COMMONWEALTH OF AUSTRALIA.

DEPARTMENT OF NATIONAL DEVELOPMENT.

BUREAU OF MINERAL RESOURCES
GEOLOGY AND GEOPHYSICS.

RECORDS.

RECORDS 1958/95

REPORT ON A VISIT TO MISIMA ISLAND

by

H.L. Davies.

REPORT ON A VISIT

TO

MISIMA ISLAND

RECORDS 1958/95.

By H.L. Davies,
Bureau of Mineral Resources,
Port Moresby.

November 1958.

TABLE OF CONTENTS

"Igneous Rocks" content has been excluded from the hardcopy of record 1958/95.

ILLUSTRATIONS:

INTRODUCTION

Misima Island is an island of the Louisiade Archipelago, situated 140 miles east of Samarai in the Milne Bay District of Papua. Its east-west length is 25 miles and it breadth ranges from three miles in the west to six near the eastern end. The Mararoa, Mt. Sisa, Umuna, Kulumalia and Quartz Mountain lodes are in the southern part of the broader eastern end and are included in an area over which Oceanic Minerals Development have applied for an Exclusive Prospecting Licence (see Plate 2).

The Sub-District Office and the main settlement are at Bwagaoia, near the eastern end of the island. This is the only all-weather harbour, though there are a number of inlets around the coast which may be used as anchorages depending on the season.

Kulumalia, Umuna and Quartz Mountain, five to seven miles away, are connected to Bwagaoia by roads suitable for four-wheel drive vehicles.

The island is reached by small ship service from Samarai, operating at approximately three-weekly intervals. Small ships are usually available in Samarai for charter; a twice-weekly air service connects Samarai and Port Moresby.

The writer, in the company of Mr. A.G. Palmer of Oceanic Minerals Development, arrived at Bwagaoia on 1st August, 1958. Fourteen days were spent inspecting the Umuna and Quartz Mountain areas, and sampling and mapping the Double Chance mine held and worked by Mr. H. Gladstone. On the 20th August A.G. Palmer departed for Sydney. The writer meanwhile had taken the opportunity to visit other islands of the Louisiade Archipelago, including Sudest, in the company of trader Mr. E.D. Ryan. He returned to Misima on 24th August, but as no shipping was available, remained in the vicinity working locally and visiting Western Misima and the nearby islands. On the 9th September he departed Bwagaoia for Port Moresby.

PREVIOUS WORK

In 1915 Government Geologist Evan R. Stanley spent about six months on Misima. His report includes detailed mapping of the mineralised areas at the eastern end of the island and observations on a broader scale of the geology of Eastern Misima. Subseqnent years have seen the development of major mines, notably Cuthberts at Umuna and Gold Mines of Papua at Mararoa, but no geological work of any note. The reports of Haddon King (1949) and Palmer (1957) are chiefly concerned with economic aspects.

PHYSIOGRAPHY

The narrow western part of the island is particularly rugged and is for the most part a 3,000 foot high ridge, reaching 3,400 feet at Mt. Oiatau and dropping steeply away to the sea on each flank. East of Buogabcga the island widens and the central range is only about 2,000 feet above sea level. The mining area is dominated by the Umuna Ridge, the highest point of which is Mt. Sisa, 1,300 feet. The eastern end of the island is flat and low-lying.

The island is covered in heavy rain-forest except for some flatter areas of the eastern end which are grassed.

The monsoonal seasons are well marked and have some influence on rainfall. The annual average rainfall is 123.4 inches and the monthly figures, derived from records over ten years are :-

January	February	March	April	May	June	July	August
11.1	13.4	10.5	11.3	12.2	8.9	8.4	9.7

September	October	November	December
8.6	10.6	10.4	8.3

The south-east season extends from May to October and is the cooler period with strong winds which may delay shipping. The north-west season is from December to March.

GEOLOGY

A. Stratigraphy

The sedimentary sequence consists of -

1. Quaternary sediments.
2. Tertiary volcanics and sediments.
3. Palaeozoic and/or Mesozoic Metamorphics.

   (a) Calvados Schist.

   (b) Western Misima Gneiss.

The igneous geology is more complex but the following rock-types were noted -

1. Dolerite dykes.
2. Quartz veins.
3. Intermediate porphyry, fine grained felsite, and minor granite.
4. Gneissic granite and gabbro, western Misima only.

1. Quaternary sediments -

(a) Alluvia: Only the streams of eastern Misima have deposited alluvial flats. Owing to the growth of coral and the steep off-shore slopes no extensive beaches have formed. Pebbles and boulders of pumice are noted on the small beaches near Bwagaoia.

(b) Coralline limestone: The western end of Misima is marked by six or seven benches of coralline limestone, the highest at approximately 800 feet above sea level. It is conspicuous along the southern coast though on the eastern end uplift has not been as great. At Bwagaoia the only terrace is about fifteen feet above the present-day reef. Raised reefs are absent between Rokia Point and Ewena on the northern coast.

2. Tertiary volcanics and sediments -

These extend from Rokia Point, the northernmost point on Misima, westward through Siagara to Liak, and southward for little more than a mile. At Siagara it is exclusively volcanic material: interbedded tuff, agglomerate with boulders of andesitic lava, and small flows of rhyolite (?). At Liak it is represented by tuffaceous calcarenite and siltstone overlain by conglomerate, the latter containing apparently no volcanic material. The calcarenite is well lithified and shows strong current bedding and ripple-marking. The siltstone is carbonaceous. The conglomerate is composed of boulders of gneiss, schist, dolerite and quartz. Stanley records an apparent unconformity between the finer sediments and the conglomerate in the easternmost stream draining into Liak. Time did not permit a visit to this locality.

The series is gently folded with dips of up to 40°. The source of the volcanic material was probably offshore from Siagara.

Stanley treated the volcanics and the sediments under separate headings, though noting that the two are probably interstratified, and regarded them at Late Tertiary in age. (Note: Results of palaeontological examination of samples collected by the writer are not yet available.)

3. Metamorphics -

(a) Calvados Schist: This formation consists of tightly folded metamorphosed sediments, varying in grade from phyllite to mica and andalusite (?) - mica schist and including quartzite, crystalline limestone and chert. It is the country rock in the gold-bearing areas of Misima and Sudest islands, and also forms the small hilly islands of the Calvados Chain. Two intrusives are peculiar to the Misima exposure, vis. an intermediate porphyry which shows well-developed crystals of feldspar and minor biotite, and a fine-grained felsite (?) which may be merely a rapidly cooled phase of the porphyry. Quartz and dolerite veining is common to all exposures of this series.

(b) Western Misima Gneiss: The western half of Misima is a complex of para and ortho-gneiss varying in composition from acidic to ultrabasic.

At Liak gneissic granite intrudes and absorbs a basic gneiss of probably sedimentary origin. Further west at Larama is a well-bedded garnetiferous gneiss of alternating basic and acidic layers and garnet amphibolite also crops out. Similar bedded garnetiferous gneiss and boulders of garnet amphibolite are also seen at Ewena.

Exposures on the south coast are similar. At Buogaboga a gneissic gabbro appears to intrude metasedimentary gneiss and schist. At Ebora gneiss varying from acidic to basic composition, in places bedded, is intruded by the intermediate porphyry and dolerite.

The orthogneiss of western Misima differs from the Calvados Schist of eastern Misima in its higher grade of metamorphism, being more crystalline, with the development of amphiboles and garnet. The paragneiss of western Misima has no counterpart in the eastern part of the island.

Stanley (1915) noted the intrusive gneissic gabbro at Buogaboga and on the divide between Buogaboga and Liak. He suggested that this is part of a linear batholith cropping out along/southern and northern flanks. This hypothesis does not appear to have been supported by field evidence./ the divide and concealed by metamorphics along

He also suggested that the metamorphics of western Misima are entirely of igneous origin but the author's observations contradict this.

The two series of metamorphics are tentatively correlated with the Owen Stanley Metamorphics of eastern Papua and are probably of Palaeozoic or Mesozoic age.

B. Tectonic History

The Owen Stanley Metamorphics are thought to have derived from a land-mass lying to the south and south-west (van Bemmelen, 1954). Orogeny took place in Palaeozoic or Mesozoic time, forming a mountain chain which gradually subsided until Quaternary time when uplift was renewed. This may well be the case at Misima.

The raised coral benches are evidence of marked uplift in Quaternary time, probably continuing today. This activity has been most marked in western Misima where benches stand about 800 feet above sea-level, decreasing towards the eastern end where uplift is of the order of 15-40 feet.

Thus there is an apparent regional tilt and this may explain the difference in degree of metamorphism between the basement rocks of eastern and western Misima, in that those of western Misima were originally subject to deeper burial.

It may also be that the Calvados Schist and western Misima gneiss are of different age.

Little is known of the detailed structure of the island. The most prominent feature is the NNW-trending Umuna Fault which may cut right across the island. Minor faulting and fracturing is seen in the competent beds such as limestone, chert and quartzite within the Calvados Schist, and is commonly associated with mineralisation.

ECONOMIC GEOLOGY

Umuna area: The chief gold-producing area on Misima was the Mararoa - Mt. Sisa-Umuna-Kulumalia area, a sinuous razor-back ridge representing the surface trace of a westerly-dipping quartz-filled fault-zone. The most successful company was Cuthbert's Misima Gold Mines which operated at Umuna.

Total production, during the period 1935 to 1942, was 350,000 tons of ore yielding about 96,000 ozs. of gold, average grade 6 dwts/ton according to Mr. Palmer. The post-war operations of this company were not economic and it closed down in 1950. Palmer attributes this to the appearance of sulphide ore for which the existing treatment plant was inadequate, and to the failure of a diamond drilling programme.

In 1949 Haddon King made an assessment of the mine for Zinc Corporation. It is interesting to note that he suggested further underground exploration to test the extension of the lode below the bottom level, No. 7 (old No. 2). He did not favour diamond drilling as an earlier programme of drilling by Cuthberts had given completely inconclusive results.

This was due to (i) poor core recovery, and (ii) failure to reach target depths owing to the collapse of holes. It is understood, however, that the holes were only of small diameter and little casing was used. If, in the future, drilling is contemplated, the use of bits of larger diameter, and the greater use of casing might lead to success. Alternatively percussion drilling could be employed.

It is possible that at depth the sulphides might prove to be ore-grade. In 1951 Bloomfield and Buchanan hand-picked 52 tons of material assaying 20.2% Pb, 36.1% Zn, 18.5 dwts/ton gold and 3.0 oz/ton silver, from the No. 7 level.

The other main company was Gold Mines of Papua which from March 1938 to September 1939 produced 33,632 oz. bullion from 39,993 tons of ore treated from the Mararoa-Mt. Sisa area.

Gordons Misima were ready to commence production at Kulumalia when evacuation was ordered in 1941. Mr. H. Gladstone subsequently milled about 150 tons of the better ore from this area. Production failed to confirm the reported assays and he abandoned the project.

A more complete report on these mines, particularly Cuthberts, is given in the reports of Haddon King et al (1949) and Palmer (1957). Evan R. Stanley, in 1915, made the only detailed geological study of the mining field. He notes that gold is generally associated with the intermediate porphyry, the richest areas being porphyry-schist contacts. He also draws attention to the action of groundwater in redepositing surface gold in lower fissures.

It is regrettable that none of the mining companies maintained a geological staff so that very little information is available on the subsequent underground workings.

Quartz Mountain: From its beginnings this prospect is reported to have suffered from mismanagement. A treatment plant was installed in 1935, but there is no record of any production before the war. Post-war a new plant was installed and an area above the 500 foot contour known as the Open Cut worked profitably on a small scale until 1951 when cyclone damage caused the closure of the mine.

The lode is probably a quartz-filled shear similar to that at Umuna. This is represented at the surface by boulders of vuggy quartz, set in clay. Only the boulders were treated. Sampling of boulders has proved that over a length of approximately 300 feet they assay 5.2 dwts/ton.

Three hundred feet to the south-west of the Open Cut, workings off the No. 2 N.E. cross-cut passed through 19 feet of material assaying 12.6 dwts/ton. These workings collapsed during the war and an attempt to reopen them was not completed. Further west still is a low cliff of vuggy quartz extending about 60 feet and bearing 310°. The north-western forty feet of this cliff are reported to have averaged 15.6 dwts/ton. The writer took check samples from the cliff, the assay values of which are not yet known. The lode, another vein of vuggy quartz, is about six feet wide and dips steeply to the north-east. A little costeaning would clarify its dimensions. The vugs here and in the minor lodes exposed in Inhabit Creek are lined with sphalerite, galena, quartz and, occasionally, show a little copper staining. Several lodes are exposed lower on the hill where considerable exploration has revealed generally low grades. It was difficult during the short visit to discern any pattern in the lode system.

Mineralisation is commonly associated with competent beds such as quartzite and limestone. Probably stress has caused the fracturing and brecciation of these beds, thus opening the way for mineralising solutions.

If the reliability of pre-war assays is proved, profitable large scale open-cut mining might be resumed.

Scottish Queen, Mararoa: After draining a small lake at Mararoa H. Gladstone won approximately 1,000 fine ozs. of apparently reef gold in 19 months. The area is now largely overgrown. The gold was in a shallow-dipping band of grey pug probably representing a fault zone in schist and porphyry.

Double Chance: This is the only mine in operation at present. It is situated on a hillside above Ingubinaina Creek east of the main Umuna lode. The ore is taken from an open cut about twelve feet wide and at present 120 feet long, trending 60°. The country rock is schist and phyllite striking 60° and dipping steeply. Immediately north of the cut are well-bedded schists dipping north-west. There appears to be a change in lithology at the vertical shear which forms the north-western wall of the cut. The material being mined is a feldspathic, iron-oxide bearing schist showing no distinct bedding. Another vertical shear forms the south-eastern wall of the cut. The rocks on this side are roughly bedded, with an alternation of fine bands of mica and feldspathic material. The gold occurs in a system of steep fractures coated with iron and manganese oxides and generally trending at about 340°.

Occasionally visible gold occurs in wire form. The fractures extend into both walls of the cut and Mr. Gladstone reports that the wall-rocks are gold-bearing, but are not considered economic at present.

A three to six feet wide irregular band of porphyry and a four feet wide dyke of dolerite are exposed above the well-bedded schist of the north-western wall. The dolerite strikes parallel to the schists but has a steeper dip. It is seen to transgress a narrow 340° - trending dyke of felsite.

Exploration along strike to the north-east has revealed a sharp decrease in the number of the fractures striking 340° and an apparent fall-off in gold mineralisation. The well-bedded schist and phyllite of the north-western wall is exposed in a deep costean about 200 feet further along strike suggesting that if the favourable zone continues along strike it will be found to the south-east of, that is downhill from, this costean. However, the author favours the idea that mineralisation is associated with a quartz-filled fault, striking 315°, and exposed at the mouth of the open cut. Movement along this plane has probably caused the 340° fractures and the quartz intrusion may be responsible for the introduction of gold into them. It is likely that certain rock-types have proved more amenable to mineralisation, notably the feldspathic schist of the open cut. The schist and porphyry south-west of the fault here are barren and thus apparently unfavourable beds. It is suggested that exploration on either side of this fault be continued along its strike in the hope of finding intersection with another favourable zone. Mr. Gladstone reports that promising dish prospects have been obtained for about 200 yards along this line.

It is understood that Oceanic Minerals Development Pty. Ltd. plan to step up production from this area by the introduction of earthmoving equipment and a new treatment plant. Their target is a million yards of material averaging 0.7dwts/ton. At present it is not known whether this quantity exists but the reports of Mr. Gladstone, based on dish-prospecting, would indicate that it is likely. Owing to the soft nature of the ground, cheap exploration could be carried out using soil augers, and it is suggested that this should be a preliminary to the introduction of any heavy equipment.

Alluvial Gold: For many years the Misima field was worked for alluvial gold only, in the streams draining the Mt. Sisa area. An extensive alluvial deposit remains below the Quartz Mountain mine where three streams join to form Tauhik Creek. Percussion drilling has proved 1,500,500 cubic yards of wash averaging 10.5 grains per cubic yard (C.H. Donaldson 1938). Sluicing is carried out on a small scale when sufficient water is available.

RECOMMENDATIONS FOR FUTURE GEOLOGICAL WORK

If a field-party were sent into the area it might undertake the mapping at 1 inch to 1 mile scale, of the entire island, with particular attention to the mineralised eastern end. It is understood that aerial photographs, scale 1 : 40,000 are available, and this would facilitate regional field-work. Plane-table or chain-and-compass survey methods might be applied to areas of particular interest where more detail is required. One such area would be the Double Chance lease, which Oceanic Minerals Development Pty. Ltd., plans to operate. This company's plan to introduce heavy earth-moving equipment would enable rapid costeaning in areas of interest.

The area has probably been thoroughly prospected so that the discovery of new surface lodes is unlikely. However, in the light of modern theories, an understanding of ore control might be achieved and applied to the directing of a search for concealed ore bodies. An assessment could be made of the value of geophysical or geochemical prospecting methods in the area.

The party might best consist of two geologists, two field assistants and twelve native labourers. Western Misima could be covered from a chartered vessel in a period of about two weeks. Eastern Misima would best be covered from a series of base camps. The whole survey would probably occupy four months.

REFERENCES

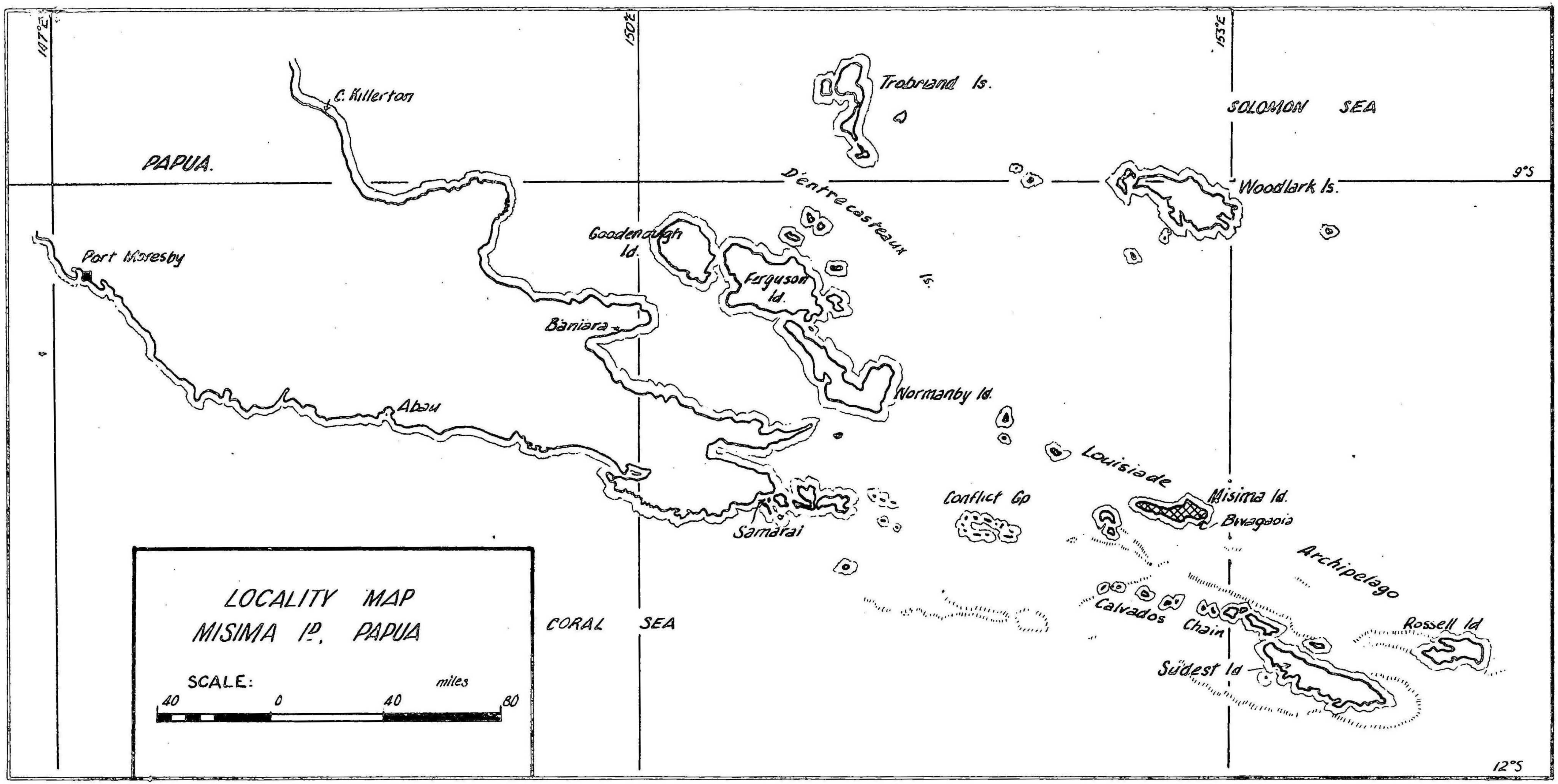
1. Donaldson, C.H., C.1938 - Report on the Tauhik Sluicing Co. Property.

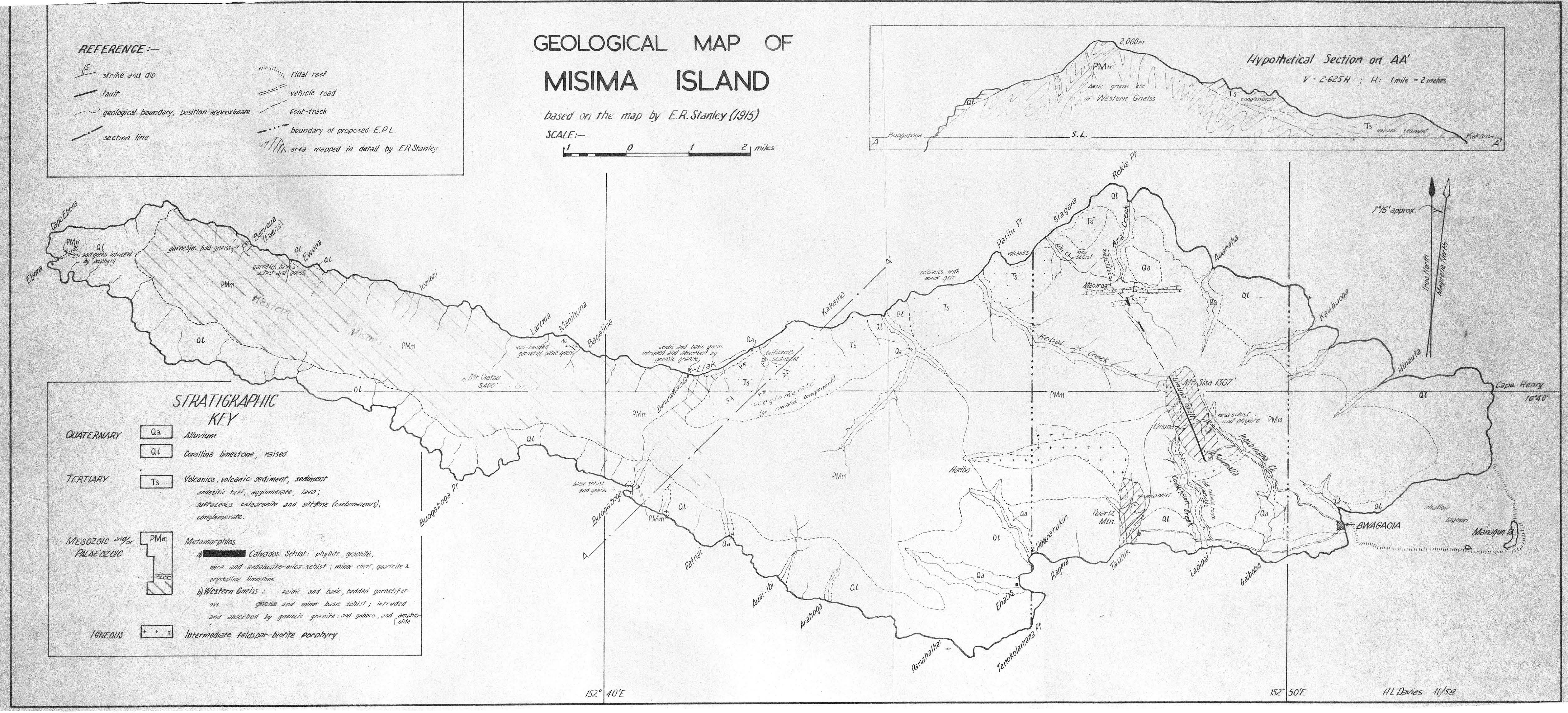
2. Haddon King, 1949 - Report to Zinc Corporation.

3. Nat. Dev., 1951 - The resources of T.P.N.G., Department of National Development, Canberra, ACT.

4. Stanley, E.R. 1915 - Report on the geology of Misima (St. Aignan), Louisiade Goldfield. T.P.N.G. Bull. No. 3.

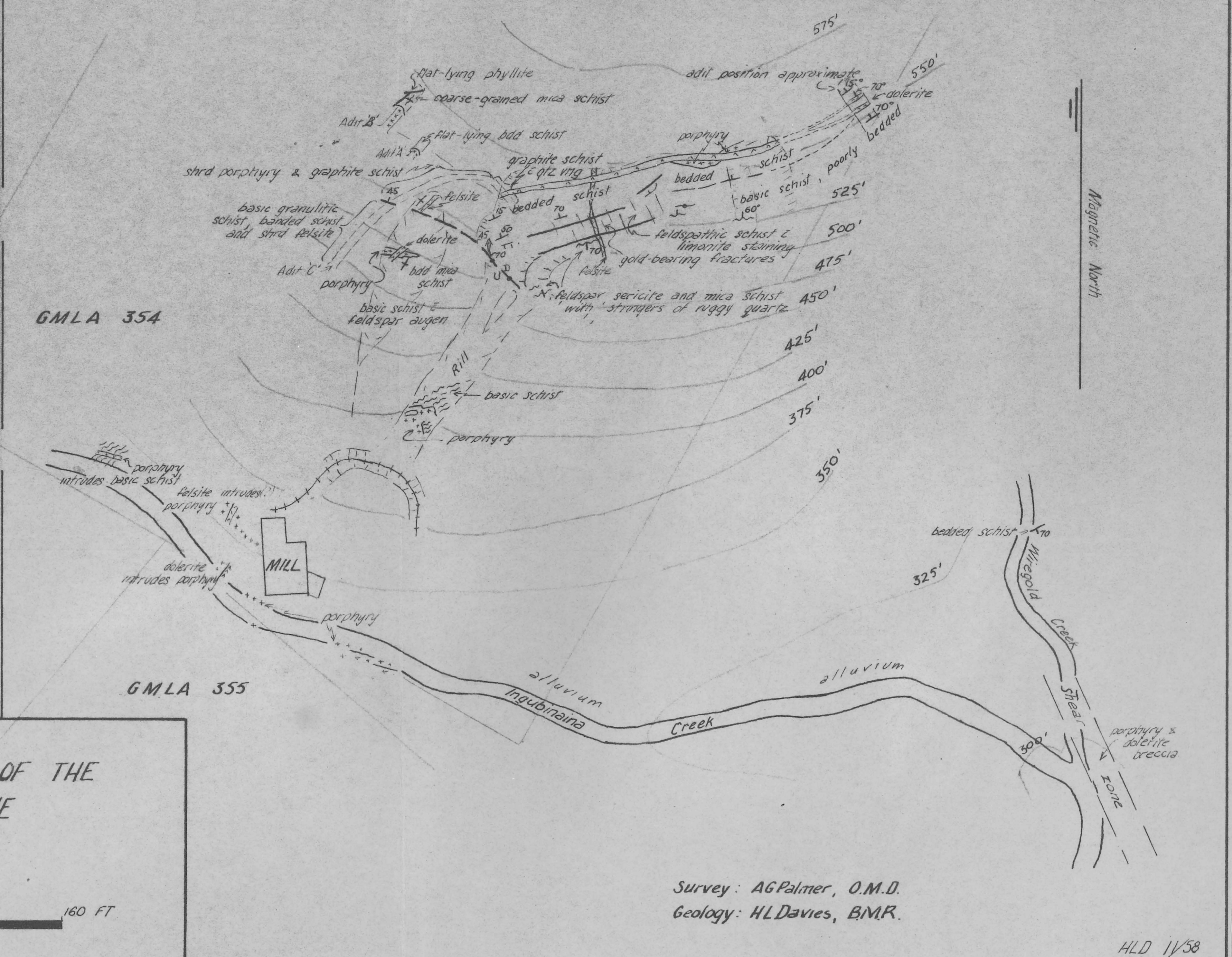
5. Van Bemmelen, R.W., 1954 - Mountain building (Martinus Nijhoff, the Hague).


147°E
150°E
153°E
9°S
12°S
C. Killerton
PAPUA.
Port Moresby
Baniara
Abau
Samarai
Goodenough Id.
Ferguson Id.
Normanby Id.
D'entrecasteaux Is.
Trobriand Is.
SOLOMON SEA
Woodlark Is.
Louisiade
Archipelago
Conflict Gp
Misima Id.
Bwagaoia
Calvados Chain
Sudest Id
Rossell Id
CORAL SEA
LOCALITY MAP
MISIMA Id. PAPUA
SCALE:
miles
40
0
40
80


GEOLOGICAL MAP OF
MISIMA ISLAND
based on the map by E.R. Stanley (1915)
SCALE:-
1 0 1 2 miles
REFERENCE:-
strike and dip
fault
geological boundary, position approximate
section line
tidal reef
vehicle road
foot-track
boundary of proposed E.P.L.
area mapped in detail by E.R. Stanley
Hypothetical Section on AA'
V = 2.625 H ; H: 1 mile = 2 inches
2,000 FT
PMm
basic gneiss etc
or Western Gneiss
Ts conglomerate
Ts volcanic sediment
Ql
Buogaboga
S.L.
Kakama
A
A'
STRATIGRAPHIC KEY
QUATERNARY
Qa Alluvium
Ql Coralline limestone, raised
TERTIARY
Ts Volcanics, volcanic sediment, sediment
andesitic tuff, agglomerate, lava;
tuffaceous calcarenite and siltstone (carbonaceous),
conglomerate.
MESOZOIC and/or PALAEOZOIC
PMm Metamorphics
a) Calvados Schist: phyllite, graphitic, mica and andalusite-mica schist; minor chert, quartzite & crystalline limestone
b) Western Gneiss: acidic and basic, bedded garnetiferous gneiss and minor basic schist; intruded and absorbed by gneissic granite and gabbro, and amphibolite
IGNEOUS
Intermediate feldspar-biotite porphyry
Cape Ebora
Ebora
Banieua (Ewena)
Ewena
Iomoni
Laetma
Manihuna
Bagalina
Mt Oiatau 3,400'
Western Misima Gneiss
Liak
Buogaboga Pt
Buogaboga
Patnai
Auai-Ibi
Arahoga
Panahalhai
Kakama
Patilu Pt
Siagara
Rokia Pt
Ara' Creek
Mararoa
Auaraha
Kaubuoga
Hinauta
Cape Henry
10°40'
Kobel Creek
Mt Sisa 1307'
Umuna Fault
Umuna
Ingubinaina Ck
Horiba
Quartz Mtn.
Cooktown Creek
Hinaratukin
Ehaus
Tenokolamana Pt
Ragera
Taulnik
Lapipai
Gaibobo
BWAGAOIA
shallow lagoon
Managun Id.
conglomerate (no volcanic component)
tuffaceous sediment
volcanics
volcanics with minor grit
acidic and basic gneiss intruded and absorbed by gneissic granite
well-bedded garnetif. basic gneiss
basic schist and gneiss
mica schist and phyllite
True North
Magnetic North
7°15' approx.
152° 40'E
152° 50'E
H.L. Davies 11/58

REFERENCE

- schist, showing trend
- intermediate porphyry
- felsite
- dolerite
- fault showing dip and lineation
- fault, position approximate
- fractures
- geological boundary
- " " , position approximate
- dip of bedding
- dip of schistosity
- underground workings
- broken ground
- railway



GEOLOGICAL SKETCH MAP OF THE DOUBLE CHANCE MINE MISIMA Id, PAPUA

SCALE: 80 0 80 160 FT

Survey: A G Palmer, O.M.D.
Geology: H L Davies, B.M.R.

HLD 11/58