; unconsolidated to very soft, unweathered.

$A1_3$ Alluvium: mainly sand and mud with some gravel, forming terrace deposits up to 10m above stream level and as much as 30m thick; unconsolidated to very soft. Moderately to slightly weathered to very soft clay to depths of 2m.

$A2_1$ Alluvium: mud, sand and gravel, with iron oxide pans in places forming terrace surfaces 10 to 150m above sea level; very soft to soft. Weathered to brown very soft clay with some rock fragments to depths of 10m.

$A2_2$ Alluvium: mud, sand, gravel, carbonaceous sandstone and mudstone, occasional iron oxide pans, forming dissected terrace surfaces more than 150m above sea level; very soft to moderately soft. Weathered to multi-coloured clay with some rock fragments to depths of 10m. Surfaces are modified by erosion and in some places by old gum diggings.

PEAT

$C1$ Peat: dark brown fibrous carbonaceous swamp deposits usually less than 4m but can be up to 11m thick, some mud and sand; very soft to soft.

SAND AND SANDSTONE

$S1_1$ Sand: mostly quartz and feldspar, some shell, forming intertidal and beach deposits; unconsolidated.

$S1_2$ Sand: mostly quartz and feldspar forming moving and partially fixed dunes; unconsolidated, unweathered.

$S1_3$ Sand: mainly quartz and feldspar, forming fixed dunes; unconsolidated to very soft. Weathered to brown stained clayey sand to depths of 2m.

$S1_4$ Sand: mostly quartz and feldspar forming low dunes interspersed with low lying flat areas at water table level (Coastal Deflation Zone); unconsolidated to very soft. Unweathered.

$SM5_3$ Interbedded sandstone and mudstone: grey quartz-feldspar sandstone and grey mudstone, minor conglomerate and calcite cemented concretions, locally baked by interbedded basalt; moderately hard to hard. Weathered inland to light coloured clay to depths of 10m.

IGNEOUS ROCK TYPES

EXTRUSIVE ROCK

$F6_4$ Basalt and dolerite: flows (commonly pillow form) of fine to medium grained crystalline basalt and dolerite with minor mudstone, intruded by numerous medium-grained dikes and plugs of diorite and gabbro; closely to moderately fractured; hard to very hard. Altered and weathered to soft brown clay to depths of 30m.

PHYSICAL CHARACTERISTICS OF UNWEATHERED ROCK TYPES, AND A GUIDE TO EXCAVATION METHODS

*TERM	NUMBER & PATTERN	*DIAGNOSTIC FEATURE	§GUIDE TO EXCAVATION METHODS
Very Hard	7	Not scratched with knife or hammer point.	Explosives generally required.
Hard	6	Scratched with knife or hammer point only with difficulty.	Heavy machinery generally required; explosives will be needed where rocks widely fractured.
Moderately Hard	5	Scratched with knife or hammer point.	
Moderately Soft	4	Grooved or gouged to depth of about 3mm by firm pressure on knife or hammer point.	Machinery required; explosives may be needed where rocks widely fractured.
Soft	3	Grooved or gouged readily with knife or hammer.	Machinery required.
Very Soft	2	Carved with knife or scratched with finger nail.	Can be dug with spade, light excavators suitable.
†Unconsolidated	1	Disaggregated by hand, or easily moulded.	Can be dug by hand.

*Refers to hand sized samples of fresh rock of the map unit.

§Fractures can have a significant effect on the ease of excavation; e.g. hard rocks if closely fractured, may be excavated as readily as softer material. (see table on fracture spacing).

†Units such as gravel or scoria are unconsolidated as a mass but consist of fragments with individual hardnesses of up to 7.

DEFINITION OF DESCRIPTIVE TERMS

GRAIN SIZE

SIZE	CRYSTALLINE ROCK	UNCONSOLIDATED SEDIMENT	CONSOLIDATED SEDIMENT	FRAGMENTAL VOLCANIC DEBRIS
	glassy			
less than 2 microns	very fine grained crystalline	clay } mud	claystone } mudstone	
2 to 60 microns	fine grained crystalline	silt }	siltstone }	tuff
60 microns to 2mm	medium grained crystalline	sand	sandstone	
2 to 60mm	coarse grained crystalline	gravel	scree (angular) } conglomerate } breccia (angular) }	volcanic breccia
more than 60mm	very coarse grained crystalline	cobbles and boulders		

BEDDING

The following terms denote bedding thickness ranges:

thinly bedded	less than 200mm
medium bedded	200–600mm
thickly bedded	more than 600mm

FRACTURING

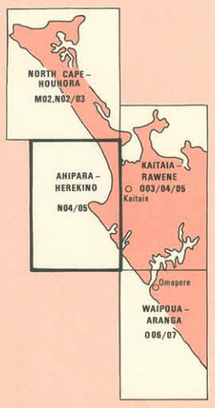
The following terms denote fracture spacing ranges:

closely fractured	less than 20mm
moderately fractured	20–200mm
widely fractured	more than 200mm

SYMBOLS

- Rock type boundary – known
- Rock type boundary – uncertain
- ^{x}Mn Sample site or mineral outcrop with chemical symbol (N.B. Q = quartzite or chert)
- Quarry or pit (closed) — Quarried material indicated eg. Crystalline Limestone
- Quarry or pit (operating)
- Underground mine (mined material indicated e.g. Silver)
- Spring (mineral composition indicated when known e.g. Soda)
- ⊙ 1957 0.1 l/s Water bore (with sample pumping rate in litres per second (l/s), and date when known)

SHEET INDEX



Area covered by "Rock Type" maps.

COMPILATION NOTE:–The base map is compiled from the NZMS 1 series (1:63360) dated 1971, 75

EDITION 1 1982

NEW ZEALAND LAND INVENTORY

SCALE 1 : 100 000

Metres 1000 0 1 2 3 4 5 6 7 8 Kilometres

REFERENCE

WHANGAREI	*Cities*		*Rivers and streams*
KAIKOHE	*Towns*		*Trig stations*
Hauhere	*Settlements*		*Vincula (separate parcels under same ownership)*
	State highways		*Land holding boundaries*
	Other roads		*Sand and mud*
	Tracks		*Wetlands*
	Railways		

This map is one of a series. Themes mapped in this study are :– Land Tenure and Holding, Rock Types, Soils, Existing Land Use, Wildlife, Indigenous Forest.

HEIGHTS ARE IN METRES ABOVE MEAN SEA LEVEL

This map is drawn on the New Zealand Map Grid Projection, a minimum–error conformal projection. The grid is the New Zealand Map Grid, showing coordinates in metres in terms of the Geodetic Datum 1949, based on the International (Hayford) Spheroid.

The smallest area mapped is generally not less than 10 hectares. Calculation of areas from this map should be within the limitations of scale. For example, individual areas should be rounded to the nearest 5 hectares. Accumulated areas should be rounded to the nearest 50 hectares.

AREAL SCALE

500 hectares divided into units of 25 hectares

Compiled by D.R. Petty
New Zealand Geological Survey, Department of Scientific and Industrial Research,

Published by the Department of Lands & Survey, New Zealand, under the authority of W.N. Hawkey, Surveyor General.

P.D.Hasselberg, Government Printer, Wellington, New Zealand.

RELIABILITY

This is a small scale map, therefore rock type units and their boundaries are generalised. The reliability of the content and position of unit boundaries is influenced by the lack of detailed field mapping, the uneven distribution of observation points, the variety of rock materials within some units, the degree of distinctiveness of the topography as seen on aerial photos, and the variability in the accuracy and completeness of the existing descriptions of the rock types.

No general field checking of original data or boundaries has been done. Small significant areas have been exaggerated.

For more detailed information on selected areas write to:

The Director,
N.Z. Geological Survey, DSIR,
P.O. Box 30-368,
Lower Hutt.

Note: This map should not be used for planning engineering projects, large scale quarrying operations, or detailed work, for which individual investigations are required.

COMPILATION METHODS

This map was compiled by D. R. Petty, New Zealand Geological Survey, DSIR.

Alluvial areas and distinctive landforms were delineated from aerial photos (scale 1:15,840), and rock type and extractive mineral information obtained from maps and manuscripts by Hay (1981, in prep), Maxwell (1968), N.Z. Mines Department (1966-77) and Petty (1974, 1975, 1978). Additional data were obtained from various unpublished reports filed at the Otara District Office of N.Z. Geological Survey, and University theses in geology.

Refer to this map as:
Petty, D.R. 1981: Ahipara-Herekino NZMS 290 Sheet N04/05, 1:100 000. New Zealand Land Inventory, Rock Types. Department of Lands and Survey, Wellington, New Zealand.