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COMMONWEALTH OF AUSTRALIA.

DEPARTMENT OF SUPPLY AND SHIPPING.

BUREAU OF MINERAL RESOURCES GEOLOGY AND GEOPHYSICS.

REPORT No. 1949/79.

(Geol. Ser. No. 57).

A GEOLOGICAL RECONNAISSANCE OF THE COUNTRY BETWEEN MT. HAGEN AND MONGUREBA, CENTRAL HIGHLANDS DISTRICT, MANDATED TERRITORY OF NEW GUINEA.

by

H. J. Ward,
Geologist.

CANBERRA. A.C.T.

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C O N T E N T S.

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P H O T O G R A P H S.

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M A P S.

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2. PETROLOGICAL DESCRIPTIONS BY W. B. DALLWITZ.

Appendix 2 has been omitted from the hardcopy of record 1949/79.

DEPARTMENT OF SUPPLY AND DEVELOPMENT.

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INTRODUCTION.

General Information.

This investigation was undertaken primarily to assess the importance of a discovery of gold in the tributaries of the Porgera River west of Mt. Hagen (lat. 5°48', long. 144°13') Mandated Territory of New Guinea. Two patrols, the routes of which are shown on the accompanying map (Plate I) were carried out.

The first patrol was from Wabag (approx. lat. 5°35', approx. long. 143°42') to Nongureba (Porgera Police Post) about 42 miles west of Wabag. The purpose of the patrol was to inspect the main gold find in the vicinity of Nongureba (Porgera Police Post). The patrol, which on return to Wabag from Nongureba followed a more southerly route than on the outward journey from Wabag, began on 17th November, 1948, and finished on 23rd December, 1948.

The occurrence of alluvial gold was also reported from the River Timen area, about seventeen miles northeast of Wabag, consequently a patrol from Wabag to Mt. Hagen Police Post by way of the River Timen was undertaken. The patrol set out from Wabag on 31st of December, 1948, and reached Mt. Hagen Police Post on 10th of January, 1949.

The patrols were organised by the District Services Branch of the Papuan and New Guinea Administration on direction from Colonel J. K. Murray, Administrator.

Previous Work.

No geological mapping has been carried out in the country to the west of Mt. Hagen but officers of the District Services Branch of the New Guinea Administration have conducted numerous patrols, the best known being the Mt. Hagen-Sepik Patrol led by J. L. Taylor and J. R. Black in 1938-1939.

Contributions to the knowledge of this part of the Central Highlands and that in the vicinity of Mt. Hagen are contained in articles by K. L. Spinks, (1936), H. Leahy, (1936) A. J. Bearup, (1936), L. C. Noakes, (1939), and in patrol reports especially those by I. E. Champion, (1932), R. I. McIlwain, (1948), and P. K. Maloney, (1948).

The writings of Hides, (1936), Champion, (1932), Karius, (1929), and Cheeseman, (1938) also provide excellent information on the type of country likely to be encountered in the Central Highlands of New Guinea.

Mapping.

Pace and compass and time and compass methods of surveying were used to record observations and the route of the patrol between Wabag and Mongureba.

The airstrip at Wabag was used as a base for triangulation between Wabag and Chirunki (see Plate I). At Chirunki a paced base line, over a mile in length, was used to continue the route to Tumandan. From Tumandan to Mongureba time and compass methods were relied on to map the route as the dense forest made triangulation impossible in the time available.

On the return journey from Porgera Police Post to Wabag, time and compass methods were used in forested areas and pace and compass traverses with triangulation in open country.

On the patrol between Wabag and Mt. Hagen, the map of the Hagen-Sepik Patrol (1938-1939) was used and observations were recorded thereon. Using the airstrip at Wabag as a base compass triangulation methods were possible as far as Kisemunda, thereafter time and compass methods of surveying were mainly used.

Barometric heights are quoted from a map compiled by Taylor and Black of the Hagen-Sepik patrol, and reports by Champion, Spinks and Leahy.

Transport and Costs.

Aerodromes are situated at Mt. Hagen and Wabag and there is a dropping ground at Mongureba. The only other method of transporting food and equipment is by native labour over bush tracks.

Conditions of employment of native labourers is contained in Native Labour Ordnance No. 5 of 1946 Papua-New Guinea Ordnance. This Ordnance provides for a minimum wage of fifteen shillings per month with clothes, rations and medical attention.

Acknowledgments.

The writer wishes to express his thanks to Patrol Officer G. Linsley, who accompanied him on the first patrol, and to Assistant District Officer R. I. McIlvain, who accompanied him on the patrol from Wabag to Mt. Hagen. The company and assistance of both these officers is deeply appreciated, as is also the hospitality of Mr. S. Christian and Mr. P. K. Maloney at Wabag during Christmas 1948.

Mr. Dan Leahy of Kuta extended his exceedingly generous hospitality and assistance when the writer was at Mt. Hagen.

Mr. Ivan Champion, Acting Director of District Services, kindly allowed the writer to make use of barometric heights and other information which he, Mr. Champion, had recorded when on patrol between Wabag and Mongureba (Porgera Police Post).

Mr. Osborne, chief geologist of Australasian Petroleum Company, Port Moresby, kindly allowed the writer to make use of aerial photographs of a run on a true bearing of 318 degrees from Mt. Hagen. Dr. Glaessner, palaeontologist of the same company, helped the writer by palaeontological discussions and practical suggestions.

CLIMATE, FLORA & FAUNA.

Climate.

There are no meteorological records of this area and consequently only general remarks can be made.

Noakes (1939) reports that in the Wahgi River Valley temperatures range from a minimum of 39° Fahrenheit to a maximum of 81° Fahrenheit and that the average annual rainfall is 80 inches.

The climate may be classed as the Tropical Highland type with a fairly pronounced difference between day and night temperatures. The mornings are bright and clear. Clouds begin to cover the sky about mid-day and light rain generally falls in the late afternoon and night. The heaviest rains are reported to fall between December and April.

On the first patrol heavy rains fell early in December (1948) at Mongureba; the rivers were flooded and geological work was hazardous. In January, 1949, during the patrol between Wabag and Mt. Hagen, heavy rains fell in the afternoons and nights. Heavy rains were reported at Mt. Hagen during the same period.

During the day light-weight clothes such as shorts and shirt can be worn, but at night it is necessary to have a good supply of warm clothes and blankets. On patrol, six blankets were carried but not always used.

Fauna.

The bird and animal life of the region was not at all conspicuous; generally birds were heard and not seen in the dense forests. Three Birds of Paradise, two pigeons and one cassowary were seen.

One small animal of the class known generally in New Guinea as "Kapul" was found but apart from this and native pigs no other animals were seen.

Flora.

The vegetation varies from dense forest to short grass. Moss forests are found at heights above 8,000 feet in the McNicoll and Marap Ranges. Casuarina trees and pandanus palms were frequently seen and pandanus swamps were traversed on the route between Wabag and Mongureba. The biggest pandanus swamp was between Ragis and Tumandan. Some fine stands of pine and cedar were seen.

Swampy grasslands occur in the broad undulating valley of the River Era at heights between 8,000 feet and 9,000 feet. On either side the valley is flanked by steep limestone cliffs clothed in dense forest. This area is devoid of native population and is regarded by natives of bordering districts as a hunting ground. The lack of trees may be partly ascribed to the choking effect of moss. Killing of trees in this manner was observed in some parts of the moss forest of the McNicoll Range.

Extensive swamps (see photo 22) up to two miles in length occur to the south of Lake Ivaia at Chirunki — they may be remnants of former extensions of this lake.

A large part of the country north of Wabag, except for the Sau River Valley east of Nisemunda, is covered with dense vegetation. The Lai River and the Boiyer River valleys have little vegetation other than long grass.

PHYSIOGRAPHY.

General Topography.

The region which is still undergoing uplift has a very rugged topography which varies in height from 4,000 to 13,000 feet above sea level. The general trend of the country is in a westnorthwesterly direction. The Mt. Hagen Range, which has a northerly trend, is an exception.

It may be noted here that physiographic barriers such as the Mt. Hagen Range and the McNicoll Range, which encloses the Porgera River basin, also form boundaries between ethnological and lingual groups.

Earth tremors have been felt in this region. On 28th November, 1948, a tremor lasting about two minutes was felt at Mongureba. Residents at Mt. Hagen report an earth tremor on probably the same day.

Mountains:

To the west of Wabag and in the area traversed by the patrols, the most conspicuous mountains were those of the McNicoll Range, the highest points of which are Mt. Kaijendi (approximately 11,500 feet) and Mt. Kumbaviera.

The McNicoll Range owes its height to massive limestone formations which cap the shales and sandstones. The northern face of Mt. Kaijendi (photo No. 4) rises sheer above the surrounding country for about 3,000 feet. The southern flank (photo No. 5) is serrated and presents an extremely inhospitable appearance to the explorer.

Between the River Miju and the River Lagaip, south of Auvugetta and between the two routes from Wabag to Mongureba a number of large limestone-capped hills were seen — the highest being Mt. Tongabibi.

The Marap Range forms part of the divide between the Rivers Lai and Lagaip.

The "Divide Range", so named by Messrs. Taylor and Black, and not to be confused with the Main Divide which separates the headwaters of the Fly and Purari River Systems from those of the Sepik and Markham River Systems, is situated north of the Rivers Lai and Lagaip. This divide is between 10,000 feet and 12,000 feet above sea level and diminishes in height eastwards towards Wabag, terminating in the vicinity of Mt. Hungamunda. No limestone was seen on those parts of the "Divide Range" which were visible from the patrol route west of Wabag.

Mt. Hungaro (photo Nos. 10, 11, 12) composed of sandstone, is a very conspicuous peak and its southern face rises vertically about 250 feet above the comparatively flat country about two miles to the westnorthwest of Waimarugus.

Rivers:

The principal rivers of the country west of Mt. Hagen are the Lagaip and Lai, both of which belong to the Sepik River System. The Boiyer River, which drains the country north of Rugi and to the east of the Mt. Hagen Range, joins the Lai River which flows into the Yuat River. The Lagaip flows generally westwards into the headwaters of the Sepik River. The Nahgi River, which is a tributary of the Purari River, drains the country south of Rugi and east of the Mt. Hagen Range.

Lagaip River.

This river has its source about 10 miles west of Nabag and southeast of the Narap Range. The largest tributaries of the River Lagaip are the Rivers Porgera and Miju.

The Lagaip River in the vicinity of Nurida appears to be in the early stages of maturity but northwest-wards towards Auvugotta there are gorges and rapids. These are reported to be more numerous farther west.

The River Miju was crossed in one place only, namely near Tumandan (photo No. 3), but it rises some 16 miles to the south where it is joined by the easterly flowing River Era. The River Era has its source in the McNicoll Ranges and meanders towards the River Miju through an open valley with low, undulating, boggy slopes, flanked by limestone cliffs about three miles apart.

The River Porgera drains a dissected, basinlike area between Mt. Kumbaviera and Mt. Kaijendi and has its upper sources in the hinterland of the McNicoll Ranges. The River Porgera has two main tributaries — the easterly flowing River Kaiya and the westerly flowing River Lilia.

The Kaiya River, which has many graded stretches, is much wider than its northerly flowing tributary, the Kogai River. The Kogai River flows over rapids and several waterfalls, the largest of which is about 40 feet high, to join the Kaiya River. Below the junction of the Kogai River with the Kaiya River there are several gorges through which the Kaiya River flows towards the Porgera River. The Kogai River, about half a mile above its junction with the Kaiya River, is about 6,300 feet* above sea level. The height of the junction of the Porgera and Kaiya Rivers is probably a little over 5,000 feet.

* Barometric height supplied by Mr. I. Champion.

Lai River.

The Lai River (see Plate I) flows eastwards from the limestone ridge east of Chirunki and Lake Ivaia, past Nabag towards Yaramunda in the vicinity of which it turns abruptly northwards and then flows through deep gorges to join the Boiyer River. After its junction with the Boiyer River, it is known as the Gai River.

The Lai River has many mature sections along its easterly flowing course. Between Kumbalita and Nabag the river has no rapids but at Nabag the river has entrenched itself in a gorge about 500 feet deep. At Nabag, on the southern side of the river, there are remnants of at least three river terraces (photo No. 2) on the largest of which (photo No. 1) the present air strip has been made. Farther east of Nabag the valley of the River Lai is open and presents a mature aspect. The deep gorges (photo No. 16) through which the River Lai flows northwards from Yaramunda are incised in sedimentary rocks dipping

Lai River (cont'd.)

at a low angle to the west. Remnants of a former river level can be seen on the western bank (photo No. 17). This old river level did not appear to be much higher than the valley floor of the Boiyer River.

The main tributaries of the River Lai are the Rivers Ambun and Sau. The River Ambun joins the River Lai about two miles west of Wabag. The River Sau, on the northern side of the Main Divide, flows eastward for about eight miles past Nisemunda then swings to the north. To join the River Lai, it resumes an easterly course.

Boiyer River.

The Boiyer River has a "drowned valley" topography. The comparatively flat valley over 12 miles long and up to 6 miles wide is surrounded by mountains rising steeply above the level of the valley floor in which the Boiyer River is deeply entrenched in a series of gorges.

Lakes:

Lake Ivaia (photo No. 23) and Lake Inim were the only lakes seen in the region. Lake Ivaia, whose maximum diameter is about one and a half miles and whose minimum diameter is about three quarters of a mile long, is situated about one mile northwest of Chirunki. Lake Inim, which is about half a mile in diameter, is situated about three and a half miles east southeast of Chirunki. Both lakes are at a height of over 8,000 feet and are surrounded by swampy ground and marshes. They are probably consequent lakes, formed through inequalities of the uplifted surface.

GENERAL GEOLOGY.

No geological work has been done previously in the country west of Mt. Hagen and the only geological information apart from the present reconnaissance has been that obtained from the examination of specimens collected by District Services Patrols and prospecting parties. Detailed geological work was not undertaken on either of the two patrols -- the nature of the terrain and the necessity to keep up with the patrol did not permit side traverses.

To the east of Mt. Hagen Noakes (1939) mapped a thickness of about 22,500 feet of "a folded series of predominantly fine clastics representing Mesozoic and lower Tertiary sedimentation .... despite the immense thickness, ... there seems no reason from the field evidence to suggest major repetition." This sequence of sedimentary rocks has been called the Wahgi Series and will be referred to herein as the Wahgi Group. The beds have been folded along an anticlinal axis, trending west northwest, which passes half a mile north of Kuta.

To the west of Mt. Hagen, the rocks consist of folded and faulted grey to black shale, sandstone, mudstone, grit and conglomerate which are thought to be the western continuation of the Wahgi Series. These sedimentary rocks have been intruded by quartz-monzonite and dolerite dykes of unknown age and in some places appear to be unconformably overlain by limestone of which samples collected southeast of Mt. Hagen by Fisher in 1937 have been determined as Miocene in age. In the Mt. Hagen area the Wahgi beds are overlain in places by rocks of volcanic origin and probably of a fairly recent age.

A list of specimens collected on patrol is contained in Appendix I of this report and a petrological description of some of the rocks by W. B. Dallwitz, petrologist, is contained in Appendix II.

SEDIMENTARY ROCKS.

Wahgi Group.

Fossils, representing periods from the Jurassic to the Eocene, have been found in the grey to black shales and sandstones which are interbedded with mudstones, siltstones, grits and conglomerates and hence these sediments are considered as the western continuation of the Wahgi Series described by Noakes.

The sediments, whose stratigraphic relations are not known in detail, strike in a general westnorthwesterly direction and dip from 30 degrees south to 70 degrees north.

In the vicinity of Mongureba the black shales are interbedded with sandstones which vary from one inch to four feet in thickness. The black shales are pyritic; boulders of crystalline pyrite up to 3 inches in diameter have been found. One horizon of black shales, outcropping along the banks of the Kaiya River, contains fossil remains of belemnites, ammonites and lamellibranchs. Palaeontological examination of these fossils has not been completed but the belemnites are thought to be Upper Jurassic in age.

In the Kogai River about three quarters of a mile south of its junction with the Kaiya River, a specimen (field No. 21) was collected from an outcrop of tuffaceous sandstone and was found to contain foraminifera of Upper Cretaceous age.

The grey to black shales with interbedded sandstones outcropped in many places between Wabag and Mongureba and probably they overlie the yellow shales, mudstones and tuffaceous sandstones to the west and north of Wabag. The greater part of the route to the Timen River was through dense forest and consequently the limits of these rocks could not be determined.

In an easterly flowing tributary of the Miju River, boulders of conglomerate were found. This indicates that a grit horizon should outcrop farther west.

In the Sau River at Nisemunda, to the north of Wabag, coarse sandstones and conglomerates were found apparently overlying conglomeratic unfossiliferous black shales. A vertical gradation from black shales to those with a conglomeratic facies was observed. Conglomerates form the Sau-Timen Divide and in the vicinity of Wabamunda provide good examples of strike ridges and dip slopes (photo No. 14).

Limestone, determined as Eocene in age, interbedded with the grey to black shales of the Wahgi Group, outcrops at Chirunki and also on the western bank of the Lai River above Kunbalitz.

A line of limestone outcrops extends from about 4 miles west of Chirunki westwards to Tumandan. The route of the patrol did not permit close examination of these outcrops but they appeared to be interbedded with shales and sandstones and probably belong to the Wahgi Group.

A specimen of limestone (Field No. 4) was collected in the vicinity of Maladoka and cursory palaeontological examination determined it as of Eocene age which was in keeping with the field occurrence. This limestone was conformable with the underlying grey shales striking N5°W and dipping

Wahgi Group (Cont'd.)

65 degrees to the east.

Owing to the exigencies of the patrol the massive limestone of the McNicoll Ranges was not studied in detail. One specimen only (Field No. 35) was collected and a palaeontological examination of the contained foraminifera indicates an Upper Cretaceous to Lower Eocene age which, unfortunately, is difficult to reconcile with field observations. In the field this massive limestone forms the cappings of Mts. Kaijendi, Kumbaviera, Tongabibi and Anonia. It appears to lie unconformably on the sediments of the Wahgi Group. At Mt. Kaijendi the limestone seemed to dip about 30 degrees in a southerly direction. The base of the limestone is probably at a height of 9,000 feet and summit at 11,500 feet. No limestone of Cretaceous Age, of such thickness and height, has been reported farther east in the Wahgi Group. E. R. Stanley (1923, p.290) states that "Alveolina limestone is recorded from the Wilhelmina Mountains, in Dutch New Guinea at an altitude of 15,400 feet." No thickness of the limestone of Eocene Age outcropping in the Wilhelmina Mountains, which are a continuation of the Central Highlands of New Guinea, is given. It may be possible that at Mongureba the limestone of the McNicoll Range represents a thicker section of the Chimbu Limestone (Noakes 1939, p.8) which may have been thrust over the underlying shales and sandstones. However, more field work will be necessary before the age and the structural relationship of the McNicoll Range limestone can be established.

Miocene Limestone.

Limestone outcropping on the western side of the Nabilyer valley south of Mt. Hagen is considered to be of Miocene Age.

From oblique aerial photographs of a run in a northwesterly direction from Mt. Hagen, it appears that the massive limestone ranges mapped by Messrs. Taylor and Black are an extension of the Miocene limestone on the western side of the Nabilyer valley. Aerial photographs also show massive limestones as a capping on the eastern extremity of the Main Divide. The limestone, which is gently folded and appears to dip about 20 degrees south, may possibly be of Miocene Age.

GRANITE.

No outcrops of granitic rocks were seen in the country traversed and apart from an outcrop of quartz monzonite at Mongureba, there was no evidence to presume that granite outcropped between Mongureba and Mt. Hagen. No boulders of granite were seen at either of the two places where the Porgera River was forded above its junction with the Kaiya River and hence it is quite possible that granitic rocks only outcrop near the western edge of the Porgera River Basin.

The Kubor Granite, east of Mt. Hagen, has been described by Noakes as varying in composition from diorite to granodiorite — the most common type is intermediate between granodiorite and granite. Noakes regarded the Kubor and Wilhelm granites as older than the Wahgi "Series", mainly because of the lack of contact metamorphism in sediments close to the granite. He suggested that the igneous intrusives found in the Wahgi "Series" were of Tertiary Age and were genetically connected with gold mineralization in the Mesozoic sediments.

DYKE ROCKS.

Few dyke rocks were observed on route as outcrops are poor and soil and dense tropical vegetation covers the underlying bedrock, but available field evidence indicates the discordant nature of some of the igneous rocks seen at Mongureba and on the Timon River.

Intermediate.

At Mongureba a quartz monzonite bordering on a quartz diorite in composition, outcrops in Yagetubali Creek and the Kogai River. It has been pyritised, chloritised and sericitised and gold has been found in the valley of the Kogai River where it is exposed. Only portions of its eastern contact with sediments of Mesozoic Age have been observed and the zone of contact metamorphism did not appear to be more than 3 feet wide. The sediments were slightly pyritised by the intrusive which is over 2 miles in length (see plate 2) and at least half a mile wide and which is regarded as a dyke rock.

Basic.

At Mongureba porphyrite and porphyritic dolerite dykes intrude members of the Nahgi Group. One of these (Field Nos. 11 and 12) has been slightly mineralized and propylitised but no gold has been found associated with it.

On the Timon River, to the south of Mairamunda, a dolerite dyke intrudes members of the Nahgi Group and may possibly be an intrusive member of the Mt. Hagen volcanics and if so is probably of Pleistocene Age.

VOLCANIC ROCKS.

Rocks of volcanic origin, such as agglomerates, volcanic tuffs and breccias were found as boulders in many streams and rivers and outcrops of andesite, basalt and agglomerate were observed.

The Mt. Hagen volcanics were not closely investigated and the only outcrops of these rocks which were encountered on the route were agglomerates and consolidated volcanic ash exposed on the banks of the Lai River at Arunka. Andesite and basalt which outcrops on the Timon River may belong to this Series. Aerial photographs, held by Australasian Petroleum Company, were used to determine the approximate western boundary of the volcanics. It is quite likely that the area marked on the accompanying map (Pl. I) is not entirely composed of volcanic rocks as the aerial photographs show, in some places, an erosion pattern which is not characteristic of that developed on rocks of volcanic origin. This is especially so in the portion of the country drained by the River Kundamo. The few observations which could be made in the field confirm this view and it is most likely that the volcanic flows have been eroded to expose the underlying sediments.

At Mongureba, apart from several exposures of andesitic dyke rocks, no outcrops of volcanic rocks were seen although there are numerous boulders of tuffs, agglomerates and breccias in the Kaiya and Kogai Rivers and their tributaries. Hence it appears that the boulders have been transported from the western edge of the Porgera River Basin.

A petrological examination, by W. B. Dallwitz, petrologist, is contained in Appendix II of this report.

STRUCTURE.

In the region traversed the sedimentary strata strike in a west northwesterly direction and dip from 30 degrees south to 70 degrees north.

At Kongureba, where fossils of Mesozoic Age were found, the sediments have a general N60 W strike and a vertical dip. Variations of strike from N70 W to N65 E and of dip from 30° S to 55° N are due to folding. Minor structures indicate that the area is on the southern limb of an anticline, the pitch of which is about 30 degrees to the southeast. Minor faults were observed but not studied in detail.

The continuation of the Mesozoic geosyncline as far west as Kongureba is now established. The position of the axis of the Kubor anticline is not fixed but possibly strikes in a west-northwesterly direction to the north of the Timeh River as the general dip of the Wahgi Group south of the Timeh River is to the south.

GEOMORPHOLOGY.

The Lagaip River and the Lai River west of Yaramunda occupy strike valleys and it is not unlikely that the course of the tributaries of the Lagaip River, namely the Porgera and Miju Rivers, are influenced by the geological structures of the Wahgi Group. The River Era, a tributary of the Miju River, is a consequent river whose junction with the Miju corresponds to a change in strike of the bedrock. The course of the Kaiya River and its tributary, the Kogai River, is controlled by the changing strike of the folded bedrock.

East of Yaramunda, the Lai River abruptly changes its course from a southeasterly to a northeasterly direction. West of Yaramunda the Lai River flows in a strike valley but north of Yaramunda it is deeply entrenched in sediments which dip about 20 degrees to the west. The rejuvenation of the Lai River could have been caused by uplift or by a change in course effected by the ejection of the Mt. Hagen volcanics. Insufficient evidence is available to form a definite opinion as to the cause of this superimposition. However, there is some evidence in favour of uplift — namely, the Boiyer, Lai and Jau Rivers now flow through gorges whereas the higher parts of their valleys have a mature appearance and there is a general concordance in the height of the ridges, which is most noticeable in the vicinity and to the north of Wabag.

E. R. Stanley (1924-p.36) and S. W. Carey (1938, p.15), both have observed the summit concordance at more than one level and suggest that peneplanation followed by uplift has occurred.

ECONOMIC GEOLOGY.

ALLUVIAL GOLD AT MONGUREBA.

INTRODUCTION.

Situation: Mongureba (or the Porgera Police Post) is situated about 42 miles west of Wabag Police Post and can be reached only by foot. The normal time for a patrol to cover a distance is six days.

Transport and Costs: Apart from native portage, the only other method of transportation is by aeroplane which drops food and equipment by parachutes at Mongureba.

Before entering the area, prospectors must lodge a bond of £250 as this part of the Mandated Territory of New Guinea is classed as "uncontrolled"; they must also guarantee that food will be dropped by aeroplane within one month of their arrival at the Porgera Police Post. The air-freight rate is approximately two shillings per pound and an airdrop of food costs between £300 and £400. There is no possibility of making an airstrip within two days' walk of Mongureba. On departure from Wabag, each prospector must have at least twenty native labourers and a food reserve to last fourteen days. To prevent the spread of dysentery to the west of Wabag, every member must take seventy (70) sulphaguanadine tablets (spread over 4 days) prior to departure.

The native population of the area is not large, consequently supplies of food from this source are limited.

Water and Timber Supplies: Plentiful supplies of water and timber, both for domestic and mining purposes, are available.

History and Tenure: The occurrence of alluvial gold in the vicinity of Mongureba was officially reported in 1938-1939 by the leaders of the Wagen-Sepik Patrol, Messrs. J. L. Taylor and J. R. Black. The advent of war in 1939 prevented any further inspection of the area. In March, 1948, several prospectors, on hearing exaggerated reports of the extent of the deposits of alluvial gold, started a minor gold rush. Results were disappointing and most of the prospectors left the area without even pegging claims.

At the time of inspection (December, 1948), Mr. J. Searson was the only miner in the area. He was employing 35 native labourers to ground-sluice three alluvial terraces on the northern bank of the Kaiya River about a quarter of a mile from its junction with the Porgera River. He had not pegged out any prospecting claim.

Production: Up to February, 1949, there was no official record of production.

Geology: The rocks of the area consist of folded and faulted grey to black banded graphitic shales with interbedded sandstones which have been intruded by quartz-monzonite, porphyrite and dolerite dykes. Limestone of doubtful geological age appears to unconformably overlie these rocks.

Boulders of volcanic tuff, breccia, agglomerate and felspar porphyry in the Kogai and Kaiya Rivers indicate that these rocks outcrop on the western edge of the Porgera River Basin.

The quartz monzonite dyke, over two miles long and at least half a mile wide is the largest intrusive seen in the area. It is probably younger in age than the porphyritic dolerite dyke (spec. 20) which outcrops over a width of about 150 feet at the 40 feet waterfall on the Kogai River, as small veinlets of monzonite were seen intruding the dolerite dyke to which it is adjacent.

Apart from these two discordant intrusives there are two smaller dykes, no wider than 20 feet, one of porphyrite on the Kaiya River and one of dolerite on the Kogai River from which specimens 11 and 12 and specimen 6 respectively were collected.

The sedimentary rocks, which are of Mesozoic Age strike in a general direction of N60°W and dip from 30°S.E. to vertical. Minor structures indicate that the area is situated on the southern limb of an east-pitching anticline the pitch of which is 30°S.E.

Alluvial Deposit:

The auriferous wash which is found on the banks of the Kaiya River rests on a bedrock of grey to black graphitic shale and sandstone. It consists of pebbles and boulders of rocks mainly of volcanic origin; boulders of limestone, quartz monzonite and pebbles of quartz also occur in the wash. The wash (photo No. 9) varies from a loose aggregate to a consolidated deposit cemented by a yellow to bluish-grey clay. All boulders, the largest of which measured 4 feet by 3 feet by 2 feet, are well rounded and in some cases have travelled well over 5 miles. The boulders and coarser material comprise about 60 per cent of the wash.

Soil forms the overburden at Searson's Workings and varies up to 2 feet in depth.

Insufficient work has been done to determine the configuration of the bedrock, the distribution of the gold values within the terraces of wash and the value per cubic yard.

Workings:

Searson's alluvial workings are situated on the northern bank of the Kaiya River about a quarter of a mile west of its junction with the Porgera River.

Three terraces of auriferous alluvial material (plate No. 3) extend in a northwesterly direction for a distance of 550 feet from the northern bank of the river. The terraces, which contain about 42,000 cubic yards of alluvial wash, have a surface area of about 2½ acres and an assumed average depth of 10 feet. The limits of the terraces are shown on the accompanying map (plate No. 3) where the limits are obscured by vegetation and soil, their approximate position is shown.

The uppermost terrace is between 60 feet and 100 feet above river level, the middle terrace is 40 feet and the lowest terrace is up to 20 feet above river level. The two lower terraces (photo No. 8) were being ground-sluiced at the time of inspection. Water for ground-sluicing is obtained by the diversion of a small stream which flows past the northeastern edge of the terraces into the Kaiya River. Searson had just commenced operations and was removing only about 5 cubic yards of wash per day.

Origin of the Gold:

Gold is found in the Kogai River and its tributary Yagotubali Creek which flows over and adjacent to a pyritised, chloritised and sericitised quartz monzonite.

The alluvial gold is thought to have originated from the disintegration of quartz veinlets and stringers which were introduced by or at the time of intrusion of the quartz monzonite. The character of the gold tends to support the view that it originated from quartz veinlets and stringers although none were seen in situ, outcrops being confined to river beds. The gold which is generally flat, commonly has pieces of quartz adhering to it, and the largest nugget found measured 0.7 inches by 0.6 inches by 0.2 inches.

Distribution and Nature of the Gold:

Gold is found in the Kaiya River below its junction with the Kogai River, in the Kogai River and in Yagotubali Creek which flows into the Kogai River. No gold has been reported from the Kaiya River (see Plate 2) west of its junction with the Kogai River and none was found therein when the area was inspected (December 1948). Only traces of gold have been found in the Kogai River above its junction with Yagotubali Creek. The principal deposit is at Scarson's Workings on the Kaiya River.

The distribution of gold indicates that there is no single large source such as a reef and the streams which drop about 500 feet in every mile have no places in which to deposit the gold. Consequently the removal of gold has more or less kept pace with erosion.

The gold found at Scarson's Workings (photo Nos. 6 and 7) varies in character. Generally the gold is smooth and flat but some[illegible] wire gold is found. Several pieces of gold with quartz adhering to them have been recovered. Four samples were sent for fineness determination and these ranged in gold content from 768 to 785 parts per thousand and 192 to 198 parts of silver per thousand, corresponding to a gold to gold and silver ratio of 802 to 810 parts per thousand.

The gold farther upstream, in the Kogai River, is less rounded and larger in size. Coarse gold, the largest piece of which was 0.7 inches by 0.6 inches by 0.2 inches in size, has been recovered from a small terrace in the Kogai River about one and a half miles south of its junction with the Kaiya River.

W. B. Dallwitz described gold, presumably from Yagotubali Creek, submitted by H. J. Leahy to the Chief Geologist, as "flaky, granular or in dendritic groups of crystals. Little (if at all) waterworn. .....".

Five samples sent for fineness determination gave the following results:-

Parts per thousand.

No.	Fine Gold	Silver	Combined Gold & Silver	Au / Au + Ag
1	796.9	187.6	984.5	809
2	781.1	187.9	969.0	806
3	782.2	186.1	968.3	808
4	723.9	248.2	972.1	745
5	676.4	293.4	969.8	697

These results indicate that two types of gold are present - one with gold/gold + silver ratio just over 800, the same as that found in Searson's Workings, and a lower more variable grade of gold with fineness about 700.

Recommendations:

In the area drained by the Kogai and Kaiya Rivers there are no large terraces in which alluvial gold could have been retained.

One terrace (see plate 2) about 15 feet above river level and one and a quarter miles east of the junction of the Kogai River with the Kaiya River was recommended to Mr. Searson but it will be difficult to obtain water for ground-sluicing. The terrace has a surface area of about one acre and is 20 feet deep.

Prospecting the river level boulder flats is warranted. One such flat on the Kogai River about one and a half miles south of the junction of the Kogai and Kaiya Rivers yielded coarse gold and several large nuggets.

Conclusions:

Gold, originating from quartz veins and veinlets introduced during the intrusion of a quartz monzonite dyke has been found in the Kogai and Kaiya Rivers, in the vicinity of Mongureba. Mongureba is relatively inaccessible - access is gained by means of bush tracks.

There are no large areas of alluvial wash and those that do occur are sufficient only to support one or two prospectors and do not warrant expenditure of capital, by mining syndicates or companies, for their development.

ALLUVIAL GOLD AT KUTA.

INTRODUCTION.

Situation:

In January, 1949, a brief inspection was made of the auriferous alluvial workings at Kuta situated about 5 miles south of Mt. Hagen Police Post.

Transport and Costs:

Kuta is reached by means of a road, suitable for jeep transport, from Mt. Hagen. All supplies are flown from Lae to Mt. Hagen. The freight rate is one shilling per pound.

Water and Timber Supplies:

Plentiful supplies of water and timber both for domestic and mining purposes are available.

History and Tenure:

Alluvial gold has been mined from streams near Kuta by the Leahy brothers since 1933. Mr. Dan Leahy is now ground-sluicing his claim but at the time of inspection little work was being done as the water races had been damaged by heavy falls of rain.

Production:

Since 1935, until March 1948, 3,603 fine ozs. of gold valued at £35,683 have been produced.

Geology:

The geology of the Mt. Hagen area has been discussed by Noakes (1939) and the geology of Kuta was fully described by Dr. Fisher (1937), then Geologist to the Mandated Territory of New Guinea. Unfortunately the report, which was not published, was lost during World War II and is only available in a summarised form (Fisher, 1945, p.478).

The rocks of the area consist of mudstone, shale and tuffaceous sandstone which have been intruded by small diorite sills and partially covered by volcanic ash beds probably of Pleistocene Age.

The mudstone, shale and tuffaceous sandstone belong to the Wahgi "Group". The Series has been folded along an anticlinal axis which strikes in a northwesterly direction through Kuta. In the vicinity of Kuta, the sediments dip from 15°S.W. to 15°N.E.

Alluvial Deposit:

The auriferous wash has been deposited on a bedrock of tuffaceous sandstone in Kunimo, Kwunga and parts of the Ambi and Kuan Creeks. The overburden is either soil or unconsolidated volcanic ash.

Bedrock:

The bedrock generally consists of tuffaceous sandstone which contains boulders of tuff (photo No. 19).

In Kuan Creek the bedrock, which consists of horizontally bedded yellow sandstone with thin bands of interbedded conglomerates, is exposed for at least 20 feet below the surface on which the auriferous wash has been deposited. The surface of the bedrock is quite uneven.

In No. 3 workings on Ambi Creek the wash has been deposited on a bedrock of consolidated black mud which also contains layers of gravel. Decayed wood and twigs in the mud indicate its Recent Age. Trenches 4 feet deep have not revealed true bedrock.

Wash:

The auriferous wash contains boulders of andesite, derived from the bedrock, quartz and pebbles of sandstone cemented together by a bluish-grey or mustard yellow clay. In places, limestone boulders are found in the wash. The quartz boulders are vuggy and in some places are mineralized. The degree of roundness of the basic tuff boulders is no indication that they have been transported very far as they are quite round when seen in situ due to a type of onion weathering. These boulders, which attain a maximum size of 12 feet by 6 feet by 5 feet, are commonly about 3 feet by 2 feet by 2 feet and comprise about 60 per cent of the wash. The wash is reported to vary in thickness from a few inches to 8 feet.

Overburden:

The overburden on Kunimo Creek is volcanic ash which ranges in thickness from a few inches up to 20 feet. Elsewhere soil up to 5 feet in thickness forms the overburden.

Origin of the Gold:

The gold has originated from quartz veinlets and stringers which are found in the sedimentary beds of the Wahgi "Group". Dr. Fisher considers that the introduction of the quartz veinlets and stringers may have been associated with the small diorite sills which intrude the sedimentary beds. In the absence of further evidence the writer sees no reason to disagree with this conclusion.

Distribution and Nature of the Gold:

Gold which has an average fineness of 753 has been won from four small creeks near Kuta. Two creeks, the Kunimo and Ewunga', flow northwards towards the Wahgi River and two, the Kuan and Ambi, flow southwards towards the Nabilyer River.

Kunimo Creek rises near the top of the northern slope of the divide on which Kuta is situated and flows in a northerly direction for about a mile past Kuta and then it swings to the east for about a quarter of a mile. At the end of its easterly flowing stretch it is joined by Ewunga' Creek and then resumes a northerly course. In the vicinity of the alluvial workings at Kuta the course of the Kunimo has been altered several times for mining purposes.

The source of the Kuan Creek lies about threequarters of a mile to the west of Kuta on the southern slope of the divide and that of the Ambi Creek over half a mile to the east.

The greatest amount of gold has been recovered from auriferous wash on the eastern bank of Kunimo Creek, at the junction of Kunimo and Ewunga Creeks and along Ewunga Creek. According to Mr. Dan Leahy, no gold has been discovered in the easterly flowing tributaries of Kunimo Creek at Kuta. Small deposits of gold have been found in Ambi Creek and only one deposit, which yielded about 300 ozs. (bullion), was found on Kuan Creek.

At the time of inspection the only work in progress was on Ambi Creek where a small amount of coarse gold was recovered. The gold was quite ragged, with quartz adhering to some pieces. A nugget about half an inch in diameter was found.

WORKINGS -

North of Kuta.

Kunimo Creek.

The workings on this creek extend for over threequarters

(Kunimo Creek - Cont'd.)

of a mile on the eastern bank of the creek.

No. 1 workings, situated about 1,350 yards on a compass bearing of 357 degrees from Kuta House, have a maximum length of 200 feet and an average width of 50 feet. The wash varies up to 5 feet in depth.

About 110 feet west of No. 1 workings are No. 2 workings which are 300 feet long and have an average width of 50 feet. The maximum length of the workings is 230 feet. Work was commenced on 5th of March, 1948.

No. 3 workings are situated about 600 yards south of No. 2 workings. A large amount of ground has been removed over a maximum length of 800 feet and a maximum width of 350 feet. Gold values and wash were confined to an area 370 feet long and 150 feet wide at the northern end of the workings.

Other workings now overgrown with vegetation are south of and adjacent to No. 3 workings.

Bwunga Creek.

The workings on this creek are situated on a compass bearing of 30 degrees from Kuta House. They are mainly on the eastern bank of the creek where they extend over a length of 350 feet and have an average width of 30 feet.

At the junction of Bwungar and Kunimo Creeks an area of about 2 acres has been worked for alluvial gold.

South of Kuta.

Ambi Creek.

No. 1 workings are near the headwaters of Ambi Creek on a compass bearing of 138 degrees from Kuta House. Work was begun on a small terrace on the eastern bank of the creek on 17th of January, 1949. The terrace is about 150 feet long and 10 feet deep and it has an average width of 20 feet.

No. 2 workings, on the eastern bank of Ambi Creek, are about 150 yards below its junction with Koibiga Creek and on a compass bearing of 170 degrees from Kuta House and of 185 degrees from No. 1 workings. No. 2 workings are about 60 feet long and have a maximum width of 60 feet. Gold values were confined to the northern end of the workings.

No. 3 workings are about half a mile southwest of No. 2 workings and due south of Kuta House. One area, with a length of 160 feet and an average width of 80 feet (maximum width 160 feet), has been worked on the western bank of Ambi Creek. Another area extends to the northeast between the junction of the Ambi Creek with the Kuomatina Creek for 180 feet at which point the two creeks are 240 feet apart.

Kuan Creek.

The workings on Kuan Creek (photo No. 20) are on a compass bearing of 203 degrees from Kuta House. The workings, which were commenced in 1935 and terminated in December 1948, have an area about 800 feet long and an average width of 100 feet.

Recommendations:

Development to the east of the present workings on Kunimo Creek has revealed that the alluvial deposit lensed out and that the overburden has increased in thickness. Consequently prospecting on the western bank of Kunimo Creek nearer its source, that is towards the top of the watershed, is recommended.

Geophysical methods of prospecting would aid in locating the former course of Kunimo Creek and may also reveal the source of the gold.

Conclusions:

Gold is thought to have originated from quartz veins probably associated with diorite sills which are intrusive into sediments of the Wahgi Group. It has been deposited in creek beds subsequently covered in part by volcanic ash. Erosion by streams draining to the north and south of Kuta House has revealed some of these deposits.

Ordinary methods of prospecting have not revealed the source of the gold but it may be located by geophysical methods.

ALLUVIAL GOLD ON THE TIMEN RIVER.

INTRODUCTION.

Location:

The occurrence of alluvial gold was reported on the Timen River at a place about 17 miles, on a compass bearing of 40 degrees, from Wabag Police Post and about a mile southwest of Hairamunda (see plate No. 1).

Transport and Costs:

Food and equipment can be transported from Wabag only by means of native labour. The time taken to travel from Wabag to Rowlands Mining Camp on the Timen River is 3 days. Freight rate by air from Lae to Wabag is one shilling and fourpence per pound.

Water and Timber Supplies:

Water is plentiful and timber can be obtained from the dense forests which surround the locality.

History and Tenure:

Gold has been found in small amounts in the gravels of the Sau and Timen Rivers by several prospectors. In 1948 the most persistent prospector, Mr. Ned Rowlands, reported he had found gold in the Timen River to the west of Hairamunda. As far as is known, no mining claim has been applied for.

Production:

There is no recorded production of gold from the area.

Geology:

The area was completely covered with soil and dense vegetation. Any outcrops of bedrock in the Timen River and its tributaries in the vicinity of the "find" were of basalt which, in most places, was decomposed.

Boulders in the riverbed showed that the Timen River drained country which contained limestone, basic volcanic rocks — tuffs and agglomerates — and granodiorite.

Alluvial Deposit:

The wash, which has been deposited in terraces varying in height from 3 feet to 10 feet above the river level, contains boulders of volcanic origin, limestone, granodiorite and occasionally some of the mineralized quartz. The boulders are not very large -- about 3 feet by 2 feet by 1 foot. The maximum size of quartz boulders is 3 inches by 6 inches by 18 inches, and limestone boulders 3 inches by 3 inches by 4 inches. Overburden consists of soil in some places 8 feet deep.

The terraces, generally covered in "pit-pit" grass, are situated on bends in the river and may be up to one acre in area.

Origin of the Gold:

Evidence of the origin of the gold is scant. The gold has probably been released from mineralized quartz veins, a few boulders of which were found in the river bed and wash. The quartz veins could have been introduced by granodiorite or by propylitizing solutions and gases after a volcanic eruption.

Distribution and Nature of the Gold:

At the time of inspection, Mr. Rowlands was in Australia consequently little information concerning the distribution of the gold could be obtained. The results of panning about a dozen dishes of wash for gold were disappointing and it is unlikely that a large deposit of gold is present. The few pieces of gold recovered were not much larger than a pinhead and were smooth and flat.

Workings:

The extent of the workings at Rowland's Mining Camp are negligible -- about 20 cubic yards of wash has been ground-sluiced.

Conclusions:

From the results of the inspection it does not seem likely that the wash would contain sufficient alluvial gold to warrant sluicing. Prospecting farther westwards in the upper portion of the Timon River may give better results.

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omit.

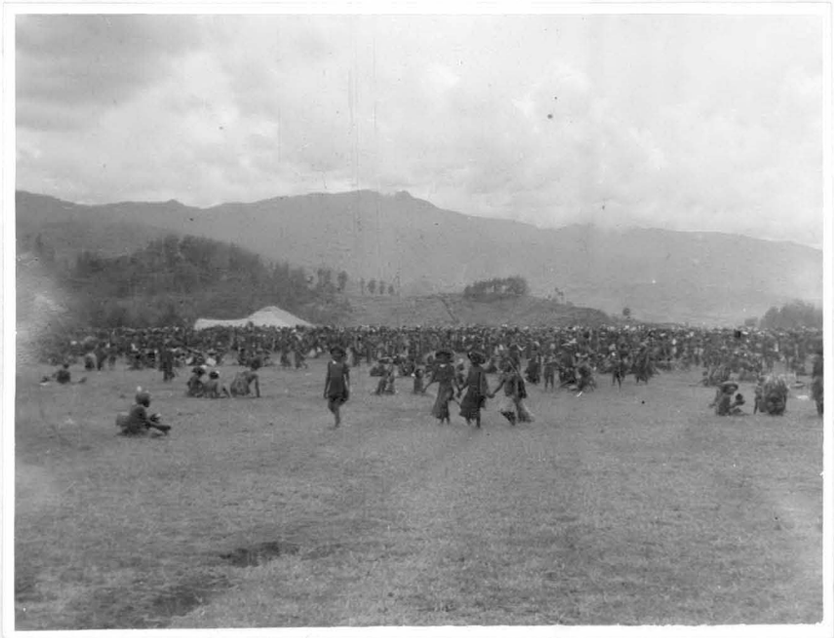
APPENDIX I.

LIST OF SPECIMENS COLLECTED BETWEEN MT. HAGEN & MONGUREBA.

Field No.	Field Name	Locality
2	Mudstone	Between Pipungus and Auwugetta
3	Sandstone	From the base of Mt. Mungaro, about two miles west of Waimarugus.
4	Limestone	From Malodoru on return route from Mongureba.
5.	Sandstone	From summit of Mt. Mungaro about two miles west of Waimarugus.
6	Porphyrite	Upper reaches of Kogai River above old mining camp.
7	Porphyritic Dolerite	Upper reaches of Kogai River above old mining camp.
9	Shale	About a mile east of Ragis.
11, 12	Porphyritic Dolerite, Propylitized	From Kaiya River.
14	Sandstone	Kaiya River.
15	Pyritised Quartz Monzonite	From Yagetubali Creek, tributary of River Kogai.
20	Porphyritic Dolerite	At 40ft. Waterfall on the Kogai River.
21	Sandstone	Kogai River, about ½ mile from the junction with the Kaiya River.
22	Sandstone	Kaiya River.
24, 25	Slate or Tuff	Kogai River near contact with (7).
27	Belemnites	Kaiya River between junction of Kogai and Porgera Rivers.
29	Lamellibranchs'	
33	Mudstone	Kuabalitz, at the western entrance to the village.
34	Limestone	Chirunki, from prominent limestone outcrop about ½ mile to southwest.
35	Limestone	Era River crossing about 13 miles to southwest of Mongureba.
40	Limestone	To the east of Lake Inim between Bulorem and the River Lai.

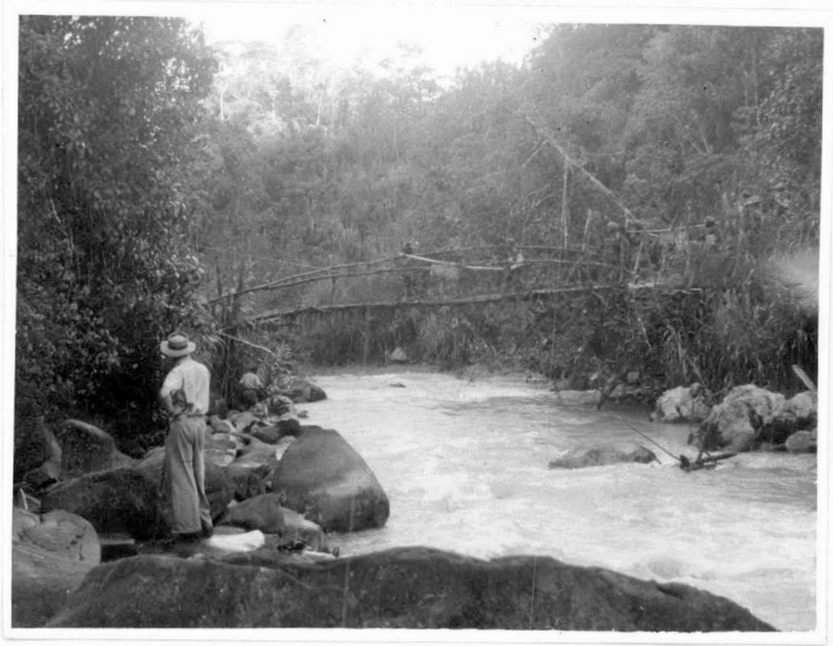
APPENDIX (Cont'd.)

Field No.	Field Name	Locality.
41 42	Porphyritic Andesite Plagioclase Basalt	From Rowlands Mining Camp on the Timen River.
45	Porphyritic Dolerite	From Timen River, one mile south of Mairamunda.
46		Kuta, Momi River, approximately 4 miles southeast of Kuta.
47		
48	Aplite	Momi River, Kuta, at the first waterfall going upstream.
49		Approximately 400 feet west of (48)
50	Agglomerate	Approximately 300 feet west of (49)
53	Tuff (basic)	Boulder from auriferous alluvial wash Ambi Creek, Kuta.
54	Tuff (basic)	Boulder from auriferous alluvial wash Kunimo Creek, Kuta.
55	Quartz	Boulder from auriferous alluvial wash Ambi Creek, mineralized.
57	Limestone	From Cave, approx. 3 miles on a compass bearing of 110 degrees from Kuta.
61	Granite	As for 57.
63	Shale	About 3½ miles on a compass bearing of 110 degrees from Kuta.
89 90	Mt. Hagen Axe Heads.	



WABAG AIR STRIP - AN OLD RIVER TERRACE - LOOKING EAST TOWARDS MT. MUNGAMANDA, THE HIGHEST POINT OF THE RIDGE.

WABAG AIR STRIP, LOOKING TO THE SOUTH-EAST REMNANTS OF A FORMER RIVER LEVEL ARE THE SPURS TO EXTREME LEFT AND RIGHT OF THE PHOTO.



CROSSING THE RIVER MIJU, TO THE WEST OF TUMANDAN

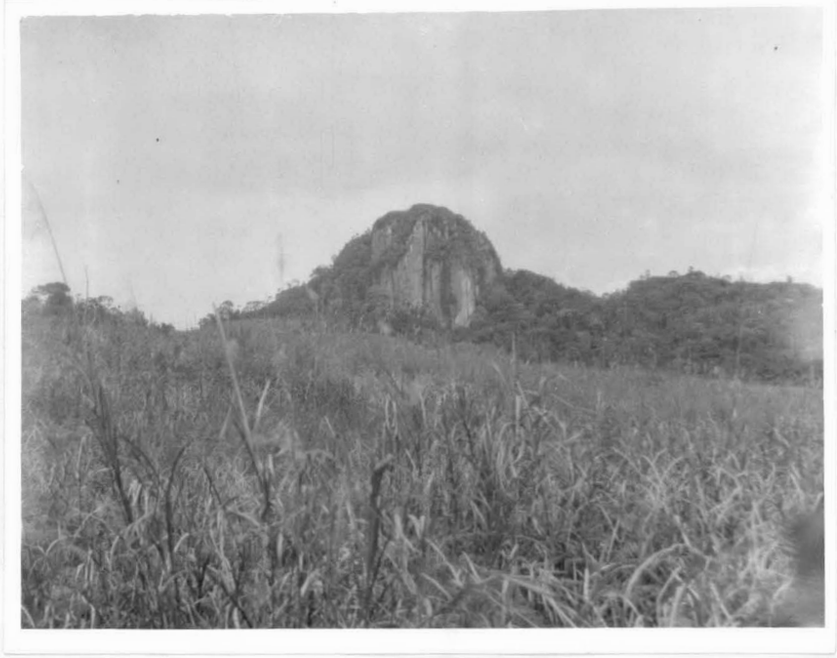
MONGUREBA, PORGERA POLICE POST, LOOKING EASTSOUTHEAST TO MT. KAIJENDI (a serrated limestone peak).

LOOKING TOWARDS THE SOUTHERN FACE OF MT. KAIJENDI, RIVERS ERA IN CENTRE FOREGROUND AND EARLY MORNING RIVER MISTS RISING.

SEARSONS WORKINGS ON KAIYA RIVER

SEARSONS WORKINGS KAIYA RIVER LOOKING AT SOUTHERN FACE OF LOWEST TERRACE

SEARSONS WORKINGS KAIYA RIVER SOUTHERN FACE OF LOWEST TERRACE (STICK IS 5' 9" LONG)



SOUTHERN FACE OF MT. MUNGARO, ABOUT 2 MILES WEST OF WAIMARUGUS

LOOKING EASTWARDS FROM THE SUMMIT OF MT. MUNGARO

MT. MUNGARO ON EXTREME LEFT OF PHOTO SHOWING NORTHERN (DIP SLOPE) FACE

LOOKING EASTWARDS TOWARDS WAIMARUGUS, LAGAIP RIVER VALLEY

DIP SLOPES AND STRIKE RIDGES. LOOKING N60°W FROM KAIBIMUNDA ON THE EAST BANK OF SAU RIVER

LOOKING SOUTHWEST FROM KAIBIMUNDA ON EAST BANK OF SAU RIVER

ON THE SOUTHERN BANK OF THE LAI RIVER AT ARUNKA, LOOKING NORTH ALONG THE LAI GORGE. THE REMNANTS OF A FORMER RIVER LEVEL CAN BE SEEN AT THE TOP OF THE GORGE

ON THE SOUTHERN BANK OF THE LAI RIVER, AT ARUNKA, LOOKING TO THE NORTHWEST; RIDGE ON WHICH PAKAU IS SITUATED IS COVERED BY CLOUDS

KUTA GROUND SLUICING EASTERN FACE OF NO.3 WORKINGS ON KUNIMO CREEK

BOULDERS OF BASIC TUFF IN BEDROCK OF ALLUVIAL WORKINGS AT KUTA

LOOKING DOWN KUAN RIVER VALLEY WITH KUAN R. ALLUVIAL WORKINGS IN CENTRE, THRUGG RIVER VALLEY ON THE LEFT OF PHOTO

KUTA, NO.2 WORKINGS ON KUNIMO CREEK

LOOKING SOUTHWARDS FROM PROMINENT LIMESTONE OUTCROP ABOUT 1 MILE S.W. OF CHIRUNKI

LOOKING TO NORTH WESTWARDS FROM PROMINENT LIMESTONE OUTCROP ABOUT ONE MILE S.W. OF CHIRUNKI.
LAKE IVAIA IN CENTRE. CHIRUNKI POLICE POST EXTREME RIGHT,

MONGUREBA - MT. HAGEN AREA

CENTRAL HIGHLANDS DISTRICT T.N.G.

GEOLOGICAL RECONNAISSANCE MAP

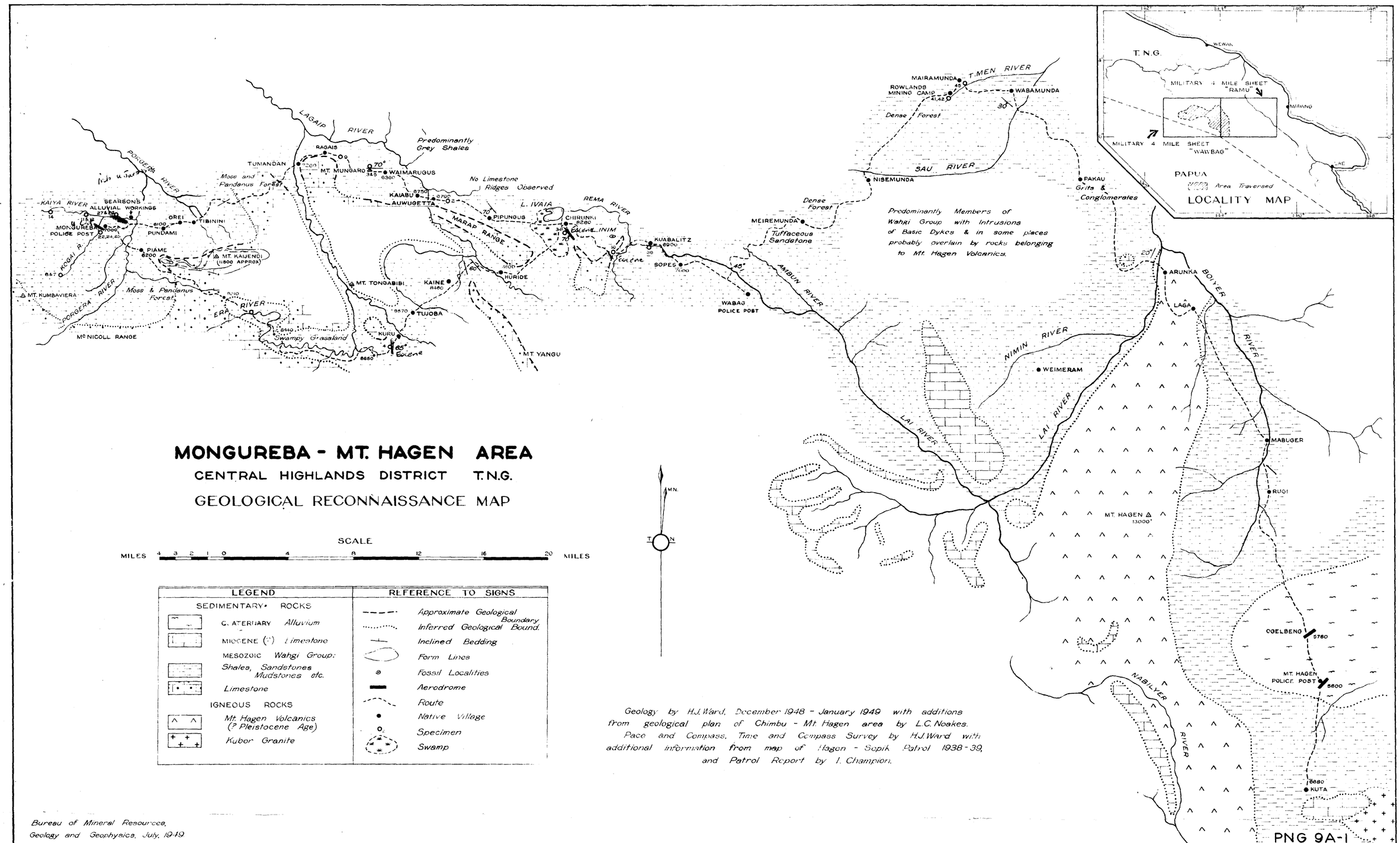
SCALE

MILES 4 3 2 1 0 4 8 12 16 20 MILES

LEGEND	REFERENCE TO SIGNS
SEDIMENTARY ROCKS	Approximate Geological Boundary
Q. ATERNARY Alluvium	Inferred Geological Bound.
MIOCENE (?) Limestone	Inclined Bedding
MESOZOIC Wahgi Group: Shales, Sandstones Mudstones etc.	Form Lines
Limestone	Fossil Localities
IGNEOUS ROCKS	Aerodrome
Mt. Hagen Volcanics (? Pleistocene Age)	Route
Kubor Granite	Native Village
	Specimen
	Swamp

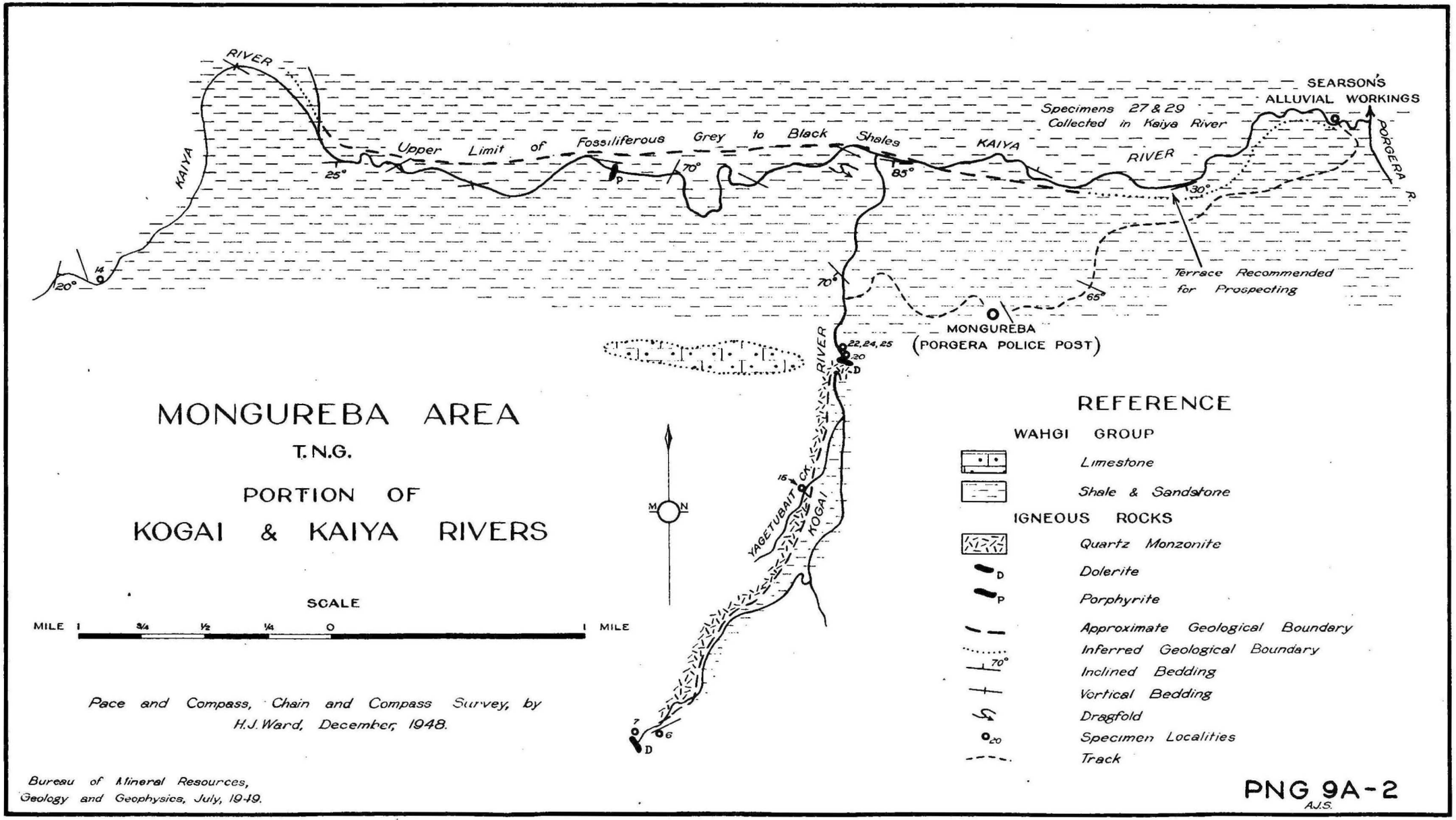
Geology by H.J. Ward, December 1948 - January 1949 with additions from geological plan of Chimbu - Mt. Hagen area by L.C. Noakes. Pace and Compass, Time and Compass Survey by H.J. Ward with additional information from map of Hagen - Sepik Patrol 1938-39, and Patrol Report by I. Champion.

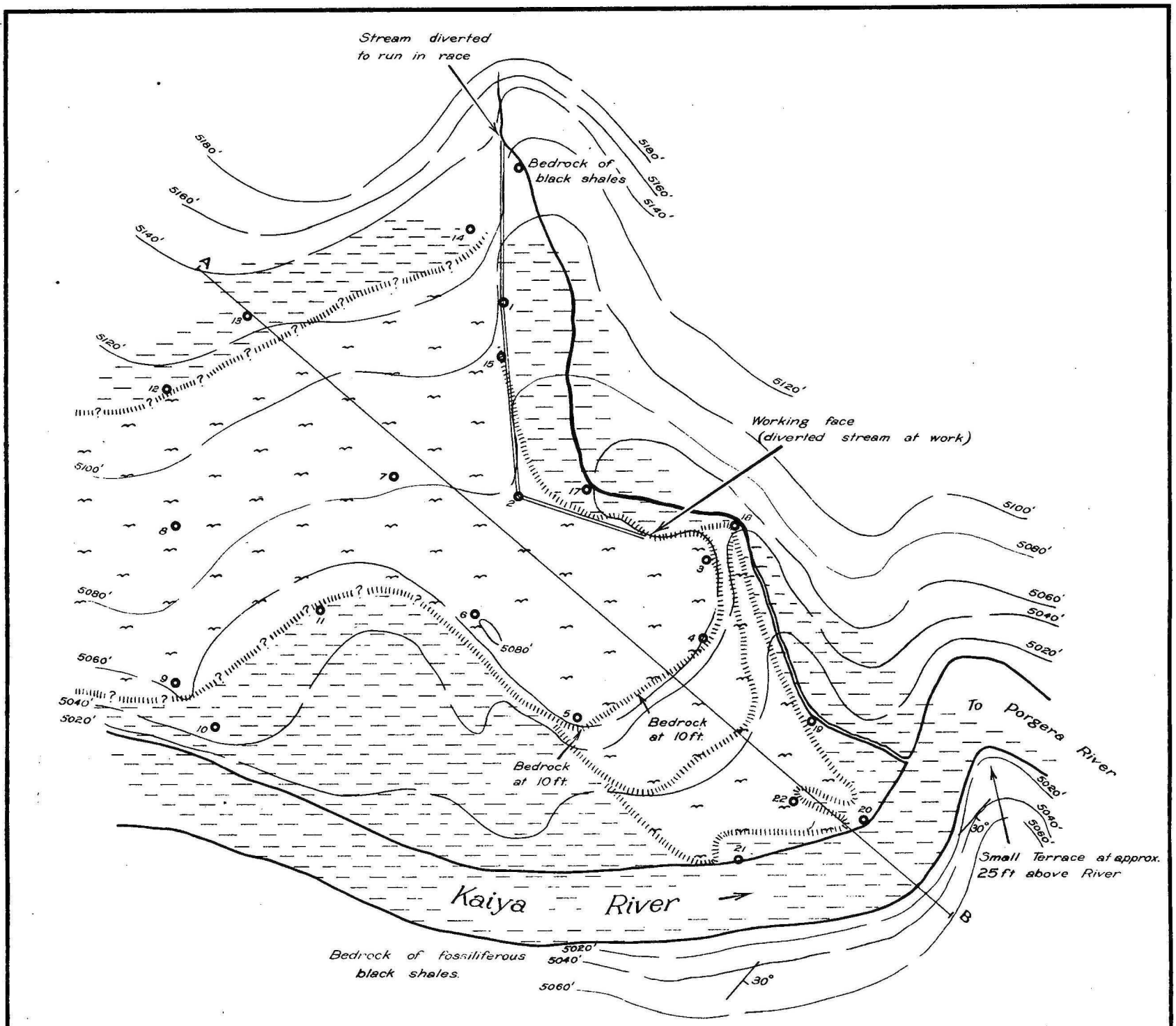
Bureau of Mineral Resources, Geology and Geophysics, July, 1949

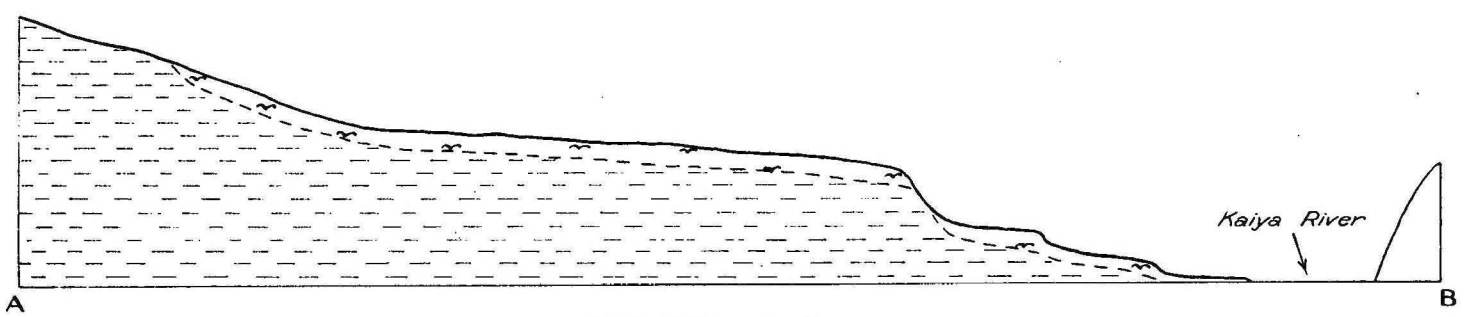


PNG 9A-1

AJS


RIVER
KAIYA
Upper Limit of Fossiliferous Grey to Black Shales
KAIYA RIVER
SEARSON'S ALLUVIAL WORKINGS
Specimens 27 & 29 Collected in Kaiya River
PORGERA R.
Terrace Recommended for Prospecting
MONGUREBA (PORGERA POLICE POST)
RIVER
YAGETUBAIT CK.
KOGAI
MONGUREBA AREA
T.N.G.
PORTION OF
KOGAI & KAIYA RIVERS
SCALE
MILE 1 3/4 1/2 1/4 0 1 MILE
Pace and Compass, Chain and Compass Survey, by H.J. Ward, December, 1948.
Bureau of Mineral Resources, Geology and Geophysics, July, 1949.
REFERENCE
WAHGI GROUP
Limestone
Shale & Sandstone
IGNEOUS ROCKS
Quartz Monzonite
Dolerite
Porphyrite
Approximate Geological Boundary
Inferred Geological Boundary
Inclined Bedding
Vertical Bedding
Dragfold
Specimen Localities
Track
PNG 9A-2
A.J.S.





SECTION A-B

SEARSON'S ALLUVIAL WORKINGS

PORGERA AREA, T.N.G.

SCALE IN FEET
(Horizontal & Vertical)

100 80 60 40 20 0 100 200

M N

REFERENCE

- Bedrock (fossiliferous black Shales of Wahgi Group.)
- Wash
- O_4 Specimen
- Form Lines
- Water Race
- Terrace Boundary
- Presumed Terrace Boundary

Chain, Compass & Abney Level Survey by H.J. Ward Dec., 1948.

Bureau of Mineral Resources, Geology and Geophysics, July, 1949.

PNG 9A-3
A.J.S.